1 Introduction: Case Studies and Details

The goal of this book is to help you better understand the juncture between computer technology and people, the process of creating that technology, and the evolution of those innovations. It does this through the use of essays and annotated case studies of people using technologies such as cell phones, blogs, and personal computer productivity tools. This book takes advantage of writings and recordings I have made over the past ten years as source material from which we can learn.

Computer Technology in Everyday Life

When I was a child, my grandfather showed me a punched card sorter at the newspaper where he worked. Ever since, I have loved computer technology and strived to find ways to exploit its potential. However, until the 1990s, people's use of computer technology in their everyday lives was seemingly limited to a small group of people like me. It was uncommon to have your own personal computer—that was a "hobbyist" thing or something only businesses did. Other than using automated bank machines and perhaps "programming" a microwave oven, most people felt they had no daily interaction with computers, especially as an obvious integral part of their personal lives. (The flashing 12:00 on a VCR was a common reminder that many people wouldn't go to the trouble to even learn how to do something as simple as "program" that machine.) Cameras had film, and you shared copies of pictures by getting "doubles" when the film was developed and mailing the copies in an envelope. To talk with someone at a distance, you had to go to a particular place inside a building or a special booth where a fixed device using 100-year-old technology was wired into the phone system. You had to know which specific such device the other person was near at that moment to talk to them. The fact that a few disparate computer systems around the world could be networked together

and may have been used for academic sharing had no meaning to most people. People would probably have guessed that the "Internet" was a sports term.

I remember in the early 1980s when Jim Finke, then head of the company that made Commodore computers, reminded us at trade conferences that the personal computer market was about the size of the potato chip market and would hopefully get as big as the pantyhose market. We in the personal computer industry were focused on our wonderful products and their potential and reveled in the glow of each little mention in the popular press or exotic bit part in the plot of a movie. By comparing us to such mundane, minor parts of everyday life, he helped show how insignificant we were in the scheme of things at the time.

I also remember going to an industry conference in Palm Springs, California, in the early 1980s. Personal computer luminaries were there, including the heads of major companies: Bill Gates, Steve Jobs, Mitch Kapor, and others. We heard that a boxer was training at the same hotel for an upcoming championship fight. And then, as some of us went outside to go from one building to another, a visitor passed by on his way to observe the training—the visitor was the great boxer Muhammad Ali. As he walked by, I felt us all just stop and stand there staring, with our jaws dropped. Here was one of the most famous people on the planet—and he probably didn't have a clue who we were. Suddenly our "greatest" seemed so much less.

Things have changed. Some of our industry's most influential people are now as well known as famous sports stars. People now make up jokes and stories involving Bill Gates the same way they used to with the Rockefellers and Rothschilds in the olden days. Television news treats new product introductions, Internet service interruptions, and computer virus outbreaks as major general news.

Today, computer-based technology is rapidly affecting all of society. Word processing is the expected way to write. An email address is often the only contact information you ask for. Carrying a cell phone is more important than a watch or wallet for many people around the world. Apple is the largest reseller of recorded music in the USA, and it doesn't ship any of it on vinyl or CD, the old dominant formats. Digital cameras have replaced film cameras, with iconic names like Nikon abandoning film cameras. New uses of the Internet and computing power are appearing constantly, with many of them catching on and, like YouTube and Facebook, having major impacts on areas such as politics and courtship, which are seemingly unrelated to technology.

Insight into the forces that govern computer technology, and how that technology affects and is affected by a society made up of people, used to be of concern to just a few insiders. With the new, prominent role that computer

technology plays supporting all of society, this insight is now something of interest to a much wider range of people. This book brings a unique perspective to help gain that insight.

I believe that it is important for people to at least try to understand these forces. We are all involved in using technology and making decisions that can affect its evolution, and its evolution in turn affects our lives. Some of us are building new technology and some of us are deciding what and when to adopt or discourage. We make decisions based upon our belief in the value of what we see now and how we think things will play out in the future.

About Me and My Book

I view myself as a tool maker. I create "tools" that make use of computer technology to help people do things they couldn't do before, or to do them better than they could without the tools. The most famous tool I helped create is VisiCalc, the early personal computer spreadsheet program, but I've worked on many others before and after, from word processors to accounting systems. In a way, this book is another type of tool that people can use.

I am a mixture of techie geek engineer, entrepreneur, and general business executive. As a teenager, I was a photographer, selling photos of children to their parents to make money so I could buy hobbyist parts like transistors and capacitors, and electronic kits from Heathkit. I learned to program computers in the 1960s, and from that time on, doing programming helped pay for cameras and film. I went to MIT for a bachelor's degree, which prepared me for programming jobs at Digital Equipment Corporation and elsewhere, but then I went off to the Harvard Business School for an MBA, which helped prepare me to found four companies since.

I've created products that have had great impact, like VisiCalc for business-people and others, and Dan Bricklin's Demo Program for programmers, software designers, and trainers. I've been in companies that failed. I've met and sat across the dinner table from people who are household names. I've watched firsthand as the computer industry evolved over the past five decades.

After VisiCalc came out in 1979, I started giving talks about computer software at conferences, and reporters started seeking me out as a source to comment on technology and the computer industry in general. When posting on web sites was starting to become a popular method to provide commentary and analysis in the late 1990s, I created some web sites focusing on particular topics and then eventually started my own personal web site, `www.bricklin.com`.

On that new web site I initially put background material about me for reporters and others so that my discussions with them could start without the preliminaries, and I put answers to common questions I received by email from people doing homework in their computer courses. I continued building the web site, adding essays and reports on events I attended, complete with many photos (which was something unusual in those days), mixing in my old love of photography.

In October of 1999, I added an ongoing blog to the web site. The blog has shorter entries than the essays and is organized in reverse chronological order. At the time, many blogs were mainly lists of links to recent articles on the Web with just a bit of commentary or were very personal diaries about daily life. My entries were focused on topics related to the computer industry and on trying to use blogs to communicate my observations to others. I made frequent use of photos, a rarity on most blogs I was reading in those days related to my topics.

Since then, I have been chronicling on the Web many of my experiences through written words, photos, and more recently audio and video recordings. I've also posted many of my thoughts at the time about different issues, trying to use my unique perspective to provide insight to others. This was a time when much of that acceptance of computer technology and Internet communication came about, and that is what I was following.

Now, after a decade of periodic essays on topics of interest to me at the moment—blogging, and documenting things chronologically—it's time to step back and try to clarify, organize, and make use of that raw material.

On the Web, I've covered many areas, from theories about computer network architecture to the joy of walking through crunchy multicolored leaves in the New England fall. Two important themes, though, were **the human aspect of the development and use of technology, and the evolution of that use. This book is the result of extracting those themes, reordering and regrouping the material from its original chronological progression, and embellishing the raw material with commentary and new observations.** The result is, hopefully, a presentation in a more coherent and useful fashion.

Web Posts as Case Material

One of the theories behind the teaching at the Harvard Business School is that business, like law and other topics, can be well taught by the case method. Cases consist of a number of pages of prose and figures describing a situation.

Exposure to cases based on real-world events and situations helps you understand the intricate world of business. It is like the immersion method of teaching a foreign language, where the students are surrounded by the second language as everything from math to meals is conducted in the new language. Principles that are difficult to articulate become second nature as you follow a multitude of complete situations and listen to "natives" speaking and follow them as they go about their activities. My web posts included here serve as case material.

In many of those business school case studies what is presented is not a lean, coherent, clean story tuned to the one pedagogic issue. There are lots of pieces and lots of extra material in a narrative. You'll find that here, too.

Much of my material was originally written to stand on its own without regard to flowing cleanly into the next piece, which is one of the important properties of a blog and web site like mine. Things are presented as chunks: single web pages, blog entries (posts), or recordings. They are linked to each other and to other pages and posts on the Web, but the order of reading was never fixed, except perhaps chronologically in the order in which they were written. On the Web, most people would read only one piece at a time, either because they were following my writings on a daily or weekly basis, or, more commonly, because they were directed to that particular piece by a link on somebody else's web writing, through an email, or as the result of using a search engine. Everybody reads a different set of pieces of the material and in a different order.

A book is different. It has a definite preferred order, and you expect people to go from one page directly to the next with few pauses. In this book, I found an order that follows the major theme of each piece and strings them together into a logical whole. I add footnotes and other material to fill in gaps and put the material in context.

In this book, I also include some of the material to which some of my writings are a reaction and also some of the reactions that are in response to my writings. In addition to putting what I write in a fuller context, it will also give you a better feel for the give and take that a blog writer gets with the community made up of readers.

Hopefully, the essays, anecdotes, interviews, and first-hand observations, and the narrative I try to build around them in this book, will help you get a better feel for that important interface between people and machines, and their evolution. Computers and the technologies that make use of them are tools that people use, just as ploughs and pen and paper have always been

used. How tools become an extension of your person matters to how well they leverage what you can do. What they leverage helps drive what you can accomplish. How tools come about matters because we want to foster the continued development of new and better tools.

In any case, I think reading all this should be interesting and illuminating to people curious about the technology-infused world we live in.

The Structure of This Book

I start this book in Chapter 1 with some discussion about why I like to go into great detail looking at various ways to understand things.

In Chapter 2 I examine some of the emotional and sociological forces that affect what people are willing to pay for in technology-assisted personal communication (such as cell phones and photographs). I follow that in Chapter 3 with a look at the recording industry as a case study about some of these forces and relate them to a business situation being impacted by changing technology.

In Chapters 4 and 5 I expand from looking at the behavior of individuals to looking at using the enhanced connectivity made possible by the Internet to leverage larger groups of people. This includes the role of people who volunteer. I also include transcripts of two interviews I conducted with a senior person from the United States Navy about cooperation and use of technology at the national and international level. As a case study, in Chapter 6 I look at a portion of the evolution of blogging and podcasting, with a detailed look at the role of bloggers during the Democratic National Convention in Boston in 2004.

In the second part of the book I change focus a bit more to the technology side and look at the nature of tools themselves. I cover in detail in Chapter 7 my view that, as human beings, we need tools and not "assistants." In Chapter 8 I look at some aspects of mobile and hand-operated computer technology-based tools, an area that is now flourishing with our ability to build products like the Apple iPhone. This way of having a person control computing power is much more intimate than the older deskbound and keyboard-controlled computers of the 1980s and 1990s and is becoming a dominant means for controlling computer power. I look at the very real issue of usability through an examination of the Palm Beach, Florida, ballot situation, which I covered in detail at the time in the fall of 2000 on my blog.

Usability is concerned with operation on a second-by-second basis and human errors that occur in an instant. Another issue is long-term usefulness

and dealing with unexpected changes and events over time. As computer technology, driven by software, becomes the fabric through which we run society and conduct much of our commerce, its robustness and durability are crucial. In Chapter 9 I cover that extensively in a discussion of both copy-protection and the long-term maintenance of the software that helps run our world, looking to noncomputer fields for guidance.

In Chapter 10 I look at an important product that has so far successfully evolved over three decades, the personal computer, especially the IBM PC and its descendents, including source material from its introduction. Too often we think of tools as static entities, born fully formed and staying unchanged, with their use and potential fully understood at the outset. Looking at the evolution of important products can help you get a better feel for the true nature of the process through which they change.

To look at the development of other tools, in Chapter 11 I cover the creation of the wiki, an Internet-based tool used by groups of individuals to leverage the group, through an interview with its inventor. In Chapter 12, I chronicle the early development of VisiCalc, a tool mainly used by individuals to leverage themselves. These stories show how inventors react to common needs to produce a solution and how those products end up in the hands of others.

Essays, Blog Posts, Quotes, and Footnotes

In addition to this new, main narrative, you will find a large number of other elements in this book that are set off typographically:

- **Essays** are writings that originally appeared on my web site, usually in my site's "Writings" section. These have a title, often followed by a summary, and include the date they were originally published to help you put them in perspective. When written, they were meant to stand by themselves like a magazine article or white paper.
- **Blog posts** are usually much shorter pieces than the essays. They were originally written with an implicit assumption that they are to be read as part of an ongoing series or in the context of following a link from another web site. They often relate to a particular recent event or writing on the Web and are more conversational than an essay. They are presented here with day and date along with the title, as they would in a blog entry.
- **Quotes** from the writings of other people are listed with attribution.

- **Footnotes** are used to present additional new commentary, background information, and reference details such as URLs.[1] The notes are meant to be read along with the main text and form an important part of this book.

Some of the essays and blog posts have been edited a bit from the original to improve readability and understanding.

I put in many headings and other section breaks to make it easier to keep your bearings as you read. In many cases the essays and posts are like short stories, and you should feel free to skip one.

As I go over my essays, I find that many of the links no longer point to the original web pages. Many give "not found" errors, or default to the home page of a publication. In some cases I was able to use Archive.org's "Wayback Machine" (a massive online database constructed by repeatedly going from web site to web site and storing what it finds) to find a copy archived by that wonderful service years ago, but in some cases I was not.[2]

One thing I am doing to make sure that my material is still available in the future is turning many of my writings into another form—this published, printed book. This gives them another path to follow through the years, and anybody who wants to refer to them another means. I discuss the issue of permanence further in Chapter 9.

Why Delve Into Details?

As you read this book, you'll see that one of the goals of my writing has been to point out ways that people or systems behave that are not obvious or generally acknowledged. I believe that this is very important for improving decision making. It is important to tool makers like myself who need to understand

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[1] Many people find the URL web page addresses helpful for giving more information about a reference. For example, the domain name (the first part of the web address, usually ending in ".com") sometimes serves as a simple publication name, and at that address you may be able to find out more information about the publication or author.

[2] This points out one of the dilemmas when you quote someone on the Web. The "right" way to do things is to link and not present a copy of what you are commenting on, except perhaps a very short, "fair use" excerpt that directly applies. After all, one of the beauties of the Web is being able to link to provide access to source material. Unfortunately, you are at the mercy of the target of that link to maintain it permanently. In many cases, even with large commercial endeavors, "permanently" seems to mean a few years at most, not decades or more. This is an issue that we need to solve. Archive.org is a good start, and the people who support it are to be commended.

which facilities or "levers" to provide to people and what those levers move. For example, if you were designing a type of screwdriver, you would want to know what shape the tip needed to be to best connect to the type of screw it would be used with, which grip would be best for the type of turning the person would be doing, etc. With computer tools used in expression or communication, you need to know what type of communication people need to do, in which circumstances, and with which constraints on time, training, etc.

When you try to figure out why something is happening or what will happen in the future—for example, to predict the success or failure of a particular company's endeavor—you usually base your prediction on some sort of model that you construct of how the components behave. For example, we assume customers behave a certain way given the choice between different prices: if two companies are selling the same product, the less expensive will be preferred. This model may be explicitly written in a document or kept in our head, often without even thinking that we are creating a model. We often think of it as "reality" even though it is a simplification, a tool for use in thinking.

In constructing these models, people seem to have a tendency to view relationships between things in two ways. The most simple is sometimes called "binary": Something is either on or off. You do "this," and it causes "that." "Natural foods appeal to health-conscious people." Something is either "good" or "bad." "Company A's products are good, and Company B's are bad."

Another view is linear. "The more you do A, the more B you get." In mathematical terms, as we are taught in grade school, "y equals m times x plus b." Change a little of the input, and you get a certain change in the output. Change twice as much in, and you get twice as much of a change out.

A graph of a linear relationship is shown in Figure 1-1.

Linearizing the description of the relationship between two items makes it much easier to calculate different values than when you need to have a table of all possible inputs with their resulting outputs. What we often do is take a few sample inputs and their corresponding outputs and from that extrapolate out a linear relationship that covers all other inputs. For many things, the linear relationship seems to predict what happens quite well, such as in describing the operation of many mechanical objects.

Unfortunately, the world is not made of simple levers and gears with no friction or wear (the traditional simplifications used in introductory physics). We forget that we are thinking about models and start thinking that the bunch of linear relationships are what is really going on. We often ignore elements that don't fit into our models, that are hard to measure, or that don't
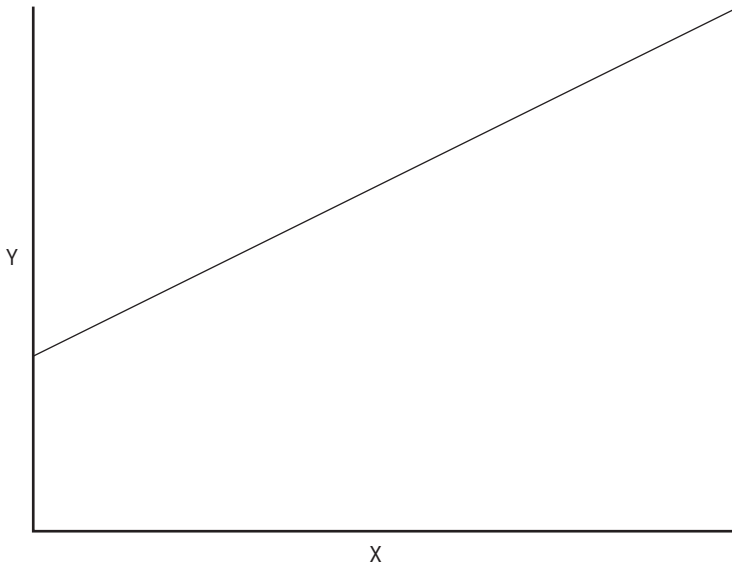
Figure 1-1 Graph of a linear function

lend themselves to easy linearization. While many things behave in a simple linear fashion in a narrow range of inputs, they often behave quite differently out of that range. For example, when blowing up a balloon, more air makes it grow larger—until it bursts. Many companies model their businesses assuming simple linear variations in sales and costs, ignoring nonlinear effects such as the loss of a market or entry of a disruptive competitor. They assume that each year will always be a minor change from the year before.

Many things of interest in the world are nonlinear, and there are often discontinuities (conditions where there is a sudden, big change in the result given a supposedly trivial change in input). For example, the more you heat water, the hotter it gets, but it is still a liquid. Past a certain point, though, it suddenly turns to steam, which behaves quite differently from a liquid.

This brings up a classic story.

A policeman is walking down the street one night and encounters a man down on his hands and knees next to a lamppost searching for something on the sidewalk and the ground around it. The policeman asks the man what he is doing. He replies, "I lost my keys at 6th and Vine Street and I'm looking for them." The policeman says, "But this is 7th and Walnut Street. Why are you looking here when you lost your keys two blocks away?" The man replies, "The

lights are out over there and I can't see anything. The light is much better over here, so that's where I'm looking."

While this seems like an absurd story about a very foolish person (so much so that the person is usually described as drunk to explain why this would not be something a normal person would do), it is really a very important lesson to remember. It is often called the "Lamppost Problem" or "Lamppost Story." People often search for answers where it's easy to get results, even if those results may have little to do with what they are really looking for.

Combining the lesson of the Lamppost Story with problems of linearizing things brings up an issue. Many of the explanations that we give for why something works may be merely oversimplifications that we use because they, or the data to use them, were easy to obtain.

As a child I went to a school where, in addition to the traditional subjects, we studied the Jewish scripture in the original Hebrew as well as some Talmud (1,700-year-old books with Jewish laws and the discussions and reasoning behind them, laid out on the printed page in a very hypertext-y way, some of which I emulate in this book). Early on, I learned to examine things very carefully, looking at alternative interpretations, looking at related writings, and going well below the surface.

When I went to engineering school at MIT, I learned in great detail how things worked, down to the hardware behind the computers, the electronic circuits that made up the computers, and the properties of the materials that made up the transistors that made up the circuits. I worked with people who invented some of the things we took for granted.

As an MBA student at Harvard, I was exposed to many of the intricacies of business, from accounting to finance to production planning to workforce management and marketing. We looked at situations with many different options balancing many competing needs.

All this gives me a tendency to want to understand the details, even when I might feel that we have a model that's "good enough" and that I should just go with the common wisdom. Often what I find is something that is not much different than the obvious answer, but at least I have some material behind it, and at least I say it explicitly. Other times, though, I find different, and more realistic, answers. When you dig very deeply into something, you often find surprising nuggets that turn out to be keys to understanding. Often, you need to look at both forests and trees, leaves and roots.

Weighting Factors

Simple linear or binary models are often not sufficient for understanding the areas we care about here. More complex models that take into account multiple factors make more sense for understanding these areas.

In the book *The Tipping Point*,[3] author Malcolm Gladwell deals with the problem of linearization. The term *tipping point* itself drives home the idea that many things are not linear. In his book, Malcolm writes about the popular adoption of an idea or desire for a product where things seem to suddenly take off.

In 2004, after the release of *The Tipping Point* but before his later book *Blink*,[4] Malcolm was interviewed by Boston reporter (and now book author) Scott Kirsner at an event in Cambridge, Massachusetts. I wrote up a report of the interview in a blog post along with my thoughts about it.

Malcolm talked about some of the ideas that ended up in *Blink*. He wondered why sometimes having more information about a situation does not help you make better decisions than your first impression or a much simpler piece of information. I tried to come up with a short, more-technical explanation of the situations he talked about that would be more generally applicable than just saying "trust your instinct."

Here's the blog post:

<div style="writing-mode: vertical">May 25, 2004</div>

Tuesday, May 25, 2004
MITX FIRESIDE CHAT WITH *TIPPING POINT* AUTHOR MALCOLM GLADWELL

Last night I attended yet another MITX Fireside Chat. The speaker was Malcolm Gladwell, best known as the author of the book *The Tipping Point*. Since 1996, he has been a staff writer for *The New Yorker* magazine. As usual, the interviewer was journalist Scott Kirsner.

The questioning started by covering Malcolm's career, starting with his childhood. He said that his father told him one thing not to be: a journalist (not very lucrative). He tried getting a job in advertising (being rejected by 21 places) and, after all else failed, took a job with the *American Spectator*, a publication

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[3] *The Tipping Point: How Little Things Can Make a Big Difference*, Gladwell, 2002, Back Bay Books, ISBN: 0316346624

[4] *Blink: The Power of Thinking Without Thinking*, Gladwell, 2007, Back Bay Books, ISBN: 0316010669

he knew nothing about at the time but that was willing to hire him. He eventually ended up at the *Washington Post* and from there, like many others, ended up at *The New Yorker*.

Scott starts the questioning of Malcolm Gladwell.

Scott asked him: "What's a typical 'Malcolm Gladwell' article?" He said that he's interested in how systems work. He likes to write about "dumb obvious" things, like SUVs, malls, and ketchup. He says that anybody can make a good $300,000 car; it's making a good $12,000 one that's hard. The GAP is interesting; Oscar de la Renta is not. "The fringes are not interesting."[5]

He talked about an upcoming article on ketchup.[6] There are more fortunes lost on going after Heinz than in most anything else in food, he said. There is no gourmet high-end nor bargain low-end. In mustard there used to be just the brown and the yellow. Then Grey Poupon came in and sold a fraction as much mustard for three times the price. They had turned a commodity product into a high-margin item. "Ah ha!" went the market. That's it, we'll broaden the lines of everything, so now we have lots of different types of tomato sauce, etc. But not ketchup. He has ideas why that's true. (Wait for the article. It has to do with the mechanics of taste.)

Scott asked him to discuss his famous book, *The Tipping Point*. He talked about the difference between the rides of William Dawes and Paul Revere. They both had the same idea, telling people the British were coming, but Dawes'

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[5] To me, though, the fringes are often quite interesting, especially when they are leading indicators that we can learn from. Of course, in my blog I often write for an audience of people who are trying to predict or create the future, not the general audience that he addresses.

[6] http://www.gladwell.com/2004/2004_09_06_a_ketchup.html

ride produced no outpouring of volunteers while Revere's did. It seemed that the way the message was carried mattered, not just the idea itself. (Revere was a well-known citizen, Dawes was little known; and Revere knew who the influential people were to tell in each city, Dawes did not. As one person said, "Better Rolodex.") There are the concepts of "Mavens, Connectors, and Salesmen" in his book.

He then went on to talk about the fall of the Hummer SUV. In 2000-2001 every car company had to say they were working on something like it. Not now. Not all new ideas have strong roots in society to keep them going. He also talked about French Fries and the oil that makes them taste good and why we switch to worse-tasting oils for reasons that don't seem reasonable.

Scott then asked about technology, etc., including weblogs. Malcolm said that he reads several, including the New York-centric Gawker and one oriented to pharmaceutical houses. He sees blogs as a "wonderful form," but that we have to sort the information.

Technology, he says, raises questions it can't answer. He talked about cancer. Mammography shows us a type of breast cancer that can only be found on x-rays. Because we see them, we treat them, but it's unclear if that is cutting down the number of bad cases of breast cancer the little ones are supposed to be a precursor to. The diagnostic tools become the definition of the disease. Full-body MRI of normal people he sees as a bad idea. Most cancers don't progress—better to learn how to fix things after they progress.

He had a new book coming out. It's about when is there too much information. He compares rapid cognition (e.g., quick first impressions) to having lots of data. Patterns appear much more rapidly than we think.

Asked from the audience about where he gets his sources, he said the psychology literature, but mainly when someone told him. "If you mingle with interesting people long enough they'll tell you something interesting."[7]

Asked about job interviews, he said that it's better to use darts. There are implicit prejudices in addition to the conscious ones. Those come out in body language, etc., and the interviewee responds and there is a feedback loop that affects the results. The situation doesn't measure most jobs. "Who you end up choosing is a function of how you choose."

Asked about reactions to his famous book, he talked about missing the issues that might lead to the suicide bombings in the Middle East, and the roles of an abundance of young males. He was too pessimistic about curbing smoking. He got the term "tipping point" from Thomas Schelling of Harvard.

He was asked by someone in the audience how to help move the Web from silent to sound as a medium (not technically but in acceptance of the idea). He talked about "reframing." He talked about how the broadcast in 1921 of the Dempsey-Carpentier fight reframed the view of radio. It changed from reporting of the news, just like a newspaper and other media, to bringing the event "into your living room." Atkins moved it from figuring out complicated fat content to easy carbohydrates. Seat belt usage was very low in the early 1980s. Then child restraint laws came in and usage jumped to the majority by 1986. Your strapped-in kids asked why you weren't wearing them. It went from the government telling you to buckle up to your kids asking.

Finally, he says that the bias should be in editing information, and not in adding more information.

My take on his claim that less information is better? I think it has merit if understood in the context he presents it. As I see it, people are very bad appliers of weighting factors[8] when evaluating lots of criteria. There ends up being a compression of ranges, and some items are given heavy weight because we have them (or because they were expensive to obtain) and others ignored because

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[7] I think, looking back on this today, you could say, "If you read the blogs and Twitter posts of interesting people long enough they'll tell you something interesting." Blogs and Twitter are covered later in this book.

[8] Let me explain what I mean by weighting factors. It is a metaphor based on using a formula to describe a model. The formula is often in the form of: *total = measurement 1 × factor 1 + measurement 2 × factor 2 + . . .* The factors represent how much weight you give to the importance of each element that you are measuring. For example, in evaluating a potential racing car design you might give a large factor to speed and a low factor to visual appearance and noise. In evaluating a luxury car you might use the opposite.

we don't have them. Using a simpler method for making decisions, based upon fewer factors that we know are relevant, may work better than having many for which we assign incorrect weightings. In those cases, less is better.

Here's a visual example. I've taken a picture of Scott and rendered it with just a simple brightness curve that just splits dark and light as well a complex curve that misapplies the dark and light but is generally correct. The simple curve works fine for identifying the picture while the complex one does not even though it takes into account more information.

Original photo, simple curve that only makes every color either dark or light, complex curve that gives inappropriate factors to each brightness level
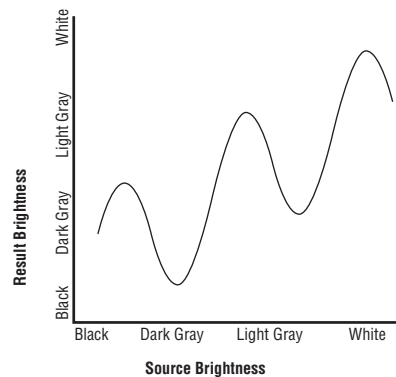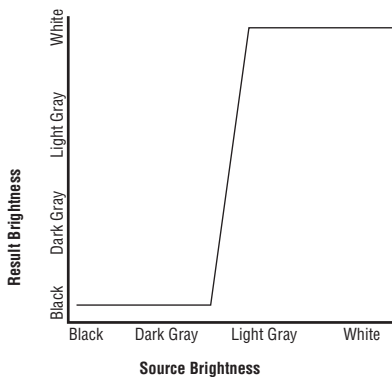
The curves used in Photoshop to transform the pictures, "simple" and "complex"

http://danbricklin.com/log/2004_05_19.htm

Applying This Here

How do we apply my theory that more information can be helpful, but only if you give each piece of information appropriate weight? We have to find as many independent variables that have a major influence on results as possible and then understand their impact. If you find only a few factors and ignore others that can have a larger influence, you may optimize against those unknown factors and end up with a worse result.

I believe that there is a "people factor" in the adoption of technology that is too often neglected. We carefully craft the usability of a product so that it is easy to use, or add functions so that it does well in comparison charts with the competition, often without looking at how its use fits in with real people's lives and their needs and how they interact with others. Product developers often are stuck in the thinking of their "silo" of expertise, such as programming or marketing.

The Mindset of an Engineer

To understand the writings in this book it helps to understand the mindset of the engineer, innovator, and entrepreneur.

Part of that mindset comes from what motivates me. Understanding some of the drives that I have will help you see why I focus on certain aspects of situations in my writings. Those drives are commonly found in other people in my field, and knowing about them can put what we choose to do and say in perspective.

People in different fields of endeavor are often motivated by different drives. They get great joy out of satisfying those drives. For example, teachers feel rewarded when they successfully help students who are struggling to discover the key to a new concept or when they introduce a child to a field that becomes their life's work. Some people are driven by wanting to "win" no matter what the field. Others are driven by wanting to help others who are in need, in pain, or suffering. Yet others are driven by wanting to express themselves in some medium, such as paint or song, and bring new beauty or understanding into the world.

Let's take a look at the drives that motivate an engineer.

One drive is the drive to build things, especially things that others will use. Engineers love to take components and put them together to create a greater whole. We build the world.

Engineers love to have their work actually used. There is beauty in something well designed, but there is also beauty in something that actually enhances someone else's life. Part of good design is solving the problems inherent in what existed before and thereby improving upon it.

This talk of "love," "beauty," and "building the world" brings up a spiritual side of being an engineer.

Here is an old parable that, as an engineer, always brings a smile to my face. It comes from the prayer book created by members of Congregation Beth El of the Sudbury River Valley[9] and is read by many of the congregants every Friday night at the time when they are celebrating the beginning of the Sabbath and the remembering of the end of the last day of Creation.[10] It is based upon something found in a book of parables and commentaries from over 1,500 years ago.

> *When the world was created,*
> *God made everything a little bit incomplete.*
> *Rather than making bread grow out of the earth,*
> *God made wheat grow so that we might bake it into bread.*
> *Rather than making the earth of bricks,*
> *God made it of clay*
> *so that we might bake the clay into bricks. Why?*
> *So that we might become partners*
> *in completing the work of creation.*

Congregation Beth El prayer book, page 9

I see this as expressing a view of a sacred place for the engineer in the scheme of things.

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[9] *Vetaher Libenu*, 1980, Congregation Beth El of the Sudbury River Valley, ISBN: B000EICUAG

[10] Periodically in my writings I make reference to a story from the Bible to illustrate the timelessness of a concept. I like to look at old teachings from religion to find values that have been passed down for many generations, withstanding the examination of many wise and experienced people, and are seen as somewhat timeless.

When Don Bulens joined me at Trellix[11] as CEO, he had been a senior manager more experienced in working with sales forces and marketing people than developers. He was looking for help in understanding engineers. He found that he had problems understanding how they chose what to concentrate on. Being connected to sales and the bottom line, he was very driven by types of success that he could easily understand and measure, but the engineers all seemed to march to a different drummer.

I told him an illustrative tale that I had heard that I thought would help him understand the mindset of many of us. This is how I remember the story:

Three men are brought to the guillotine to be executed: a lawyer, a doctor, and an engineer. The lawyer has his head placed in the device first. The executioner pulls the lever and the blade comes screaming down. Miraculously, the blade screeches to a halt just inches above his neck. As a lawyer, he quickly points out that the law states that they have but one chance at execution. He is led away a free man. Next, the doctor is brought up. Again, the blade starts its journey at full speed, only to get stuck and stop just in the nick of time. Having observed what happened with the lawyer, he demands that he, too, be freed, and he is.

Finally, it is the engineer's turn. As they push him into place, he turns his head and looks up. "Wait!" he cries. "I think I see the problem . . . "

The apparent absurdity of this story of being so much the engineer, trying to understand and fix the problem of the minute, even to your own detriment, really worked for Don. He could see that same story played out again and again in front of him. As an engineer, you feel the dilemma of that poor condemned man, dying to figure out an engineering problem and help others, even when there was a good reason not to.

Over the years, we'd make reference to that story ("remember the guillotine . . . "). It continued to be helpful to remind us of some of the motivations of engineers and the need to make sure that they understood the corporate problems (like meeting particular needs of customers) that might not be as obvious for them to consider.

Related to these drives is the interplay of value systems of different groups. "Values" in this case refers to the beliefs people hold about what is good and what is not good. These values, often unstated, help guide decision-making

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[11]I founded Trellix Corporation in late 1995 to develop software tools for creating documents with linked pages. It evolved into a company making web site creation tools. I left the company in early 2004. Trellix is now part of Web.com. I still use one of Trellix's early tools to create my web site and blog.

and facilitate communication among people who share those beliefs. They are often taught to newcomers through stories, jokes, reverence of particular individuals, and other techniques well known to sociologists. While you usually hear them discussed in relation to culture at the level of societies, countries, and religions, they are also important within a business and in relation to professions.

An observation that I learned many years ago from a friend who was studying for an MBA soon after I did was about the importance of understanding the different value systems of people when they interact.

To me, the key observation was about the miscommunication that occurs when people with different value systems try to make decisions together. When one group makes a proposal and says that it has a particular attribute, thinking that means it's a good proposal, another group may think that the same attribute means it's a bad proposal. Each has no clue why the other doesn't understand the correctness of their opinion.

As an example, here is a simple view of some different parts of a company:

- Often people involved in **sales** are accustomed to making many attempts when trying to get new customers. Each potential sale has a low probability of success. Many factors unrelated to the product itself can affect success, such as interpersonal skills, luck, and persistence. The sales team may be made up of many individuals, each working independently, perhaps sharing tips on what seems to work and what doesn't. To them, a lost sale is a common occurrence, and particular successes may be unrelated to particular failures. What matters is to have lots of good leads and a good approach.

    In this culture, having lots of opportunities is a key. As in baseball, a 33% success rate can be a very good thing. Attitude matters. Caution and slow planning can be a bad thing, wasting time for something that will cut down the number of opportunities to have a chance with more potential customers for a small increase in likelihood of success.

- In **manufacturing**, the goal is often to reliably produce products as inexpensively as possible with as few undetected defects as possible. Product designs that help this are "good," and those that don't are "bad."

- In **bookkeeping and accounting**, constant accuracy is important. It is "bad" to ever have errors. Low risk is a "good" thing. Attention to process and details are "good" things. Each transaction matters: The books must be correct at all times. It is an ongoing process, with no real end.

- In **product development**, you are often working on a long-term project. There are many steps along the way, each building to a single goal that must be met successfully. Many aspects of a project start out ill defined and may only be worked out through experimentation. People are often doing things that they have never done before. Status within the profession is often based on the technical merit or novelty of certain parts of the final product.

You can see how a meeting involving these four groups could have problems. A proposed product design using a new technology would be "good" for the developers. For manufacturing, it would be "bad" if it increased the likelihood of defects or was expensive to manufacture on the current equipment. Sales people may like it if it could attract more potential customers or not like it if it would scare them off or delay shipment. The benefit of being in a project with higher risk and unknown components may not be attractive to the financial people.

You can just hear the conversation: A developer says, "But it's cutting edge!" meaning "it's good!" Some of the others hearing that as "but it's bad!" would respond, "So we shouldn't do it!" Others think it's good, but for different reasons, which may not play out when the product is finished being developed because the developers didn't know of those reasons.

You can see how it is important to understand the value systems for different parts of a business.

Some of my writings assume an understanding of the value systems of people in different professions. Sometimes, I address those value systems directly. In all cases, reading this book should give you insight into the mindset of engineers and innovators. Part of turning my raw writings into a book has been an effort to make these values more explicit and accessible to those with different backgrounds.

I have been involved in projects that had influence beyond my wildest dreams. My most famous creation, VisiCalc, and the products that followed and were influenced by it, have changed the way all sorts of business people do their jobs. (Some accountants thank me and say that "it made accounting fun.") In the old days, only accountants, bookkeepers, and planners dealt with spreadsheets, and it was mainly by using paper and pencil. Now "spreadsheeting," the personal computer way, is taught to everybody in many grade schools. Doing "what if?" analysis is available to all, not just big corporations with staffs of clerks and MBAs.

I have also been involved in many projects that had very little effect and that even I probably forget.

It is important to understand that much of the time while you are developing a new product the likelihood of success seems the same whether it eventually ends up an influential success or a forgotten failure. You need a strong belief in the project to spur you on. Many of the signs of ultimate failure are subtle, ambiguous, or not always present, and are, therefore, often ignored, which is appropriate. You might also be so caught up in the details that you find it hard to step back and take a wider view.

As an engineer, you are tempted to think that the reasons for success are related to how "good" one product's technology or internal craftsmanship is compared to another. As a business person, you are tempted to think that the reasons are related to the project management, marketing plan, sales strategy, or amount of money spent. Analysts and other observers look at industry trends, changes in the population of people using the products, and sociological forces. In reality, there are many components to product success, and they are often completely interrelated.

At this point, you should understand what I am trying to do here in this book and where I come from, including my feeling about the importance of looking at details and a variety of viewpoints. Next let us look at some of the personal uses of technology. We'll see how some of the simplistic business-oriented models of what can make money may not explain what really motivates people to pay for things or to create for others.