IMAGE-BASED INSTRUCTIONS

KIMBERLY STANLEY MARKOWITZ
THE POLYTECHNIC INSTITUTE OF NEW YORK UNIVERSITY
Abstract

As technology has become more integrated into our daily lives, the need for easy-to-understand instructions has become more critical. Simple, image-based instructions are more frequently being used to immediately convey the basics of how to use technology to an increasingly broad audience that speaks different languages and comes from different cultures. This paper focuses on the current use of image-based instructions. It makes the case that while there is always a place for text-heavy reference materials, when it comes to instructions, materials that emphasize images over text are easier to understand and faster to absorb than materials that rely mostly or solely on text.
# Table of Contents

Why Pictures over Text? 4

Why Are Image-Based Instructions Easier for People than Text Ones? 6

In a Perfect World, There Would Be No Need for Instructions 7

Types of Non-text Instructions 11
  - Procedural 12
  - Reference 13
  - Signage 16
  - Imaged-Based Instructions Embedded in Products 18

So, What Is the Role of Text in Instructions, if Any? 20

Portfolio 23
  - Good vs. Bad Procedurals: Furniture Instructions 24
  - Good vs. Bad Signage: When Understanding Instructions Is Critical 36
  - Good vs. Bad Embedded Instructions: The Rainbird ESP-LX Modular Sprinkler System Control 40

Bibliography 43
Why Pictures over Text?

In the 21st century, we are wedded to our technology more than ever before. Although past generations were exposed to technology via factory workplaces and new fangled inventions like the telegraph, the automobile, and the radio, never before have so many complicated technical devices and concepts become such an integral part of our day-to-day lives.

Televisions, MP3 players, cell phones, computers, and the Internet—for everything from entertainment to dating to shopping to finances—are technologies that all of us use nearly every day—ones that it would be very difficult to forgo.

Our success in business, school, and our personal lives depends upon the understanding and use of complicated devices. Helping us to navigate all this technology is something quaintly old fashioned: reference materials and written instructions. While our technology has advanced rapidly, our way of teaching people to use the technology has not moved quite so fast. Cell phones, computers, DVD players, and appliances all still come equipped with text-heavy door stops that confuse people more than they help them. How can something with so many words convey so very little?
Watch children with new toys—instructions are thrown aside with the wrapping paper, and the kids are immediately pushing buttons and flipping switches trying to figure out how the toy works rather than reading the meticulously constructed directions.

Adults are not that different than children in this capacity. It is not uncommon to hear people say that they do not bother to read the manual, and frequently, the only reason they ever end up reading it is if something goes wrong—something that probably could have been avoided if they had read the manual.

One could make a lot of psychological or sociological arguments about this: people do not like to read, people prefer to learn through trial and error, people have short attention spans—but regardless of the reason, it is important to recognize that there needs to be a change in way that people are taught to use their technology.

The way to make instructions more immediate to users is to use more pictures. This is not to say that any set of pictures is better than any set of text instructions, but with knowledge, planning, and an understanding of the user, image-based instructions can be more noticeable and easier to understand than text ones, and they are more likely to be read.

This paper explores alternatives to text-based instructions. The focus is on image-based and embedded instructions. This is not to say that no text is included in these instructions, simply that text plays a more minor role than image or product design. The first part of this paper presents some theories on why non-text-based instructions are so effective and what those instructions need to accomplish. The next part lists some of the most common image-based and embedded instructions and shows their characteristics, when they are used, and why they are effective.
Lastly, a portfolio of instructions is included which more closely reveal the differences between text, image, and embedded instructions and highlights why the text-based instructions are not as effective or user friendly as imaged-based or embedded instructions.

**Why Are Image-Based Instructions Easier for People than Text Ones?**

Images work better than text because they are easier to imitate. In their chapter on cognition and action, neuroscientists Wolfgang Prinz, Gisa Aschersleben, and Iring Koch cite several interesting studies that reveal the way that humans respond to visual stimuli.

One series of studies of three- to five-year-olds reveals that even young children can easily imitate actions that are demonstrated for them visually; these studies also show that humans are primarily goal oriented, and if they are shown a series of actions, and they see a faster way to end up with the same result, then they will take shortcuts—basically deviating from the shown action to get to the goal more quickly. (42)

But, even images that are not goal oriented are often more effective than audio or text cues because the visual simply translates faster than other stimuli. Another series of studies from the same chapter reveals that people respond faster when there is a visual cue rather than an audio one. (46) The scientists conclude that “...actions are guided by anticipations of intended action effects.” (46) In other words, people will do what they are shown how to do more quickly than what they are told how to do, but they always seek a faster way to attain whatever goal they are pursuing and are willing to skip steps whether
it is making an omelet or building a piece of furniture. This goal orientation becomes very important in embedded instructions or interface design because in a sense, interface designers are anticipating the actions that users might take and are attempting to force users to behave in a certain way.

Although these studies look at visual versus audio stimulation, it is not much of a jump to conclude that if visuals are read faster by the brain than audio, then visuals are also read faster than text, which requires a higher level of translation to comprehend.

These concepts are really important for anyone creating instructions or designing interfaces to understand. Non-text instructions are often easier to follow because they show what success looks like. Furthermore, the idea that people are willing to skip steps to attain their goals means that instructions need to be as brief and to the point as possible in order to ensure that people actually read and comprehend them.

**In a Perfect World, There Would Be No Need for Instructions**

Well-designed products need minimal instruction because the instructions for using the product are embedded within them. Unfortunately, there are many badly designed products out there, and when a product is not well designed, the quality of the instructions becomes a lot more important. In a sense, instructions fill the gap between bad design and usability. In order to understand how to fill the gap, it is necessary to understand what makes a well-designed product.

When it comes to good product design, there is no better source than Donald A. Norman’s seminal 1988 work, *The Design of Everyday Things*. In it, Norman details the key qualities that any well designed product has (52–3):

**Visibility:** By looking, the user can tell the state of the device and the alternatives for action.
A good conceptual model: The design provides a good conceptual model for the user, with consistency in the presentation of operations and results and a coherent, consistent system image.

Good mappings: It is possible to determine the relationships between actions and results, between the controls and their effect, and between the system state and what is visible.

Feedback: The user receives full and continuous feedback about the results of actions.

Figure 4, Mercedes Benz Seat Control, illustrates Norman’s concepts. It is a particularly good example of embedded instruction: The controls are shaped like the seat, so it is both visible and a good conceptual model. The buttons are mapped well to the seat—to raise the seat, you push up on the lower button that resembles the bottom of the seat, and to move the seat back, you push back on the rear button that resembles the back of the seat. Users receive immediate feedback since the seat moves as they operate the buttons.

In addition to those four attributes, there are also three considerations that writers of instructions and product designers need to pay attention to—context, prior knowledge, and constraints.

Context

It can a be a challenge for writers to pare down instructions to the minimum, but a full understanding of the context under which a technology is going to be used makes this a lot easier. Context takes into consideration the circumstances under which a product or technology will be used, and it takes into consideration
the skill level of the user, which means that it is also important to product
designers.

Figure 5, How to Create a Make-Shift Sling, describes how to create an arm sling using the
victim’s clothes. The context here is very specific—here’s what you do if you are treating someone with a
damaged arm, and you don’t have a traditional sling available. Text is used here, but the images provide
key information on the way the various slings are supposed to look. In fact, with some slight tweaking,
it would be possible to rely on the images totally because the images provide what
Norman refers to as feedback—they show a user what success looks like. There’s no
discussion of regular slings or putting a sling some place other than the arm—just four
different ways to sling an arm using clothing. Like most image-based documentation, it
is simple and straight to the point.

Prior Knowledge

One instruction and product design shortcut is tapping into users’ prior knowledge
of similar technology. It would be pretty difficult to write instructions where every single
thing had to be explained. So, writers and designers take shortcuts by making
assumptions about what users already know. Obviously, this means that they have to
understand their audience. As with context, an awareness of users’ prior knowledge is
particularly important when creating image-based instructions.
Figure 6, Western vs. English Riding, taps into people’s familiarity with the fashion of cowboys and huntsmen to quickly illustrate the differences in the rider’s seat and saddle in the two different riding styles.

**Constraints**

Another very important thing to consider is constraints: what are the constraints of the product being documented, and what are the constraints of the potential user? *In The Design of Everyday Things*, Norman cites four types of constraints: physical, cultural, semantic, and logical:

- Physical limitations constrain possible operations...
- Semantic constraints rely upon the meaning of the situation to control the set of possible actions...
- Cultural constraints rely on cultural conventions...
- Logical constraints are created by the spatial or functional layout of components and the things they affect or are affected by.

Constraints force users to do things a certain way, which is actually an advantage to a product designer or documentation expert because it allows them to take certain shortcuts.
For example, Figure 7, Kraft Macaroni & Cheese Instructions, was heavily influenced by constraints. Firstly there is the physical constraint of the instructions being on the side of a small and narrow box; secondly there are number of cultural constraints involving ingredients, cooking apparel, and even order (top to bottom); lastly, there are logical constraints that require that the steps be performed in a certain order. All of these constraints work together to help the creator of these instructions to come up with a streamlined, simple set of directions that (almost) can be read by looking at the images alone. Without such limitations, the designer (or Kraft stakeholders) might have been tempted to add a lot of extraneous information that would confuse users, and that they would be less likely to read.

**Types of Non-text Instructions**

Although there are many types of non-text instructions out there, only the four main categories are included here: procedural, reference, signage, and embedded instructions.

![Figure 7: Kraft Macaroni & Cheese Instructions (Kraft)](image)
Procedural documentation is one of the most common types of instructions; it appears on food packaging, assembly instructions, and any place where users are being given directives. While sometimes mere text is sufficient to explain a task, in most cases images help, and for certain tasks images are a necessity. Figure 8, How to Tie a Bowline Knot, is a perfect example of this. It would be very difficult to write out the steps for tying a bowline knot, and even more difficult to successfully use those text instructions to tie one of these knots accurately. This is because tying a knot involves actions that we do not typically perform and that we do not have phrases to describe. Most people would understand what to do if they were told to clap their hands or snap their fingers. But, if they were told to make a loop in a cord with their left hand, put the right end of the cord through the loop, bring the end of the right end of the cord behind the end of the left cord, and pull it through the loop in the other direction, they would find it considerably more difficult to follow.

This underscores the earlier theory that states that people can follow steps they are shown more easily than ones they are told. This is particularly true in situations that require actions that are complicated or unusual; the images also provide critical feedback on what success looks like.
Reference

Reference graphics are used to clarify complicated ideas; ideally they make data more accessible by showing it from a different perspective. Nigel Holmes, a information designer whose work has appeared in *Time* and the *New York Times* says:

A good approach to [reference] graphics includes an appeal to the reader, immediately followed by a true account of the story, whether it is statistical, geographic, or diagrammatic. I want to make room for enjoyment, delight, aesthetic appreciation and wit, and a friendly “you can understand this” approach. (Steven Heller, *Nigel Holmes on Information Design*, 78)

In other words, reference graphics have to not only accurately relate data, they also need to be easy to understand—or as Donald Norman might say, reference graphics have to have good visibility and utilize a good conceptual model.

Figure 9, How Snoring Happens (next page) is a Nigel Holmes graphic that shows the specific blockages in the throat and sinuses that cause snoring. Even though most people probably know the body parts being discussed, it is much easier to understand how they creating snoring by presenting everything in situ:
Figure 9: How Snoring Happens
(Nigel Holmes/Explanation Graphics)
Figure 10, What’s Going Down in Downtown Brooklyn, uses graphics to illustrate the changes in job growth in the different zip codes of Downtown Brooklyn. The graphic turns what would normally be a very dry statistical list into something conceptually easier to understand by organizing the info in a whimsical, image-laden graph that includes an inset map that helps to orient the reader with the part of Brooklyn being discussed.
Signage

Signage falls into two main categories: warning and information—sometimes the categories overlap slightly.

Warning Signs

Warning signs are particularly constrained because they must appear on or very near the technology they are warning about. Figure 11, Beware of Falling Rocks, is an example of a sign embedded within the highway system that warns drivers to be on the lookout for rocks falling on their car from above. Warning signs are a particularly useful form of non-text instructions to study because their message is often critical, and therefore, they use a lot of tricks to ensure that users understand the message quickly.

One trick that warning signs use is that they not only tell users not to do something, and they also show them the consequences if they disobey—sometimes quite luridly like in Figure 12, Don’t Do This. It could be considered a form of “pre feedback” that speaks directly to our fears, which helps to ensure that the message is received quickly. Another trick is the use of strong colors. Warning signs often juxtapose saturated colors like red and black against a white or yellow, which improve the visibility of the signs. But, it is not only the strength of the colors that creates the impact, but the choice of color. By using red and yellow, warning signs tap into prior knowledge and cultural constraints that
state that these colors are used in situations that require extra alertness and caution. Still another trick is the use of plain, stick figure imagery. Superficially, this imagery seems slightly cartoonish, but using simple shapes streamlines the message of the sign making it easy to understand and increasing its visual impact.

**Information Signs**

Information signs are usually intended to provide information rather than to warn, but some of them—particularly street signs—are a hybrid of information and warning. These signs (See Figure 13, School Crossing Signs) inform and warn at the same time, but without showing the consequences of disregarding the sign.

What is also interesting to note about both warning and information signs is that there is often a consistency in color, shape, figure, and style across not only the United States, but across the world. While it is true that the crossing signs in Figure 13 differ, there is a similarity in shape and in the figures depicted—including the USA and Japanese signs. Despite differences in color, these signs are similar enough that drivers in any of these countries would understand what they meant fairly quickly.
Information signs rely on pictograms, which are special images that are used in heavily trafficked spaces like airports and other transportation hubs. The pictograms in Figure 14, Düsseldorf Airport Signs, are recognizable to anyone who regularly travels. Many airports include text in select languages alongside the pictograms, but it is usually unnecessary since nearly identical pictograms are used in airports all over the world.

Of course, this is not to say that anyone could understand pictograms. One still has to learn the language of pictogram and image in order to understand it. But, for those who are familiar with the language, individual images become synonymous with their associated concepts, and both warning and information signs can quickly and easily convey their intended message to people across cultures and languages. These signs work because they were designed using effective visibility techniques, with an understanding of the context in which they appear, and with an awareness of prior user knowledge.

Imaged-Based Instructions Embedded in Products

Embedded instructions deserve their own category. Part design and part labeling, embedded instructions show a person how to use a piece of technology not through lines of text, but through the use of labels, symbols, and placement (design). All instructions, particularly image-based ones are closely tied to the technology that they describe, but with embedded instructions the relationship is even closer. More than other instructions,
embedded instructions tap into a user’s prior knowledge of past practices or cultural norms.

Figure 15, Old Stovetop Controls, is a picture of the burner controls for a GE stovetop from the 1980s. Most people know how to use these controls because the controls for stovetops have been very similar for a number of years—round knobs are twisted to both turn on a burner, and adjust its heat level. Figure 16, 2005 Stovetop Controls, adds an extra embedded instruction by using four dots below each knob to refer to the burner that the knob controls. Figure 17, Induction Stovetop Controls, breaks from traditional stovetop controls by separating the controls for on/off and for temperature from one another, and by using numbers to indicate the temperature level, the square icon with the dot on the far left is meant to indicate that the controls pertain to the upper left burner. Although these controls are different than past stovetops, the symbols used are not unfamiliar: most people could figure out that the up and down arrows raise and lower the temperature of the burner; the on/off switch is probably the least clear, but it is nearly identical to the on/off switch on computers, and the designers have taken the extra precaution of labeling it.

In some ways, embedded instructions are the ideal because they convey their message with an attractive minimalism; how much better would it be for everyone if every product was as obvious and easy to use as these stovetops?
So, What Is the Role of Text in Instructions, if Any?

After all this discussion of advantages of image-based instructions, this paper wouldn’t be complete without a discussion of when and where text works better than image. Paul Mijksenaar in his 1997 book *Visual Function: An Introduction to Information Design* explores the antecedents of modern information design. Halfway through the book, he talks about the best time to use text:

> Just as...pictograms refer succinctly and immediately to concepts and functions; illustrations, such as drawings and photographs, bring products or production parts to life; and text, finally, is suited to those situations where exact information is crucial. (33-4)

In addition to sometimes being more precise, text can also be more practical. There are times when text explains a concept far more succinctly than image. Figure 20, Parking Lot Warning Sign, is a parking lot sign meant to warn people against leaving valuables in their car. The people who created this sign were amusingly creative in trying to convey the concept, but they were not very successful. The last image of a robber running away from an opened car is clear, but the initial image of a car with a red X, which is meant to convey leaving valuables in your car (the car as a safe) is not. So, the whole sequence is thrown off, and it takes too much time to figure out what is intended. This is a case where it would be much more practical to have a sign that simply also says, “Don’t leave valuables in your car.”
Of course, it is possible to create an image that does successfully tell people not to leave valuables in their car (see Figure 19, New Zealand Warning Sign) but anyone creating documentation has to weigh the time and effort it takes to come up with a good image against the speed and preciseness of text.

Another reason that text is often attractive to technical writers is because text seems easier. Most adults can write, and a large portion of them have at least some experience writing directions, whereas illustrating or even photography requires a bit more skill.

So, text can be more direct, and it is often easier to produce than images. But this does not let the technical communicators off the hook when it comes to images. Even though text plays an important role in instructions, and it can be very effective when specificity is important, and despite the fact that good images can be more of a challenge to create than merely writing out instructions, the arguments and information presented here reveal why images often work better than text when it comes to instructions.

No longer can we rely on the old-school method of reference materials and text-heavy procedurals. Instructions need to be streamlined. When the instructions for using a product cannot be embedded into a product itself, then the instructions created for it must quickly convey the key concepts of how to use the product as intended without breaking it.

Everyone from Plato to Neil Postman has complained about society’s preference for the presentational over the discursive, and how it dumbs us all down. But, the intent of
any instructions is to convey an idea as quickly and thoroughly as possible, and pictures can simply do that better than words: people read pictures faster and more readily than they do words. Images are the sentences and paragraphs of a pictorial language that when spoken correctly convey ideas to the human brain faster than words can. Technical communicators and product designers need to master this visual language in order to use it to teach us to use our technology and to help guide us through the 21st century.
Portfolio
Good vs. Bad Procedurals: Furniture Instructions

Last year, I bought two deck chairs online; the Boulder Chaise Lounges (see image, right) came in two large, flat boxes consisting of four big pieces (the back, the base, and two legs) and a handful of bolts, nuts, and washers.

The chairs came with a single page of text instructions (see image right). I struggled for nearly an hour in 95-degree July heat on my roof deck before I gave up. Ultimately, I had to print out zoomed and blurry images of the completed chair from the website in order to figure out how what went where, and it still took me another 90 minutes to get both chairs together.

Never before had the failings of non image-based instructions been so obvious to me. Part of the problem with these chairs (and with other self-assemble furniture) is the fact that many of the pieces look similar, and it isn’t always apparent which piece the instructions are referring to. This applies not only to large pieces like panels and legs, but to small pieces like screws and nails. Another issue is that it isn’t always easy to figure out which way the pieces are supposed to be positioned. More than once I had to take apart and reassemble the chaise because I turned something backward or upside down. Lastly, there is the translating thing: it’s harder to translate...
text into action than it is to translate image into action—particularly when you are doing something you have never done before like putting together a deck chair.

From the perspective of Norman’s design principles, these particular instructions are not very effective. The mappings, which show the relationships between actions and results, are lacking here—there is little sense of what does what, and what goes where. Without images, there is none of the pre-feedback that allows people to see what success looks like. Also, the manufacturers of the chaise have made a lot of false assumptions about their customers’ prior knowledge; or maybe prior knowledge is not even a consideration—I can’t imagine who could put these chairs together with these instructions. Lastly, there are few constraints, which is one of the reasons it is so easy to assemble the chaise incorrectly using these instructions.

It is easier to illustrate these ideas by looking at an example of good furniture assembly instructions. Ikea is pretty well known for this. Because they are an international company, they make completely image-based instructions for assembling their furniture that, in theory, could be followed by anyone regardless of what language they speak.

One of the first things Ikea does at the beginning of all their instructions is to tell you what tools you are going to need (see image on next page). So, there’s no more scrambling for that Phillips screwdriver or level while you are in the middle of putting something together. This is a way that Ikea situates the customer into a certain context: you will need these tools to put this together.
Ikea Tool List
This tool list appears at the beginning of all Ikea instructions; they did not include this information in the past, but they have since tweaked their instructions over time—presumably in response to user feedback. (Ikea 2009)

Another thing Ikea does is make an extra effort to make sure you understand which side is which; you can see this in the image below, which was taken from the most recent Bjursta china cabinet instructions.

Bjursta Glass-Door Cabinet
Step four, of the assembly instructions for Ikea’s Bjursta china cabinet. (Ikea 2009)
In this Bjursta image, there is contextual information, pre-feedback of what success looks like, and even constraints that attempt to prevent the users from using the wrong size wood peg (see inset, upper left). It is obvious that Ikea is thinking about where people are going to get confused and where they might make a mistake.

As good as Ikea is, they have improved their instructions over the years, and some of those changes illustrate why their image-based instructions work so much better than text ones. I have bought a number of shelves from Ikea over the years, and the model I usually get is one called Billy. I found some old instructions from a Billy wall shelf I bought in 1998, and I compared them to the most recent instructions I downloaded from Ikea’s website for a similar Billy wall shelf (next page).
Some of the differences between the old (top) and current (bottom) instruction panels might seem like minor cosmetic changes, but they actually make the instructions easier to
read and follow. The new images are more sharply drawn, which eliminates that bad photocopy look that Ikea instructions used to have (and that the Boulder Lounge Chair instructions have). Also, the insets are a little larger, and notice that Ikea has more carefully pointed out when parts are confusingly similar by including a “this not that” reference. They also include a useful tip about using books to prop up the shelves to make it easier to fit them into their respective slots. These are all examples of contextualizing, good mapping, pre-feedback, and necessary constraining, which help to make these instructions work.

Anyone assembling this shelf for the first time is still going to struggle a bit, but Ikea’s instructions make it a lot easier to put their furniture together; obviously it works for them since they have been in the business of selling self-assembly furniture for decades.
Good vs. Bad Reference Graphics: A Comparison of Quick Guides and Exploded Graphics

Reference graphics cover a wide field that includes maps, charts, graphics, quick guides, exploded graphics, and numerous others. The intent behind a reference graphic is to elucidate or clarify complex information such as statistics, geography, and mechanics into a graphical form that allows users to think about the information in a different and easy-to-understand way. When used with products, as quick guide graphics often are, reference graphics are supposed to help users to quickly understand the relationships between things.

Paul Mijksenaar and Piet Westendorp in their book, *Open Here: the Art of Instructional Design*, give several good and bad examples of reference graphics. The image on the next page, Clock Radio, is, unfortunately, typical of product reference guides: it uses the label and key method to show users what button/switch does what. I’ve never been a fan of switching back and forth between a labeled image and a key list because it is easy to get confused, and it makes things harder than they need to be. This method works fine with simple maps, but with more intricate graphics like Clock Radio, label and key fails many of Norman’s tests for good design: the conceptual model is bad because the number labels don’t provide a coherent system image of the radio; the mappings are off because the user has to take the extra step of looking up the number to see what the button does. The number labels are too close together, which increases the likelihood of reading the key incorrectly. Basically, it is just unnecessarily complicated. It is an example of where text is more useful than symbols.
The second image, Computer Ergonomics, works better; it uses short lines of text to help users understand what the graphic is telling them. No key is necessary; all of the information is included in one simple graphic. It’s visible, it conceptually makes sense, the mappings are clear, and pre-feedback is present—the image itself shows what success looks like.
The difference between the clock radio reference guide and the ergonomics one might not seem that dramatic, but the below examples of exploded graphics do a better job of showing the difference between a good and bad reference graphic.

The exploded graphic has long been an engineering staple used to highlight the various parts of a machine and show how they fit together. The example above, IBM Series III Copier, is a particularly bad example of a reference graphic. This appears in a manual, so while the image might have been bigger than it appears here, it wasn’t much bigger.

Going back to Norman’s design principles, one of the first problems with this image is that it is not shown in context. If this image wasn’t labeled, it would be nearly impossible to know what machine it belongs to. A small inset could be included to show
how this component fits into the copier as a whole. Also, the mappings are not that great.

The artist’s decision to use tiny red numbers and lines to identify each component of the machinery makes the image confusing. Users have to use a key to figure which part is which, and in many cases it is hard to see which number refers to what part because the red lines actually obscure some of the parts. Overall, this image creates a frustrating user experience, and it increases the likelihood that users will make an error in identifying which part is which.

While it is true that it is a challenge to depict the many parts of this copier machinery on one page, the artist is overlooking the obvious: it doesn’t have to be on one page. If this image were broken down into multiple images that depict each section of this mechanism, the artist could easily include clear and full labels for each part; a macro image could be included, which would show how all the broken down sections fit together to ensure that the user gets a contextual understanding of how the mechanism works as a whole.

A better example of an exploded graphic can be seen on the next page: U.S. Air Force Plane.
This image has good visibility and is contextual because it is easy to immediately see how all the parts fit together and their purpose. Each part is labeled in a way that doesn't obscure it and which allows anyone who looks at this to see immediately where everything is and what it is called. If it was necessary to show more detail, then each
section of the plane could have its own detailed graphic layed out in the same way as this one.

I would also argue that the difference in drawing style between the copier part and the Air Force plane is a factor. The copier drawing is very detailed—maybe even too detailed. Detail can be important if two parts look very similar, but it can be distracting if it is used unnecessarily. There's reason why drawings are often used in reference graphics rather than photographs. The simplicity of a drawing allows the creator of the graphic to focus users' attention only on what is germane rather than allowing them to be distracted by unnecessary details. But even within drawings there can be too much detail. In the case of the copier machinery, it is hard to imagine that it is necessary for users to see every thread and every notch in each screw and component. It creates visual fatigue, and it might make users focus too much on the details rather than the parts as a whole. The Air Force plane, on the other hand, provides just enough detail to show what the part is, and to make it visually interesting and appealing.
Good vs. Bad Signage: When Understanding Instructions Is Critical

Signs, as discussed earlier, are particularly important instructions that often provide critical information that has to be understood and acted upon rapidly. Other instructions and reference materials can afford to be misunderstood, but signs, particularly warning signs, cannot.

High voltage signs are used any place where there is danger of someone getting electrocuted. The signs to the right in English and Spanish are pretty typical of what one would see near power stations or on electric switch boxes. The sign seems straightforward, and it uses typical sign techniques to get it’s message across: saturated black and red—the word danger is highlighted in a red oval. There’s even a consistency in format that makes it easy to recognize the warning even when it appears in Spanish; of course this assumes that you are already familiar enough with the English version to recognize the color/iconography repeated in the Spanish sign.

That’s actually a pretty big assumption, and probably one that the manufacturers and maintainers of high-voltage equipment should not be making—someone who didn’t speak English or Spanish, and who was not familiar with the high-voltage sign might end up hurting themselves fatally because the sign relies mostly on text to get its message across.
To illustrate this, take a look at this partial sign that appears on an electrified fence in Somalia (right, top). It says, in Somali, “DANGER High Voltage Electric Barrier.” Imagine if the lightning bolt symbols had not been included (right, second). Keep in mind that this sign appears on a fence; there aren’t any obvious clues here like power lines or electric switch boxes—this is just a sign that appears on a fence. Sure, it’s yellow, but one might assume it is a trespassing warning. However, when you see the lightning bolt symbols, you get a powerful clue as to what this sign is warning about.

Better still is the third sign (right, third) which emphasizes the lightning bolt image over the text by putting it at the top and making it very large. The visibility, as Norman would say, is very good. However it could be even better. The last sign (right, bottom) utilizes pre-feedback by showing what will happen to you if you disobey—namely the stick figure struck by lightning. Although, if I were designing the sign, I would put the electrocuted stick figure at the top, and make it larger, while putting the text underneath.
Road signs have to be understood particularly quickly since people are seeing them at 50+ mph, while they are driving a car. For this reason, road signs don’t typically use a lot of text. The sign at the right, Danger Drive Slowly, is an example of a sign that you can buy, and put up in your neighborhood. It makes the unfortunate mistake if not using road sign style but high voltage style, which might, at quick glance, confuse people.

The more traditional sign (Slow Road Sign, right) works a lot better. Even though it says the word “slow” I doubt that most people read the sign—it’s more likely that they recognize it; signs that consistently use the same colors, shape, and iconography—like stop signs—become symbols in of themselves regardless of what they actually say. But, even an official text road sign telling drivers to go slow has its limitations. Part of this has to do with the fact that images stand out more (high visibility) but also that drivers are given many commands to slow or regulate their speed, and a lot people ignore those signs because they want to drive as fast they want to drive. It is important to understand this about drivers: it is an awareness of constraints—you can only constrain drivers so much. It is also an awareness of context: drivers aren’t going to slow down on a highway unless they are given a good reason to do so. Signs that include images allow you to elaborate on why the driver needs to slow down without adding more text than they can read.
For example, drivers may be more cautious with their speed, if they think they might strike a child or a kangaroo (See images, right). Including the images gives drivers a context for slowing down—they might hit someone or something, if they don’t. It also gives them pre-feedback about what might happen if they don’t slow down. All of this could be presented in text with no images, but images work better because they stand out more, and because they don’t require that you read English or any text language to understand them—you just have to understand the pictures.

Overall, warning and information signs do a fairly good job of alerting people to key information, but it is obvious that in some cases a better job could done. More use of images and an emphasis on a consistent style and iconography in signs across the United States and the world would greatly improve the effectiveness of signs, and it would ensure that people get the information that they need quickly and that they do not harm themselves unnecessarily.
Rainbird has a history of problems with their sprinkler control interface. Human Factors International provided usability consulting for Rainbird for their controls because customers were returning the sprinkler systems, saying they were “broken”; as it turns out, customers simply couldn’t figure out the Byzantine control interface. (2010).

There are lots of problems with this interface, but one that immediately jumps out is the lack of visibility and feedback. It is not readily apparent looking at the knob, the two switches, and the push-button panel what controls what or even how to begin. After looking at several different sprinkler systems that suffered from similar problems, I decided I was going to have to mock up by my own sprinkler control interface that would tap into some of Donald Norman’s design principles (See Kimberly Sprinkler System on the next page.)
My goal was to create an interface that someone could figure out how to use without reading the manual, and while I may have omitted some of the more sophisticated features of the Rainbird, I think that my interface permits users to do most of what they want to do with their sprinklers.

Even though a lot of text is being used in my interface rather than image, embedded instructions are still visual because they rely on organization, color, and shape to convey meaning rather than mere text.

My main deviation from the Rainbird is that my interface is an iPod-like touch screen to replace the mechanical knobs, switches, and buttons. Users scroll to select the desired start and end times, and touch the appropriate weekdays and sprinklers; their selections are displayed as they select them, so there is immediate feedback showing them
what they have accomplished. I would probably also add a little beeping sound as users make their selections to provide additional feedback. The visibility of my interface is also good because the actions are arranged in the order they should be performed—1) Select start and end times; 2) select days, and so on.

Lastly, I constrain users in the choices of what they can do—eliminating all those confusing (and I suspect unnecessary) options that the Rainbird includes makes the interface easier to use. If the additional options did need to be included, using a touch screen interface means that designers can easily create multiple screens to accommodate more functions. The important thing is that the designers make sure the interface provides feedback and good visibility, and that it constrains users from taking actions that make them think the system is broken.
Bibliography


Chapman, Darren. “Slow Down!” This is Not a Test. 
http://dchapman.wordpress.com/2008/12/16/slow-down/.


Cornell Publications, LLC. *Remington Model 81 Woodmaster Instruction Manual*. 


Fry, Fred. “Maritime Monday 164.” gCaptain. 
http://gcaptain.com/maritime/blog/tag/maritimemonday/.

Funkypancake. “don’t leave valuables in your car,” uploaded on May 9, 2009 to Flickr. 
http://www.flickr.com/photos/68236655@N00/3515922369/.


Patio Furniture USA. Boulder Chaise Lounge with Sliding Table.


http://wordsthatbless.wordpress.com/2009/03/14/approaching-the-unapproachable/.


Rainbird Landscape Irrigation. ESP-LX Modular Controller.


Speedy Signs. “Danger Signs.”


