

Introduction

Two personal stories



Here are two stories of personal experiences that led me to start working toward a new design discipline, eventually called “interaction design.” The first, about buying a digital watch for my son, made me see that I needed to learn how to design controls for products that contain electronics. The second, about designing the first laptop, made me see that I needed to learn how to design user interfaces for computers. The next nine chapters contain thirty-seven interviews, both in the book and on the DVD, with people who have made interesting or important contributions to this field. In chapter 10, “People and Prototypes,” I expand my personal point of view about designing interactions.

The Radio Watch

- The author with his son, in front of the Southland Runabout trailer where many of the ideas for this book were formed

Photo
Catherine Ledner,
published in
Dwell magazine

I WAS BROWSING in the duty-free store in Narita airport outside Tokyo while waiting for my flight back to San Francisco in 1983. When I was on business trips, I tried to find gifts to bring home for my two sons, aged thirteen and ten at the time. I already had a Yomiuri Giants hat for the baseball-crazed ten-year-old but still needed something for the teenager, who was starting to get interested in heavy metal music and realizing that dad was not necessarily always right about everything. He was saving the money from his paper route to buy his first electric guitar.

I drifted across to a large array of glass-topped cases and found in them a seemingly endless collection of watches. My designer soul was mesmerized. How could there be so many great looking watches in the world? As well as the international brands that I was used to, there was case after case of beautiful and innovative designs from Japanese manufacturers. Some were for running or swimming, some had interchangeable dials with alternative functions, and many were just elegant. Then I saw a digital watch



- Yomiuri Giants hat
- Interested in heavy metal

that had a radio in it. It was black rubber with a rectangular face blending smoothly into a ribbed strap; it included alarm functions and had a neat little tuning knob for the radio. It was not too expensive and amazingly small for all that functionality. What a perfect present for the teenager! I paid for it and purred with the gratification of my techno-lust until I fell asleep on the plane. He was already in bed when I gave it to him, and we were both excited as he unwrapped the package, took it out, and fastened the strap on his wrist. He tried the radio first. There was a tiny earpiece for listening, attached to the watch by a delicate cord. He tuned to his favorite station, but I could see the excitement in his face fade to disappointment as he heard it.

“The quality’s not that good, Dad,” he said, glancing at his boom box. I was flustered, but did my best to disguise my chagrin as I tried it myself and heard the crackly and distorted sound. That was the end of the radio!

I recovered by explaining the digital functions, and he brightened up as he suggested that he could use it as an alarm clock to get up at five o’clock every morning for his paper route. He asked me to set the alarm and adjust it to the local time. There were four buttons as well as the tuning knob. The instructions were on a tightly folded sheet, printed in seven languages, and it took me twenty minutes of concentrated effort to set everything up; following the instructions step by step and pushing the right combinations of buttons in the required sequence eventually prevailed. I kissed him goodnight and took the big old alarm clock with the bells on top with me as I turned out the light and closed the door to his room.

Everything went well for six weeks. He didn’t seem to miss the radio, used the alarm every morning, and enjoyed the cool design. Then two things happened; daylight savings time ended, and he gave up his paper route. He left the watch on the chest of drawers in our bedroom, as he said, “Could you cancel the alarm and change the time, please, Dad?”

By that time of course the instructions were lost, so I tried to make the adjustments by pushing buttons in a vague and unstructured way, hoping that some automatic memory would make me get it right.

My wife is a lighter sleeper than I, so it was she who got out of bed to cancel the alarm when it went off at four o'clock in the morning, an hour earlier after the time change. I tried to reset it again the next night, but with the same result. She was starting to get irritated, so the following night I took the battery out, and assured her that an undisturbed night would follow. At four o'clock the next morning, there it was again, "Beep-be-be-be-beep," in an ascending volume and persistent shrill tone. That was too much! She woke me up, marched out of the bedroom and returned in a moment with a hammer. That was the end of the watch! It turned out that the battery that I had removed was for the radio; there was another one buried deep inside that powered the watch.

Kind to Chips but Cruel to People

THIS SAD STORY made me think about the design of the controls. I never had any trouble with a traditional analog watch. Pull out the knob and rotate back or forward to set the time. Pull out a second click to change the date. Why did the digital watch have four buttons, and a sequence of operations that was too complicated to remember?

I talked to some people who worked at watch companies and knew about the history of watch designs and came to the conclusion that the problem was caused by too much kindness to chips. The engineers who developed traditional mechanical watches and clocks were motivated by the ambition to create a machine that could keep accurate time, and the finest instruments were the most accurate and expensive. The controls had evolved from the analog clock mechanisms, and the design decisions that made them easy to use had happened long ago. Along came a computer chip that contained a time keeping circuit of impeccable accuracy, and offered the possibility of creating a watch that would not only keep perfect time, but could be manufactured to sell for as little as \$25.

The natural first step was to make a watch that was built around the requirements of the chip, so the controls were designed to fit the electronic circuit as extensions of the logic

diagram, causing the user to operate a sequence of simple push buttons. This was the simplest form of control for the chip, and the easiest solution for the hardware and software engineers, but it was so difficult for the people who wanted to use it that it amounted to cruelty. For a while, the digital watch was a novelty and sold well to enthusiasts, even with controls that were cruel to people; in the longer term it led to a backlash and a resurgence of analog watches, with successful designs like the Swatch series.

In my education as a designer of everyday things back in the sixties, the products that we learned to design usually had simple controls that were easy to understand, comparable to the mechanical watch. The demise of the radio watch made me realize that designers needed to face new challenges, as electronics started to replace mechanical control systems. In order to create products that are enjoyable, satisfying to use, and aesthetically pleasing in behavior as well as shape, designers would need to learn how to design hardware and software as well as physical objects. For me, this was the beginning of designing interactions between people and products that contain electronics.



GRiD Compass computer, 1981

The First Laptop¹

THE NEXT CHALLENGE was to design the interactions between people and computers. The stimulus for me came from designing the first laptop computer and starting to use it myself in 1981. I had designed the physical enclosures for some computers in the seventies but had never used them myself, so the frustrations and pleasures of using the software were something that I had watched, rather than experienced.

My first design was for a mini computer in 1972, for an innovative British company called Computer Technology Limited (CTL), but it was not implemented. The first computer to be manufactured was in 1974 for ITT, in Spain. It was a data entry workstation, similar to an IBM product of the time. I observed people using the IBM product and worked out some improvements for the physical design, but the software task was only tedious numeric entry and was already defined by the IBM mainframe that used the data.

By 1978 my design practice was well established in London. I thought that a good way to keep expanding would be to start a second office, and the USA seemed to offer opportunities for a designer from Europe. I decided to mix business with adventure by taking a vacation in the USA and look around for possible locations for the office. We rented a Ford wagon with plenty of room for kids and camping gear and went from one national park to another. Whenever I had a contact in the vicinity, I would don my business suit, brush the dust off my shiny shoes, and head into town for a meeting or presentation to potential clients. We looped around the East Coast and Midwest, and I came to the conclusion that the Boston area seemed the most promising. There were plenty of companies along Route 128 full of eager young engineers creating high-tech products. Then I heard that Silicon Valley in northern California was a place with even more innovation than Boston.

I had an image in my head of Silicon Valley as an industrial wasteland in the desert, with enormous machines gouging raw material from burnt sandy rock. What a surprise to find that it was



- 1972—Minicomputer for CTL ■
- 1974—Data entry workstation for ITT ■
- 1978—Brochure from Design Practice ■
- Ford Fairlane wagon ■



- Stanford University
- Freddie Laker
- John Ellenby in 1981

a gentle landscape of orchards and fields around San Francisco Bay, being gradually gobbled up by low office buildings and suburbs, with a well-established area around Stanford University and “Professorville” in Palo Alto.

The innovation was certainly there, with connections between Stanford and the industry that emerged from it, a rapidly expanding venture capital community, and startup companies all over the place. It was very exciting for me to discover that the valley was evolving from a place where electronic chips and printed circuit boards were invented to a product development community with the chips included in the products; this meant that they would find themselves needing good industrial designers.

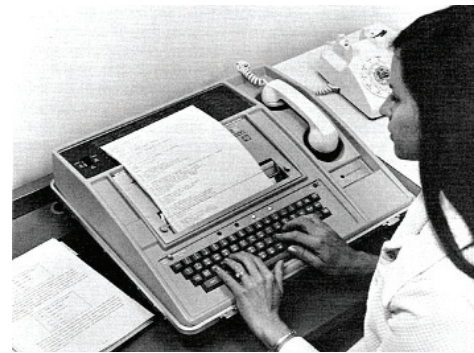
Direct flights from London to San Francisco had recently started, and thanks to price wars between the major airlines and the Skytrain service from Freddie Laker, the cost of flying standby was only £40 more to the West Coast than to the east. What’s more, the Pan Am–operated jumbo jets that I traveled in were usually only half full. I perfected the art of being the last passenger to board the plane, so that I could claim an unoccupied row of four center seats and settle down after takeoff to catch up on some sleep. I spent ten days a month for six months in the San Francisco, Palo Alto, and the Silicon Valley area, showing my portfolio to vice presidents of development and marketing, venture capitalists, and anyone who was interested in design. When I took the plunge and moved the family to Palo Alto, I already had a list of a dozen likely clients and another dozen “possibles.” We rented an Eichler, a flat-roofed wooden house with lots of glass walls, and I converted the garage into a studio in the best Silicon Valley startup tradition. Work was slower to start than I had hoped and expected, but when it came it was worth the wait.

A few months before we moved to California, I noticed a stranger sitting on the front steps of our neighbor’s house across the street in London, waiting for someone to come home. We started chatting and found that we had lots to talk about. John Ellenby² was visiting from Palo Alto. He had moved to Silicon Valley a few years before and worked at Xerox PARC (Palo Alto

Research Center) to try to improve the transition from research findings to real products. He was an ambitious engineer from Scotland, with a glint in his eye and an outrageous sense of humor. He told fascinating stories of life in the San Francisco Bay area, reveling in the excitement of innovation and technology, while complaining of the suburban lifestyle, synthetic-seeming bread, and weak coffee. He was immediately interested in my plans for a design office in the valley and came to see our office in London to find out more about our work. We became friends, and I got to know him better on my monthly trips to Palo Alto.

The airlines allowed two suitcases per person without a charge for excess baggage, so when we moved to California in the summer of 1979, the four of us had eight suitcases of the maximum size allowed. They were tightly packed with as many of our worldly possessions as we could fit into them. John's wife Gillian met us at the airport with a big welcoming smile and ushered us into her huge Dodge van. It swallowed all of us, and our suitcases, and still looked empty. There was a cooler by the seats, loaded with champagne and soft drinks. What a welcome to California. Thanks, Gillian! We settled into our Palo Alto house and enjoyed the California summer weather, spending weekends exploring San Francisco and the beautiful coastline and mountains. John was busy raising venture capital and putting his startup company, GRiD Systems, together. GRiD became my first major client.

Soon after we had settled in, John revealed his plans to me. He was raising venture capital to start a new company, and he was determined to develop a computer with an electronic display that would be small enough to carry around. There were a few precedents to build on; Alan Kay had developed the Dynabook concept model in 1968,³ and there were several portable data terminals, such as the Silent 700 from Texas Instruments (1973);⁴ there were also several luggable computers more the size of a sewing machine than a laptop, the best known of which was the Osborne, but that was designed in parallel with the GRiD Compass. John saw the components used in a computer steadily shrinking and had the vision to realize that there was a potential market for people who needed to move around for their work



Texas Instruments Silent 700, 1973 ■
Osborne 1 computer, 1981 ■



- First model for GRiD
- GRiD Compass computer: first sketch, 1980
- Compass computer side view

and would like to carry the information with them in their computers. He set out to create a computer that would fit in a briefcase and be usable away from the office.

He first asked me to visualize a design to help people understand what he imagined and to show to venture capitalists and potential employees. We felt that a three-dimensional model would communicate much more powerfully than drawings, so I designed and drew up a concept and sent it back to my office in London, where they made a completely realistic-looking model out of very unreal materials. The shape was like a fat dictionary, opening like a clamshell, to reveal a flat display on the top half and a keyboard on the bottom. John had identified a display technology with a set of characters that glowed bright green, and I made up a simulation of a keyboard with modern-looking keycaps on a pastel green field. The model did its job of convincing people that the concept had potential. John successfully raised money and put together an amazingly talented team of founders for GRiD Systems. The plan was to sell the products to large companies, so that individuals could gain access to company-wide information on the road. Potential applications included a salesperson confirming an order in real time, or an executive tracking the performance of the company. All this was very new at the time, as there was not yet even an IBM PC or an Apple Mac, let alone a pervasive Internet.

My responsibility was the physical design, and I had the experience of a lifetime developing a design that was innovative in so many ways. I developed the way that the screen was hinged to fold down over the keyboard for carrying. This geometry accounted for only one of the forty-three innovative features in the utility patent that we were awarded. Most of these innovations are taken for granted today, but they were new at the time: for example, the flat electroluminescent graphic display, the low-profile keyboard, bubble memory, and the enclosure in die-cast magnesium. The metal housing offered a combination of strength and lightness, creating an amazingly tough machine that was sent up in the space shuttle and dropped from military helicopters.

The epiphany for me occurred when I started trying to use the software. GRiD had developed a unique operating system

(OS) that was very advanced at the time; it was a graphical OS (but without a mouse) that had resizing fonts and many features that later took hold in the computer industry. The system also had a linked suite of applications, which allowed people to move data from program to program, for example between spreadsheet and word processor.

I had helped with information and graphic design for the summary of commands above the keyboard and the design of the typefaces for the screen, so I knew something about what to expect. I was surprised to find that I became absorbed in the interactions with the software almost immediately. I soon forgot all about the physical part of the design and found myself sucked down into the virtual world on the other side of the screen. All the work that I had done to make the object elegant to look at and to feel was forgotten, and I found myself immersed for hours at a time in the interactions that were dictated by the design of the software and electronic hardware. My frustrations and rewards were in this virtual space. As I gradually mastered my personal computer, almost all of the subjective qualities that mattered most to me were in the interactions with the software, but not with the physical design. At that point I realized that I had to learn a new sort of design, where I could apply as much skill and knowledge to designing satisfying and enjoyable experiences in the realm of software and electronic behaviors as I had with physical objects.

Interaction Design

LEARNING THIS NEW form of design was a gradual process. I discovered more about using software in the first half of the eighties, as I started to rely more and more on the GRiD Compass computer that I had designed, as I learned to use computer-aided design (CAD) systems, and then fell in love with the Mac. I found that there was a well-established community of human-computer interface (HCI) designers, busy creating the software that people were using on mainframes, minicomputers,



Apple Mac, 1984 ■

and the emerging personal computers. There were people with computer science backgrounds who were writing code and had a technical and performance-based vision of the design requirements. There were also human factors specialists, who had backgrounds in psychology and had been educated to evaluate and test designs that were already prototyped. This approach tended to generate incremental improvements to the designs but did not encourage more radical innovation.

I felt that there was an opportunity to create a new design discipline, dedicated to creating imaginative and attractive solutions in a virtual world, where one could design behaviors, animations, and sounds as well as shapes. This would be the equivalent of industrial design but in software rather than three-dimensional objects. Like industrial design, the discipline would be concerned with subjective and qualitative values, would start from the needs and desires of the people who use a product or service, and strive to create designs that would give aesthetic pleasure as well as lasting satisfaction and enjoyment.

I gave my first conference presentation on the subject in 1984, and at that time I described it as “Soft-face,” thinking of a combination between software and user-interface design. At that time a fashionable toy was called the Cabbage Patch Doll, a soft stuffed doll with chubby cheeks. A friend pointed out to me that “Soft-face” sounded like a description of one of these dolls, but not so much like a design discipline, so we went on thinking of possible names until I eventually settled on “interaction design” with the help of Bill Verplank.⁵ I had started to assemble a team of interaction designers to work with our industrial designers in San Francisco, drawn from various backgrounds, as there was not yet any education in interaction design. One had been trained in information design, one in graphics, and another in industrial design. I was lucky to persuade Bill Verplank to join the team, as he brought with him a guru status in the subject and already knew how interaction design worked. By the end of the eighties we were starting to feel that we had momentum, and that we could declare ourselves to be interaction designers.



■ Bill Verplank