Push or Pull?

How do product designs influence people to perform specific actions?

It seems hard to believe, but brand-new buildings are still being constructed with very silly design features. For example, a new building on our campus opened last year and featured many modern technologies, including very nice-looking glass doors through which you enter and exit the building. The problem is that the doors have identical handles on either side. The handles themselves are very attractive, but they don't tell me what to do when I want to enter the building—should I push or pull the door? The handles on these particular doors suggest to me that they are made for grasping and pulling. However, the door goes in only one direction, and the very same handles appear on *both* sides of the door. Therefore, to enter the building, I have to use the handle to pull the door, and to exit, I have to use the identical type of handle to push the door. How would someone possibly know which way the door swings when approaching it? After a year of using these doors on a daily basis, I still just guess about whether to push or pull. Why would someone design a door like that?

Michael Darnell has created a wonderful website that illustrates many instances of products that have been designed without the user in mind. One of his web pages describes a door handle problem similar to the one I just described, in which a building has a short walkway with one set of doors on either end. Each door has identical handles on either side of the door (the same type of handle is used for pushing and pulling the door). However, according to Darnell, these particular doors were installed such that the problem was magnified even more—the doors at either end of the walkway both swung out from the walkway. He tells the story of a friend who entered the walkway by pulling on the handle of one door; then went to the second door and found that the door would not open when she pulled on the handle. So, concluding that the door was locked, she returned to the first door to exit and found herself trapped in the walkway when the door wouldn't move when she pulled on its handle. After trying to get the attention of others on the outside to tell them that she was trapped in the walkway, she finally realized, with much embarrassment, that the handles had to be pushed when inside the walkway. Darnell reminds us that this funny story could have had tragic consequences if, for example, a panicked person were trying to flee the building in case of a fire.

There are many ways to solve this problem of having identical handles used for opposite actions. One solution would be to put signs on the door

From T.D. Lee, 2011, *Motor control in everyday actions* (Champaign, IL: Human Kinetics).

that say “push” or “pull.” Although these signs would probably work, a well-designed door (i.e., designed for the user rather than for its looks) should not need a sign to tell people how to use it. Pushing and pulling a door are not rocket science, after all. A better solution would be to install a flat plate on one side of the door, which would make the correct choice obvious: Because there is no handle to grab to pull toward you, there is only one other option—push! A sign would be unnecessary in this case because there would be no question about which action to take.

Signs and symbols that tell us how to use things should be the last option in technology design. Signs are sometimes small and hard to read, they fall off, they wear out, other things cover them up, and they are often presented in only one language, making them less than desirable in a multicultural society. Symbols avoid being unilingual but introduce other problems, such as ambiguity. For example, how would one create simple, unambiguous, and instantly recognizable symbols for “push” and “pull”? As in the door handle example, a better design would be one that made the correct action as obvious as possible, one that would negate the need for a sign or symbol.

A classic example of the failure of technology to exploit this simple idea is a standard topic in ergonomics textbooks and on websites: the arrangement of burners on the stove top. A typical stove top layout is shown in figure 1.5. The four knobs used to turn on the elements are located at the top of the figure. Quick, say out loud which one is used to turn on the right front burner. My guess is that it is one of the two rightmost knobs. But which one? It is impossible to know for certain without turning one of the knobs and waiting to see which element begins to heat up. So, designers add little labels to tell us which knobs are mapped to which burners. Do they work?

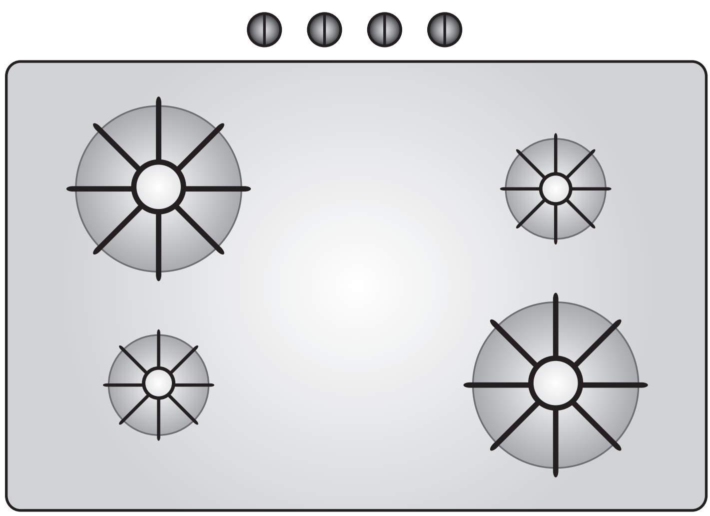

Figure 1.5 Common stove top layout. Quick, which knob controls the back left burner?

My personal experience is that these labels, if they have not fallen off, worn out, been covered by last night's pasta sauce, or been printed too small to read, are still hard to interpret. More times than I wish to remember, I have returned to a stove expecting to find a pot of boiling water for my pasta but instead found a glowing burner with nothing on it. The relative failure rate of these labels leads me to believe that they are only slightly more helpful than if I had just turned a knob at random.

Have a look at the two alternative stove top designs in figure 1.6. The layout of the knobs in figure 1.6*a* is the same as before; only the burner layout has been altered. In figure 1.6*b*, the burner layout is the same as it was before, but now the arrangement of the knobs has been altered. In

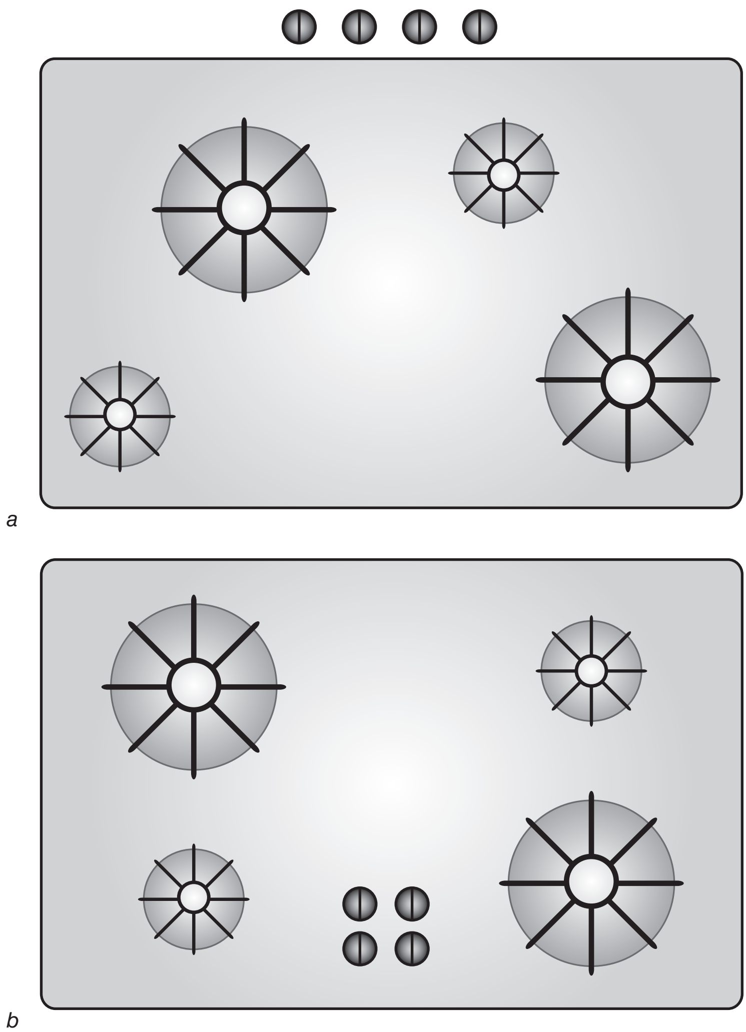

Figure 1.6 Two alternative stove top layouts. Compare these layouts to the layout in figure 1.5. Now there is no ambiguity as to which knobs control which burners.

both cases, the mapping of each knob to its associated burner has been made obvious by a simple rearrangement of either the knobs or the burner layout. No symbols or labels are needed, and the chances of turning on the wrong burner are minimal. Moreover, the amount of space occupied by the burners and knobs in these more compatible layouts is identical to the space occupied in the incompatible layout. It is interesting to note that these alternative layouts have been available for many years. But have a look at any appliance store flyer or website, and you will see that the classic design still continues to dominate the market.

Sometimes it is simply not possible to avoid the use of labels or signs. In such cases the designer's goal should be to make them as informative as possible. The typical ceiling fan is another good example of a failure to consider the needs of the user when designing the product. The ceiling fan that we have in our home has a wall switch that turns the fan off and on. But the ceiling fan has three additional controls, located on the base of the fan itself (where the fan connects to the ceiling), that are operated by pulling on long strings that hang down from the base. These three strings can be pulled to adjust the speed of the fan, to reverse its direction, or to turn off or on a light located on the bottom of the fan. The problem is that the strings are identical in appearance; I have no way of knowing which control I am activating when I pull on any of the strings.

Actually, that is not completely true. If I stand on a stepladder and get up really close to the ceiling, I can see little labels beside the holes where the strings exit the electrical base of the fan that say "speed," "light," and "direction." I could also stand on the floor and use binoculars to read these labels, I suppose. But, you get the point. Because these labels are next to useless to me, I really just have a one-in-three chance of getting it right each time I pull one of the strings.

How could each control be designed to communicate its function easily to the user? I have used two strategies to modify my own fan. Because reversing the fan's direction is the control that I use least often, I have shortened the string associated with this option to be the most difficult of the three to reach. However, I use the light and speed options about equally often. So, to make these as distinct as possible I borrowed two charms from an old charm bracelet and attached them to the ends of each string. A charm of a rabbit is attached to the string that controls the speed of the fan, and a charm of a book (for which I turn on the light to read) is attached to the string that controls the light. The fan may not look the way the manufacturer had intended it to look, but I have not made the mistake of pulling the wrong string since I attached these charms.

Motor skills such as pushing doors, turning knobs, and pulling strings are simple to learn, and we have all mastered these simple skills over our lifetimes. So why do we have such trouble using them? One reason is that the manufacturer is often paying more attention to aesthetics than to the needs of the user.

From T.D. Lee, 2011, *Motor control in everyday actions* (Champaign, IL: Human Kinetics).

Self-Directed Learning Activities

1. Describe, in general, the principle of how product design influences human performance.
2. Search the literature for the term *stimulus–response compatibility*; then define it in your own words with specific reference to an example presented in this story.
3. Over the next 24 hours, keep a diary of all the objects or things you encounter that you think represent stimulus–response *in*compatibility. Propose ways each of these things could be made more compatible.
4. Find three research articles in which stimulus–response compatibility has been investigated. What are the similarities and differences in the stimuli and responses used in these studies?

Notes

- Michael Darnell has a wonderful website that features many examples of poorly designed products, with suggestions about simple ways to greatly improve usability:
  www.baddesigns.com

Suggested Readings

Proctor, R.W., & Van Zandt, T. (2008). *Human factors in simple and complex systems* (2nd ed.). Boca Raton, FL: CRC Press.

Proctor, R.W., & Vu, K.P.L. (2006). *Stimulus-response compatibility principles: Data, theory, and application*. Boca Raton, FL: CRC Press.

Schmidt, R.A., & Lee, T.D. (2011). Human information processing. In *Motor control and learning: A behavioral emphasis* (5th ed., pp. 57-96) Champaign, IL: Human Kinetics.