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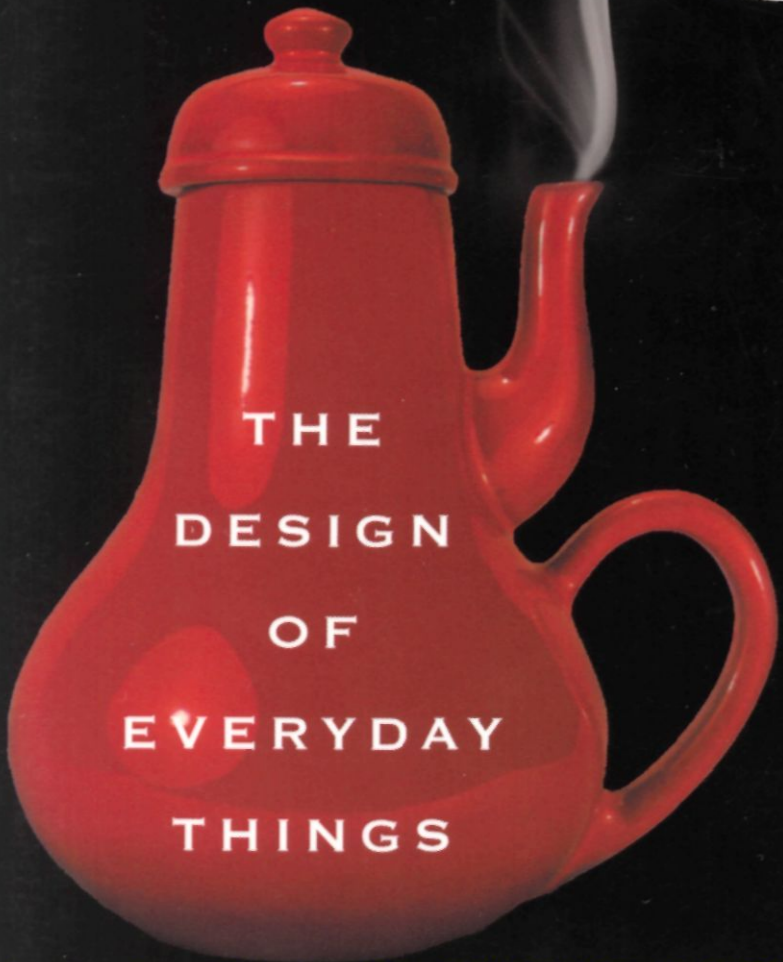

THE DESIGN OF EVERYDAY THINGS

Previously published as *THE PSYCHOLOGY OF EVERYDAY THINGS*

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PREFACE TO THE 2002 EDITION

"Norman Doors"

"I just found a Norman door: It was really difficult to open."

I am famous for doors that are difficult to open, light switches that make no sense, shower controls that are unfathomable. Almost anything that creates unnecessary problems, my correspondents report, is a "Norman thing": Norman doors, Norman switches, Norman shower controls.

That wasn't what I had in mind when I wrote this book. I thought my ideas would stand for good design, for objects we could use easily and efficiently—with delight and fun. And without having to read complex instructions or ask for help. Sigh. All those years spent studying fundamental principles of the human mind, of memory and attention, learning, motor control—only to be remembered for bad doors.

But then again, the interest shows that I made my point. Far too many items in the world are designed, constructed, and foisted upon us with no understanding—or even care—for how we will use them. Calling something a "Norman door" is recognition of the lack of attention paid by the maker to the user, which is precisely my message. I am delighted by the letters I receive, including yet more examples. I am delighted that many wonderful products now do exist, and that in numerous cases designers

have stated that *The Design of Everyday Things* was required reading for their staffs. This book has succeeded.

So show me more of those Norman doors, those faucets, those plastic bags of food that can be opened only by ripping them with the teeth. Show me more of those automobile radios, such as the one in my own car, with rows of tiny identical buttons that can't possibly be operated while driving.

The problems sound trivial, but they can mean the difference between pleasure and frustration. The same principles that make these simple things work well or poorly apply to more complex operations, including ones in which human lives are at stake. Most accidents are attributed to human error, but in almost all cases the human error was the direct result of poor design. The principles that guide a quality, human-centered design are not relevant just to a more pleasurable life—they can save lives.

The Hidden Frustrations of Everyday Things

Before I wrote this book, I was a cognitive scientist, interested in how the mind works. I studied human perception, memory, and attention. I examined how people learned, how they performed skilled activities. Along the way, I became interested in human error, hoping that my understanding of error would provide ways to teach people how to avoid mistakes. But then came the nuclear power plant accident at Three Mile Island in the United States, and I was among a group of social and behavioral scientists who were called in to determine why the control-room operators had made such terrible mistakes. To my surprise, we concluded that they were not to blame: the fault lay in the design of the control room. Indeed, the control panels of many power plants looked as if they were deliberately designed to cause errors.

My interest in accidents led me to the study of human-centered development procedures that might eliminate those problems. I spent a sabbatical year in Cambridge, England, at the Medical Research Council's world-famous Applied Psychology Unit and was continually amused and frustrated by the workings of the building. It was difficult to figure out which light switch controlled what light. Doors were another puzzle: some had to be pushed, some pulled, and at least one required sliding, yet there were no clues to the unwitting person attempting to go through the doorway. Water taps—"faucets" in the United States—were capricious; some sinks had the hot water on the left, some on the right. Moreover, whenever people made errors using these ill-constructed devices, they blamed them-

selves. What was going on? Why did people blame themselves when a device itself was at fault?

I started to observe how people coped with the numerous devices that populate our lives. In more recent years, my studies have expanded to include aviation safety, complex manufacturing plants, medical error, and a wide range of consumer products such as home entertainment systems and computers. In all these situations, people often find themselves flustered and confused. Worse, serious accidents are frequently blamed on "human error." Yet careful analysis of such situations shows that the design or installation of the equipment has contributed significantly to the problems. The design team or installers did not pay sufficient attention to the needs of those who would be using the equipment, so confusion or error was almost unavoidable. Whether kitchen stove or nuclear power plant, automobile or aircraft, thermostat or computer, the same problems were present. In all cases, design faults led to human error.

My frustrations while in England caused me to write *The Design of Everyday Things*, but the problems I encountered there are universal and worldwide. When I wrote the book, I was a research scientist interested in principles of cognition. But I found myself more and more fascinated by the way these principles could be applied to improve everyday life, to minimize error and accident. I changed the direction of my research to focus on applications and design. Eventually I left my university so I could devote myself to the development of products. I joined Apple Computer, first as an "Apple Fellow," then as vice president of the advanced technology group. I served as an executive at two other companies and then, with my colleague Jakob Nielsen, cofounded a consulting company (the Nielsen Norman group) to apply these ideas to a wider variety of firms, a wider variety of products. It has been exciting to witness the principles in *Everyday Things* realized in products.

The Book Title: A Lesson in Design

This book has been published under two titles. The first title, *The Psychology of Everyday Things—POET*—was much liked by my academic friends. The second title, *The Design of Everyday Things—DOET*—was more meaningful and better conveyed the contents of the book. The editor of the paperback edition explained to me that in bookstores, titles are what readers see as their eyes wander the shelves, skimming the spines. They rely upon the title to describe the book. I also learned that the word "psychology" caused the book to be shelved in the psychology sections of the stores, which drew readers who cared about people and human relation-

ships rather than objects and our relationships to them. Readers interested in design would never think of looking in the psychology section. I went to bookstores and watched how people browsed. I talked with book buyers and clerks. My editor was correct: I needed to change the word "psychology" to "design." In titling my book, I had been guilty of the same shortsightedness that leads to all those unusable everyday things! My first choice of title was that of a self-centered designer, choosing the solution that pleased me without considering its impact upon readers. So DOET it became, and *DOET* it remains in this new edition.

Lessons from *DOET*

When you have trouble with things—whether it's figuring out whether to push or pull a door or the arbitrary vagaries of the modern computer and electronics industry—it's not your fault. Don't blame yourself: blame the designer. It's the fault of the technology, or, more precisely, of the design.

When we first see an object we have never seen before, how do we know how to use it? How do we manage tens of thousands of objects, many of which we encounter only once? This question propelled the writing of *DOET.* The answer, I quickly determined, was that the appearance of the device must provide the critical clues required for its proper operation—knowledge has to be both in the head and in the world.

At the time I wrote *DOET,* this idea was considered strange. Today, however, the concept is more widely accepted. Many in the design community understand that design must convey the essence of a device's operation; the way it works; the possible actions that can be taken; and, through feedback, just what it is doing at any particular moment. Design is really an act of communication, which means having a deep understanding of the person with whom the designer is communicating.

Although *DOET* covers numerous topics, three have come to stand out as critical:

1. *It's not your fault:* If there is anything that has caught the popular fancy, it is this simple idea: when people have trouble with something, it isn't their fault—it's the fault of the design. Every week brings yet another letter or e-mail from someone thanking me for delivering them from their feeling of incompetence.

2. Design principles: I make it a rule never to criticize something unless I can offer a solution. *DOET* contains several important design principles, powerful tools for designers to ensure that their products are understand-

able and usable. The principles, of course, are explained within the book, but to give you a hint of what you will encounter, here is a short list of the most important. Note that they are all easy to understand, yet powerful.

• *Conceptual models.* The human mind is a wonderful organ of understanding—we are always trying to find meaning in the events around us. One of the greatest frustrations of all is trying to learn how to do something that seems completely arbitrary and capricious. Worse, when we lack understanding, we are apt to err.

Consider the thermostat. When some people enter a cold house, they turn the thermostat to a very high temperature in order to reach the desired level more quickly. They do this because of their internal mental model of how the furnace works. The model is sensible and coherent, even if not well thought out. It is also wrong. But how would they know? Although this behavior is wrong for the home, it works for most automobiles—turn the heat or air conditioning up all the way, and when the interior is at the correct temperature, adjust the temperature control again.

To understand how to use things, we need conceptual models of how they work. Home furnaces, air conditioners, and even most household ovens have only two levels of operation: full power or off. Therefore, they are always heating or cooling to the desired temperature as rapidly as possible. In these cases, setting the thermostat too high does nothing but waste energy when the temperature overshoots the target.

Now consider the automobile. The conceptual model is quite different. Yes, the heater and air conditioner also have only two settings, full power or off, but in many autos, the desired temperature is achieved by mixing cold and hot air. In this case, faster results come by turning off the mixing (by setting the temperature control to an extreme) until the desired temperature is reached, then adjusting the mixture to maintain the desired temperature.

The explanations of the home and automobiles are examples of simple conceptual models. They are highly oversimplified but quite adequate for understanding how they work. They make it easy for us to use very different behavior when in the home or in the auto. A good conceptual model can make the difference between successful and erroneous operation of the many devices in our lives.

This short lesson on conceptual models points out that good design is also an act of communication between the designer and the user, except that all the communication has to come about by the appearance of the device itself. The device must explain itself. Even the location and operation of the controls require a conceptual model—an obvious and natural

relationship between their location and the operation they control so you always know which control does what (in the book, I call this a "natural mapping"). When the designers fail to provide a conceptual model, we will be forced to make up our own, and the ones we make up are apt to be wrong. Conceptual models are critical to good design.

• *Feedback.* In design, it is important to show the effect of an action. Without feedback, one is always wondering whether anything has happened. Maybe the button wasn't pushed hard enough; maybe the machine has stopped working; maybe it is doing the wrong thing. Without feedback, we turn equipment off at improper times or restart unnecessarily, losing all our recent work. Or we repeat the command and end up having the operation done twice, often to our detriment. Feedback is critical.

• *Constraints.* The surest way to make something easy to use, with few errors, is to make it impossible to do otherwise—to constrain the choices. Want to prevent people from inserting batteries or memory cards into their cameras the wrong way, thus possibly harming the electronics? Design them so that they fit only one way, or make it so they work perfectly regardless of how they were inserted.

Failure to design with constraints is one reason for all those warnings and attempts to give instructions: all those tiny diagrams on the camera, in obscure locations, often in the same color as the case and unreadable. I look for instructions posted on doors, cameras, and other equipment. Rule of thumb: when instructions have to be pasted on something (push here, insert this way, turn off before doing this), it is badly designed.

• *Affordances.* A good designer makes sure that appropriate actions are perceptible and inappropriate ones invisible. *DOET* introduced the concept of "perceived affordances" to the design community, and to my pleasure, the concept has become immensely popular.

3. *The power of observation:* If I have been successful, *DOET* will change the way you see the world. You will never look at a door or light switch the same way again. You will become an acute observer of people, of objects, and of the way they interact. In fact, if there is one single most important part of the book it is this: learn to watch, learn to observe. Observe yourself. Observe others. As the famous baseball player Yogi Berra said, "You can observe a lot by watching." Problem is, you have to know how to watch. Before *DOET*, had you seen a hapless user, whether an unknown person or even yourself, you would have been apt to blame the person. Now you will find yourself critiquing the design. Better yet, you will find yourself explaining how to fix the problem.

Design Today

Since *The Design of Everyday Things* was first published, products have become much better—and much worse. Some designs are wonderful, some horrible. The number of companies that are sensitive to the needs of their customers and employ good designers increases yearly. Products have improved. Alas, at the same time, the number of companies that ignore the needs of their users and thereby create ill-conceived, unusable products seems to increase even more rapidly.

The confusions foisted upon us by technology are increasing at a faster pace than ever before. Today's heavy usage of the Internet, cellular telephones, portable music players, and the wide variety of portable, wireless message and e-mail systems shows just how important these technologies have become to our lives. Nonetheless, websites are often unusable, cellular telephones grow ever more complex, and automobile dashboards look like airplane cockpits. The new products impose themselves upon us in the bedroom, in the automobile, while walking down the street. As each new technology emerges, the companies forget the lessons of the past and let engineers build their fanciful creations, driven by marketing insistence on a proliferation of features. As a result, confusion and distractions increase.

Remote control of the home is a popular fantasy among technologists. Why not, they muse, call your home while you are driving and turn on the heat or air conditioner, start filling the bathtub, or make a pot of coffee? Some companies offer products that make it possible to do these things. Why do we need them? Think of how much difficulty the average automobile radio presents to the driver. Now imagine trying to control the various appliances in the home while driving. Ah, the wonders yet before us. I shudder in apprehension.

Design is a complex endeavor, covering many disciplines. Engineers design bridges and dams, electronic circuits, and new forms of materials. The term "design" is used to refer to fashion, buildings, interior decorating, and landscaping. Many designers are artists, emphasizing aesthetics and pleasure. Others are concerned about cost. All in all, many different disciplines are involved in developing the many products we use. Although this book emphasizes one major aspect—how well the design fits the needs of the people who use it—this is only one of a multitude of dimensions that must be considered. All are important. This is what makes design such a challenging and rewarding discipline: it grapples with the need to accommodate apparently conflicting requirements.

Appropriate, human-centered design requires that all the considerations be addressed from the very beginning, with each of the relevant design disciplines working together as a team. Most design is intended to be used by people, so the needs and requirements of people ought to be driving much of the work throughout the entire process. In this book, I concentrate on one component: making things that are understandable and usable. I emphasize this one dimension because it has been so long neglected. It is time to bring it to its rightful place in the development process. This does not mean that usability takes precedence over everything else: all great designs have an appropriate balance and harmony of aesthetic beauty, reliability and safety, usability, cost, and functionality.

There is no need to sacrifice beauty for usability or, for that matter, usability for beauty. No need to sacrifice cost or function, time to manufacture, or sales. It is possible to create things that are both creative and usable, both pleasurable and completely workable. Art and beauty play essential roles in our lives. Good designs will have it all—aesthetic pleasure, art, creativity—and at the same time be usable, workable, and enjoyable.

Technology Changes Rapidly; People Change Slowly

Although significant time has passed since the writing of this book, surprisingly little needs to be changed. Why? Because the emphasis is on people, on how we, as human beings, interact with the physical objects in the world. This interaction is governed by our biology, psychology, society, and culture. Human biology and psychology do not change much with time: society and culture change very slowly. Moreover, in selecting examples, I deliberately kept away from high technology, looking instead at everyday things, things that have been around a while. High technology changes rapidly, but everyday life changes slowly. As a result, *DOET* has not become dated: the problems with everyday things are still there, and the principles described in *DOET* apply to all design, from low to high technology.

Many people write to ask whether the lessons of *DOET* also apply to computers and other digital and wireless devices. At first I was surprised at these questions—of course they do; wasn't the answer obvious?

Question: In your book The Design of Everyday Things, *you talk about the design of everything from telephones to doorknobs consisting of essentially four elements: affordance, constraint, mapping, and feedback. You weren't talking about computers, but do you think the book also applies to them?*