INTRODUCTION

Early in my career, an old boss of mine, Ed Petner, insisted that I squeeze the entire investment case for every stock I ever wanted to buy onto a single sheet of paper. It was one of the most challenging tasks I've ever tackled, but it was well worth it. Hopefully, Ed will appreciate that the entire presumption of this book is whittled to just two pages—and I am even eating into it by relaying his direction. My aim is to address two key issues that exist in the technology industry today.

ISSUE 1: HIGH-TECH FAILURE RATES STINK

The commercial failure rate of nominally great new technologies is troublingly high.
That failure rate is consistent with the hatred and distrust most normal human beings—which I like to call Earthlings—tend to have of high technology.
That hatred and distrust is a bummer since our little planet can use all the help technology might provide.

ISSUE 2: SUPPLIERS THINK THEY ARE IN CHARGE BUT IN REALITY USERS ARE IN CHARGE

The technology industry operates according to an implicit supplier-oriented assumption. That assumption is that if one builds great new disruptive technologies and lets cost reduction kick in, markets will naturally appear. This is known as "build it and they will come."

This mentality is a major problem. Adopting a new technology requires changing the habits of users. The industry acts as if change is easy when it's actually quite difficult. Users will change their habits when the pain of their current situation is greater than their perceived pain of adopting a possible solution—this is the crux of *The Change Function*.

I believe that users are *always* in charge and that supply is a necessary but not sufficient condition for commercial success. Companies and products geared toward this holistic user orientation will succeed at far greater rates than those stuck in a supplier-oriented mind-set.

The goal of this book is to look at what has failed in the past, to understand how the industry came to be in the position it is in today. And, through the prism of *The Change Function,* to spotlight examples of what might and might not work in the future, and to examine a few corporate cultures that seem to get it. But this is not eight easy steps to success. Change is *not* easy.

"It is not necessary to change. Survival is not mandatory."

—W. Edwards Deming

That's it. So long.

ONE

SILICON VALLEY, WE'VE GOT A PROBLEM

> *"Nothing is more difficult than to introduce a new order. Because the innovator has for enemies all those who have done well under the old conditions and lukewarm defenders in those who may do well under the new."*
>
> —Niccolo Machiavelli, *The Prince*

We've all heard it before: "Build it and they will come." Well, the last six years have proven that at least in the technology industry, that maxim is shockingly—and expensively—untrue. But there's an alternative approach, one that is user oriented and not so supplier-centric. That's what *The Change Function* is all about.

A couple of years ago it dawned on me in an ah-hah moment that nearly every time tech company execs got in front of me in an effort to persuade me to invest my clients' money they were focused on themselves, what they had created, and why buyers would be smart enough to figure out how smart their technology was as the price came down. It was incredibly ethnocentric. It was all about the smart technologists and the "magic" that the smart technologists had created—their propositions were devoid of a deep understanding of what really went on in their users' minds. The alternative approach is for technology companies to become riveted to the needs and wants of the users they seek. It

seems obvious when you say it out loud, but here goes: users are in charge of what they spend their money on—and they always have been. The technologists may be the magicians but the *users* have the checkbooks.

Questions from the audience?

So the user of new tech products has always been in charge?
Yes.

So we've been hallucinating that the vendors of technology are the more important part of the equation?
Yes.

Didn't David Moschella's book Customer-Driven IT *say the same thing?*
Kind of.

He said the customer is now *in charge . . .*
Yes, he did.

. . . and you say the customer has always *been in charge?*
Yes.

. . . and vendors were lured into believing they were in charge?
Yep.

. . . and during the 1990s it was easy to get confused and become supplier-centric?
Oh, yeah.

Because of the success of massive technology trends such as PCs and cell phones that had hit the mainstream?
I prefer "adopted" by the mainstream, but yes.

And now after the tech spending slowdown, the burst of the Internet bubble, and the near-80 percent drop of the Nasdaq stock index a couple of years back, the tech ecosystem is in crisis?
It sure is.

Because the supplier-centric orientation of tech companies and tech products no longer appears to be working?
Right.

And former Intel CEO Andy Grove's old mantra that the surest way to success is to focus on creating disruptive technologies that produce order-of-magnitude, or "10x," changes that dramatically alter the status quo seems so yesterday—so 1990s?
It does, doesn't it?

And no one cares so much about the importance of Gordon Moore's Law that price reductions on tech products can maintain a steady and aggressive pace and make cool technologies more and more affordable to ever large numbers of Earthlings . . .
True.

And no one quite knows what to do but create vague goofy hype phrases . . .
Ugh.

And they broadly talk of the Digital Home, OnDemand, and Grids . . .
Ugh.

And most of the companies are still stuck creating products that fail . . .
Ugh.

And this crisis provides an opportunity to suggest a new way . . .
Yes.

And really thinking about the user is a new concept even though everyone in the industry will claim that they have been doing the user-centric thing for years . . .
Pretty much.

And the tech industry thinks adopting new technology or facilitating change is easy.
They do.

Just build it and they will come. So there's been an over-reliance on Andy Grove's Law of 10x disruptive change and Gordon Moore's Law of cost reduction to make those wonderful disruptive technologies more and more affordable to more and more Earthlings.
Yes, there has.

And you and our friend Machiavelli think change is very difficult . . .
The two of us, plus many, many others.

And what you propose to do is to compare a potential user's need or crisis . . .
Keep going.

. . . with the total perceived pain of adopting the possible solution prior to forking over any money . . . a weighing machine with current pain on one side and perceived pain of the solution on the other . . .
Precisely.

. . . to see if change will happen.
That's it, in a nutshell.

THE GNAWING

> *"Now that we have progress so rapid that it can be observed from year to year, no one calls it progress. People call it change, and rather than yearn for it, they brace themselves against its force."*
>
> —Stewart Brand, *The Clock of the Long Now*

As the Global Technology Strategist at UBS from 1999 to 2005, I led a group that generated nearly three hundred reports, mostly under the title The Weekly Global Tech Journey, that were aimed at synthesizing the worlds of technology and technology investing as best possible. We still do that at Coburn Ventures under the new title Waypoints. What we *really* do is aim to learn as much about *change* as we possibly can.

In the 1960s, Eldon Mayer—a key brainwasher of mine three decades later—went to the famed value investor Benjamin Graham and asked the Yoda of investing if he objected to his (young Eldon's) approach of looking for *change* as opposed to Graham's eloquently written investment volumes on looking for *value* as the key element in identifying promising stocks.

You see, Graham started with the assumption that the inherent value of an entity could be determined at any fixed point in time and that one needed only to observe whether the price of the stock in the public market was either more or less than that value. Graham became very famous for this simple logic. Graham told Eldon that *change* investing still counted as value investing. Whereas Graham looked for a differential between value and stock price at any particular moment, Eldon looked for shifts in value that would come about as a result of major changes in the life of the company over time. If Eldon could identify and understand these changes quicker and with greater clarity than others, he would *know* the new *value* before anyone else and could profit handsomely.

With some fundamental changes at a company, the inherent value of that entity changes *now* even if it takes most of Wall Street a few years to really get it.

With Yoda's blessing, Eldon ventured off into the investment world and delivered spectacular results, even during the horrendous 1970s. It wasn't until the early 1990s that I crossed his path. I joined his investment firm, Lynch and Mayer. I had studied change previously, but now I would get to study change for a living. It seemed like heaven. Here's where I got lucky: I got to combine *change thinking* with the hottest, fastest changing portion of the investment world—*technology*—and do so as part of a group led by superstar technology-investment guru John Levinson. Technology is a great place to look for change—and the money you can make from it—it's got the least predictable business models and earnings estimates, and the greatest stock volatility.

It wasn't easy. Luckily, after a handful of soul-searching episodes of losing anywhere from 10 to 30 percent of a stock's value in a day, my ability to recover from the knife-in-the-stomach reaction that often accompanies technology investing improved dramatically. I could again sleep at night, I quit drooling and foaming at the mouth in public, and a long-lasting peace among myself, change, and technology investing emerged.

But none of this brings us back to why in July 2004, I found myself sitting in a porch rocker, clicking on my laptop, and setting out a treatise on *The Change Function.* Here's what happened. In our Weekly Global Tech Journeys, we started pursuing a question that gnawed at us for years:

Why does tech change?

More specifically,

Why in the world do new technologies get adopted?

Our goal: to develop an investment philosophy focused on recognizing patterns of change—as well as patterns where nothing changed—and to find the common thread in it all.

"PROBLEM? WHAT PROBLEM?"

> *"Despite the best efforts of remarkably talented people, most attempts to create successful new products fail. Over 60 percent of all new-product development efforts are scuttled before they ever reach the market. Of the 40 percent that do see the light of day, 40 percent fail to become profitable and are withdrawn from the market. By the time you add it all up, three-quarters of the money spent in product development investment results in products that do not succeed commercially."*
>
> —Clayton Christensen, *The Innovator's Solution*

In the above quote, Clayton Christensen—a guru of change inside enterprises—is being kind or generous or both. It seems somewhat hopeful to suggest that 25 percent of all technology research and development investment actually proves successful—that *only* 75 percent is a disappointment! My own sense is that 90 to 95 percent of new technology products fail to gain anything resembling the originally hoped-for success.

While much of this failure occurs at innumerable start-ups, lots of it also happens at the major corporate engines of the technology world. And as we see one of the most innovative tech companies on the planet—Apple—spending well below industry-wide norms on R & D as a percent of sales, it seems that effective and efficient R & D may have given way to sloppiness and accommodation across the technology industry during the five decades of success that followed the development of the transistor at Bell Labs in the 1940s.

The technology world—indeed, the entire technology ecosystem—accommodates such atrocious failure rates unnecessarily.

The implicit thinking that creating Andy Grove-style 10x disruptive technologies is an end in itself is not wrong but *limited*. By tolerating and accommodating pathetic success rates as opposed to examining the horrendous failure rates, the technology industry has generated numerous disservices, of which the primary one is as follows:

Technology is widely hated by its users. The potential for technology to prove beneficial for *everyone*—from creator to investor to the vast bulk of the planet's six billion residents—is currently being undermined.

> *"Technology is a queer thing. It brings you great gifts with one hand and it stabs you in the back with the other."*
>
> —C. P. Snow, British writer and scientist, *The New York Times*, March 15, 1971

THE RESPONSE

> *"Technology is not kind. It does not wait. It does not say please. It slams into existing systems . . . and often destroys them. While creating a new system."*
>
> —Economist Joseph Schumpeter

This remark from the famed economist Joseph Schumpeter typifies the relationship many in industry have with technology, including its creators. Schumpeter's quote might be translated to read, *Engineers create technology and the world is forever changed—no questions asked!* In that context, a desire to examine the horrendous success rates might be seen as an unwanted intrusion into the creative world that is the invention of new technologies.

"Huh?"

In studying change, it's hard to find actual people who would volunteer to be the ones studied—but the technology ecosystem consists of

actual people. The ecosystem itself does not want to be studied either—just as most of us would react less than enthusiastically if our boss informed us that someone would be tracking our every move for the next few months to help find better ways of doing our job.

And so the occasional and unappreciated examination of failure in technology is met—as it is in most places—with defensiveness. That leaves us with a selective amnesia that looks for its lessons only from the winners—like the PC—but not from the losers—like the Picturephone. Didn't anyone ever stop to consider that the machismo-laden boast of the venture capital community—that their model *works well* when 90 percent of VC bets fail—might, just perhaps, be a little too forgiving? That it really is a little odd to celebrate the fact that only 10 percent of their bets work out in the end?

Ignore failure, and you can conclude that the system *does* work. That focusing solely on creating extraordinary 10x disruptive Andy Grove–style change and allowing Moore's Law to work its magic in lowering price so the wonders that technologists create can be made available to more and more Earthlings—the so-called price elasticity argument—is *all* that one must worry about.

The success of the PC proves it, they say! But I think they're wrong.

LESSONS OF THE PERSONAL COMPUTER

> *Alan Kay's job interview at Xerox PARC:*
> *"What do you think your greatest achievement will be at PARC?"*
> *"It'll be the personal computer."*
> *"What's that?"*
>
> —Michael Hiltzik, *Dealers of Lightning*

In the early 1970s, Alan Kay of Xerox PARC—the Palo Alto Research Center—called his personal computer a time machine. What he meant was that thanks to Moore's Law, the price would come down over time and a market would grow as a result. He was right—it did. Kay, a computer genius of legendary proportions, had seen the future in Gordon

Moore's April 1965 article "Cramming More Components onto Integrated Circuits" (*Electronics Magazine*, April 19, 1965).

Here's the issue, though: Moore's Law was a necessary but hardly a sufficient condition for the growth of the PC market. Sure, some otherwise very interesting markets would not have developed if the price point didn't drop to a level at which the products or services became economically palatable to potential customers. But with all due respect to flea markets, no one buys much of anything—whether it's an ugly shirt or a personal computer—just because the price is *really* cheap.

Alan Kay's genius was not simply that he waited around for the effects of Moore's Law to kick in but that he waited for the effects of the graphical user interface (GUI)—which was also developed at Xerox PARC—to kick in! Moore's Law might have brought the price points down on personal computers but the GUI made it accessible to millions and is primarily responsible for the massive growth of the personal computer market in the late 1980s and 1990s.

The GUI was the sufficient condition that made a cool technology less scary to Earthlings and therefore more accessible.

But is that the lesson the industry learned? That you can make cool things, but you *also* need to make them less scary?

Nah!

In 1964, Wesley Clark built the first personal computer—LINC—at Washington University in St. Louis. In 1973, Cookie Monster crawled across a display at Xerox PARC in Palo Alto—on the Alto, the first recognizable personal computer by today's perception of what a PC is. In 1980, IBM introduced the PC and in 1981 it sold 65,000 of them. In 1989, just fewer than 20 million units were sold globally. Ten years later that figure approached 170 million.

The most famous meeting in the past fifty years of technology? Headquarters in Webster, New York, orders Xerox PARC in Palo Alto,

California, to give Steve Jobs and his merry men from Apple a no-holds-barred demonstration of the graphical user interface without having to sign a nondisclosure agreement. Xerox quite literally gave away that key technology in an afternoon. Later, Bill Gates and Jobs would battle over who owned the GUI, with Gates suggesting that Jobs was jealous of Gates who made more hay—or, more precisely, money—planting the technology in the Windows environment.

> *"Hey, Steve, just because you broke into Xerox's store before I did and took the TV doesn't mean I can't go in later and steal the stereo."*
>
> —Bill Gates, *Mac Week*, March 14, 1989

The most important giveaway in the history of the PC wasn't a chip or an operating system. It was a graphical user interface—that which would make the technology available to the masses without having them strain to learn how to write code. Steve Jobs's meeting at Xerox PARC gave him the key to lowering the total perceived pain of adoption for users.

The Change Function aims to identify the root of crisis by getting in users' heads as to what they *really* want—as opposed to running insightless focus groups—and it looks for ways of reducing the total perceived pain of adopting a new way of doing things. In other words, we want to understand the crisis at the adopter level, or specifically how a new offering solves a problem such that the pain in moving to a new technology is lower than the pain of staying in the status quo.

The Change Function
f (perceived crisis vs. total perceived pain of adoption)

Sometimes technologists forget just how vast the chasm is between them and *real people*. Many real people resent technology. So it won't be easy for technologists to survive this crisis intact—this realization that it is real people and not technologists who determine the fate of technologies. "Build-it-and-they-will-come"–thinking runs deep.

Long after its years of real growth evaporated, Intel still operates on the principle of self-cannibalization with a faith that the next use for the miracles they create will most certainly appear somewhere. Intel's CEO Andy Grove was named *Time*'s Man of the Year in the mid-1990s and was quoted as saying:

"Tech Happens"

There was no reference to users deciding when and if Tech Happens or, *our job is to help users easily adopt new technology,* but rather just that *Tech Happens.*

How 'bout this famous one from Arthur C. Clarke, author of *2001: A Space Odyssey:* "Any sufficiently advanced technology is indistinguishable from magic." Technologists must have *loved* Clarke for this engineering-centric comment, the implication of which is that Technologists=Magicians. Who wouldn't want to be considered a magician?

Granted, much of technology *can* seem indistinguishable from magic to most. But something needs to be added to the mix to create a business. The magician business, while quite exciting, is generally far from lucrative, with exceptions like David Copperfield who in addition to the magic itself adds the additional magic of figuring out a business model.

But change is difficult. For technologists, the focus today remains on building miracles and letting Moore's Law do the grunt work to create commerciality. The investment community adores miracles, overlooks failed miracles with astonishing ease, and finds total perceived pain of adoption far less alluring than jaw-dropping, gee-whiz technologies.

Supplier-centric adoption model = *f* (Andy Grove Law of 10× disruptive technology × Gordon Moore's Law)

At best, gee-whiz technologies are years ahead of schedule. At worst, they are mental indulgences lacking a potential user crisis. Yet gee-whiz tech continually grabs the headlines. And so we can rest assured that

early next year the Sunday *New York Times*—among many others—will run a feature on smartphones for the seventy-fourth year in a row, despite the fact that they have been too early with this call for seventy-three years straight. There *won't* be a piece in that same Sunday *New York Times* about business intelligence software, because the average reader can't get their arms around what the heck it really is even though corporate customers keep consuming it at a predictably interesting pace.

Here's one of my 14,292 opinions on change and technology: the limited understanding of why technology is adopted has created a terribly misguided use of investment dollars and has likely sabotaged many a product that, if rethought, might have experienced far greater success . . .

. . . and those failures aid and abet the hatred and distrust the world has for technology . . .

and it doesn't work well for the world to hate and distrust technology . . .

and anyone looking around right now might get the sense that the planet can use all the help technology might be able to provide.

You can be your own assessor as to whether this thinking is on the mark. Decide for yourself if technology is working:

- Are you tired of trying to remember power cords for business trips?
- Are you tired of trying to remember to charge your cell phone at night?
- Are you annoyed by your remote control—correction, are you annoyed by the seven remotes in your home because you can't find the one you really want?
- Are you annoyed by complex alarm clocks in hotel rooms?

- Are you annoyed because your back hurts when traveling, perhaps because of all that extra junk you're hauling with you in order to be connected?
- Does it stink when you don't know how to align spacing in a Word document and spend your day guessing how to fix it?
- Are you tired of being stuck on a helpline forever, bracing to hear a flurry of TechnoLatin when someone finally does answer?
- Are you annoyed when spell check Capitalizes words You don't Want capitalized?
- Are you worried about your privacy?
- Do you have too many passwords?
- Do dropped cell phone calls annoy you just a tad?
- Did you ever have a flashing 12:00 on your VCR?

The above list could go on forever—literally. Quite clearly, something is wrong. For all the miracles technologists are performing, there is still a lot getting in the way of it all just working, of the miracles being easier to understand and adopt, and for commercial success to follow.

THE DUMB SMARTPHONE

> *"A mobile phone needs a manual in the way that a teacup doesn't."*
>
> —Douglas Adams . . . and he didn't mean a smartphone

In the midsixties, Fred Brooks helped develop the software that would instruct IBM's S/360 mainframes—a company-making event for IBM. In *The Mythical Man Month*, Brooks discusses the second-system syndrome, the main point of which is the following: In the first system, creators are happy to get the "system" out the door *anyway, anyhow*. And in the second system? Well, all the ideas rejected in the first system—with the aim of just getting the product to market—are chucked into version number two. All the fresh ideas dreamed up by the sales force

are included as well, creating a "feature-laden," all-encompassing system that surely must be better! But it doesn't quite work that way. The second system is nasty, unattractive, expensive, and commercially unwanted. The word *bloatware* may not have existed when Brooks labored on the S/360, but that lone word is extremely descriptive.

Bloatware

The mobile phone industry—as a follow-up to its incredible success that was nearly a half century in the making—created extremely expensive, feature-laden, computeresque gizmos called smartphones. These phones have a variety of attributes, so the definition is quite fuzzy, but any phone allowing a user to run an Excel spreadsheet and featuring a Windows or Symbian operating system certainly qualifies as one.

Smartphones have continually undersold expectations, much to the dismay of technologists, while "bare bones" phones that accommodate nonserious and nonsmart activities such as $2 music ring-tone downloads will likely explode to nearly 800 million units sold in 2005.

But smartphones have garnered tremendous media attention because they are supposedly *smart* and represent the future or at least the future that some folks would like to see. It's great fodder for the Sunday *New York Times*.

Supplier Orientation: More is better.
Much more is much better.

User Orientation: More is confusing.
Much more is much more confusing.

Since users are in charge of their wallets, and much more confusion means a much greater sense of perceived pain of adopting a new technology, the odds of rampant purchasing are low. Time and time again, users reject a Swiss Army knife in nearly every facet of life except in a Swiss Army knife. The concept of the Swiss-Army-knife convergence

gadget is both *ill thought* and a waste of time. Do we want an extension of function? Sure. But all-in-one convergence? Nah! The world isn't going toward one all-powerful device no matter what the common wisdom has been for the past decade. We have more devices than ever!

Smartphones provide a wonderful namesake for a repository of bloatware. Name the product *smart*, thus internally legitimizing jamming in *everything*. There suddenly is no such thing as a bad idea. It certainly makes logical sense to help consolidate devices—blah blah blah—except that the market for the smartphone gets whittled down to the technologists themselves, who live in a "more-is-better" world as opposed to "more is confusing."

The technology ecosystem hasn't *really* ever put two and two together. In fact, as I have written for AlwaysOn (www.alwayson-network.com) about the extremely low odds of an all-in-one gadget simplifying the world, I am continually met with nasty comments about how I am so *very, very* wrong and how I don't "get" how much better the world would be. I would love to be wrong, but for the past ten years such technologist dreams have been negated. Technology has proliferated into many forms as opposed to a logical single form and technology will likely continue to proliferate into even more forms.

I say that even though I would be among the ultimate beneficiaries. In May 2004 in Taipei, my friend Sean Debow and I laid out our gadgetry in one location to take a picture of all the backbreaking stuff we carry—I mean the wonderful technology we carry. I had twenty-seven pieces of gear myself. You might think Sean and I were perfect candidates for a smartphone—given the planetary inconveniences of our jobs—but *we* didn't even carry one. I see nothing noble, mind you, in lugging twenty-seven pieces of gear around on my back. In fact, my backache and the frustration of carrying the world on my shoulders around the world was what prompted the picture to begin with.

My fledging yoga practice is a response to the devices.

Today, in February 2005, I sit at the Port Bakery and Café in Kennebunkport, Maine, with my laptop, BlackBerry, cell phone, and iPod as standard operating support. Yesterday, I bought an iGo to hopefully reduce the stuff I must lug.

Pip's and Sean Debow's collection of necessary technology to stay connected, Taipei, 2004.

And now, one last flurry of frustrations like the finale of a fireworks show:

- Why do more expensive microwaves add features we never wanted and befuddle folks on basic usage? Do I really want to pay for a "popcorn" feature?
- Why do the lighting systems in four-star hotels require a potentially demeaning teach-in from the bellhop? Why should they be "systems" at all when light "switches" seemed to work pretty darn well?
- Why can't our friend Jerry at Goose Rocks Beach figure out how to operate his watch—lap 1, lap 2, mode 1, mode 2—to time his eight-year-old daughter running to the water and back?
- Why do we need to "operate" technology as opposed to just "use" it?
- Why do I have three remotes for my TV, DVD, and cable at my house in Maine, thus eliminating my desire to bother watching the muck on television anyway? Ahhh . . . that may be *smart.*