Peter Thiel's CS183: Startup - Class 1 Notes Essay

Here is an essay version of my class notes from Class 1 of CS183: Startup. Errors and omissions are my own. Credit for good stuff is Peter's entirely.

CS183: Startup—Notes Essay—The Challenge of the Future

Purpose and Preamble

We might describe our world as having retail sanity, but wholesale madness. Details are well understood; the big picture remains unclear. A fundamental challenge—in business as in life—is to integrate the micro and macro such that all things make sense.

Humanities majors may well learn a great deal about the world. But they don't really learn career skills through their studies. Engineering majors, conversely, learn in great technical detail. But they might not learn why, how, or where they should apply their skills in the workforce. The best students, workers, and thinkers will integrate these questions into a cohesive narrative. This course aims to facilitate that process.

I.   The History of Technology

For most of recent human history—from the invention of the steam engine in the late 17$^{\text{th}}$ century through about the late 1960's or so— technological progress has been tremendous, perhaps even relentless. In most prior human societies, people made money by taking it from others. The industrial revolution wrought a paradigm shift in which people make money through trade, not plunder.

The importance of this shift is hard to overstate. Perhaps 100 billion people have ever lived on earth. Most of them lived in essentially stagnant societies; success involved claiming value, not creating it. So the massive technological acceleration of the past few hundred years is truly incredible.

The zenith of optimism about the future of technology might have been the 1960's. People *believed* in the future. They *thought* about the future. Many were supremely confident that the next 50 years would be a half-century of unprecedented technological progress.

But with the exception of the computer industry, it wasn't. Per capita incomes are still rising, but that rate is starkly decelerating. Median wages have been stagnant since 1973. People find themselves in an alarming Alice-in-Wonderland-style scenario in which they must run harder and harder—that is, work longer hours—just to stay in the same place. This deceleration is complex, and wage data alone don't explain it. But they do support the general sense that the rapid progress of the last 200 years is slowing all too quickly.

II.   The Case For Computer Science

Computers have been the happy exception to recent tech deceleration. Moore's/Kryder's/Wirth's laws have largely held up, and forecast continued growth. Computer tech, with ever-improving hardware and agile development, is something of a model for other industries. It's obviously central to the Silicon Valley ecosystem and a key driver of modern technological change. So CS is the logical starting place to

recapture the reins of progress.

III.   The Future For Progress

    A.   Globalization and Tech: Horizontal vs. Vertical Progress

Progress comes in two flavors: horizontal/extensive and vertical/intensive. Horizontal or extensive progress basically means copying things that work. In one word, it means simply "globalization." Consider what China will be like in 50 years. The safe bet is it will be a lot like the United States is now. Cities will be copied, cars will be copied, and rail systems will be copied. Maybe some steps will be skipped. But it's copying all the same.

Vertical or intensive progress, by contrast, means doing new things. The single word for this is "technology." Intensive progress involves going from 0 to 1 (not simply the 1 to n of globalization). We see much of our vertical progress come from places like California, and specifically Silicon Valley. But there is every reason to question whether we have enough of it. Indeed, most people seem to focus almost entirely on globalization instead of technology; speaking of "developed" versus "developing nations" is implicitly bearish about technology because it implies some convergence to the "developed" status quo. As a society, we seem to believe in a sort of technological end of history, almost by default.

It's worth noting that globalization and technology do have some interplay; we shouldn't falsely dichotomize them. Consider resource constraints as a 1 to n subproblem. Maybe not everyone can have a car because that would be environmentally catastrophic. If 1 to n is so blocked, only 0 to 1 solutions can help. Technological development is thus crucially important, *even if all we really care about is globalization*.

    B.   The Problems of 0 to 1

Maybe we focus so much on going from 1 to n because that's easier to do. There's little doubt that going from 0 to 1 is qualitatively different, and almost always harder, than copying something n times. And even trying to achieve vertical, 0 to 1 progress presents the challenge of exceptionalism; any founder or inventor doing something new must wonder: am I sane? Or am I crazy?

Consider an analogy to politics. The United States is often thought of as an "exceptional" country. At least many Americans believe that it is. So is the U.S. sane? Or is it crazy? Everyone owns guns. No one believes in climate change. And most people weigh 600 pounds. Of course, exceptionalism may cut the other way. America is the land of opportunity. It is the frontier country. It offers new starts, meritocratic promises of riches. Regardless of which version you buy, people must grapple with the problem of exceptionalism. Some 20,000 people, believing themselves uniquely gifted, move to Los Angeles every year to become famous actors. Very few of them, of course, actually become famous actors. The startup world is probably less plagued by the challenge of exceptionalism than Hollywood is. But it probably isn't immune to it.

    C.   The Educational and Narrative Challenge

Teaching vertical progress or innovation is almost a contradiction in terms. Education is fundamentally about going from 1 to n. We observe, imitate, and repeat. Infants do not invent new languages; they learn existing ones. From early on, we learn by copying what has worked before.

That is insufficient for startups. Crossing T's and dotting I's will get you maybe 30% of the way there. (It's certainly necessary to get incorporation right, for instance. And one can learn how to pitch VCs.) But at some point you have to go from 0 to 1—you have to do something important and do it right—and

that can't be taught. Channeling Tolstoy's intro to Anna Karenina, all successful companies are different; they figured out the 0 to 1 problem in different ways. But all failed companies are the same; they botched the 0 to 1 problem.

So case studies about successful businesses are of limited utility. PayPal and Facebook worked. But it's hard to know what was necessarily path-dependent. The next great company may not be an e-payments or social network company. We mustn't make too much of any single narrative. Thus the business school case method is more mythical than helpful.

D.   Determinism vs. Indeterminism

Among the toughest questions about progress is the question of how we should assess a venture's probability of success. In the 1 to n paradigm, it's a statistical question. You can analyze and predict. But in the 0 to 1 paradigm, it's not a statistical question; the standard deviation with a sample size of 1 is infinite. There can be no statistical analysis; statistically, we're in the dark.

We tend to think very statistically about the future. And statistics tells us that it's random. We can't predict the future; we can only think probabilistically. If the market follows a random walk, there's no sense trying to out-calculate it.

But there's an alternative math metaphor we might use: calculus. The calculus metaphor asks whether and how we can figure out exactly what's going to happen. Take NASA and the Apollo missions, for instance. You have to figure out where the moon is going to be, exactly. You have to plan whether a rocket has enough fuel to reach it. And so on. The point is that no one would want to ride in a statistically, probabilistically-informed spaceship.

Startups are like the space program in this sense. Going from 0 to 1 always has to favor determinism over indeterminism. But there is a practical problem with this. We have a word for people who claim to know the future: prophets. And in our society, all prophets are false prophets. Steve Jobs finessed his way about the line between determinism and indeterminism; people sensed he was a visionary, but he didn't go too far. He probably cut it as close as possible (and succeeded accordingly).

The luck versus skill question is also important. Distinguishing these factors is difficult or impossible. Trying to do so invites ample opportunity for fallacious reasoning. Perhaps the best we can do for now is to flag the question, and suggest that it's one that entrepreneurs or would-be entrepreneurs should have some handle on.

E.   The Future of Intensive Growth

There are four theories about the future of intensive progress. First is convergence; starting with the industrial revolution, we saw a quick rise in progress, but technology will decelerate and growth will become asymptotic.

Second, there is the cyclical theory. Technological progress moves in cycles; advances are made, retrenchments ensue. Repeat. This has probably been true for most of human history in the past. But it's hard to imagine it remaining true; to think that we could somehow lose all the information and know-how we've amassed and be doomed to have to re-discover it strains credulity.

Third is collapse/destruction. Some technological advance will do us in.

Fourth is the singularity where technological development yields some AI or intellectual event horizon.

People tend to overestimate the likelihood or explanatory power of the convergence and cyclical theories. Accordingly, they probably underestimate the destruction and singularity theories.

IV. Why Companies?

If we want technological development, why look to companies to do it? It's possible, after all, to imagine a society in which everyone works for the government. Or, conversely, one in which everyone is an independent contractor. Why have some intermediate version consisting of at least two people but less than everyone on the planet?

The answer is straightforward application of the Coase Theorem. Companies exist because they optimally address internal and external coordination costs. In general, as an entity grows, so do its internal coordination costs. But its external coordination costs fall. Totalitarian government is entity writ large; external coordination is easy, since those costs are zero. But internal coordination, as Hayek and the Austrians showed, is hard and costly; central planning doesn't work.

The flipside is that internal coordination costs for independent contractors are zero, but external coordination costs (uniquely contracting with absolutely everybody one deals with) are very high, possibly paralyzingly so. Optimality—firm size—is a matter of finding the right combination.

V. Why Startups?

A. Costs Matter

Size and internal vs. external coordination costs matter a lot. North of 100 people in a company, employees don't all know each other. Politics become important. Incentives change. Signaling that work is being done may become more important than actually doing work. These costs are almost always underestimated. Yet they are so prevalent that professional investors should and do seriously reconsider before investing in companies that have more than one office. Severe coordination problems may stem from something as seemingly trivial or innocuous as a company having a multi-floor office. Hiring consultants and trying to outsource key development projects are, for similar reasons, serious red flags. While there's surely been some lessening of these coordination costs in the last 40 years—and that explains the shift to somewhat smaller companies—the tendency is still to underestimate them. Since they remain fairly high, they're worth thinking hard about.

Path's limiting its users to 150 "friends" is illustrative of this point. And ancient tribes apparently had a natural size limit that didn't much exceed that number. Startups are important because they are small; if the size and complexity of a business is something like the square of the number of people in it, then startups are in a unique position to lower interpersonal or internal costs and thus to get stuff done.

The familiar Austrian critique dovetails here as well. Even if a computer could model all the narrowly economic problems a company faces (and, to be clear, none can), it wouldn't be enough. To model all costs, it would have to model human irrationalities, emotions, feelings, and interactions. Computers help, but we still don't have all the info. And if we did, we wouldn't know what to do with it. So, in practice, we end up having companies of a certain size.

B. Why Do a Startup?

The easiest answer to "why startups?" is negative: because you can't develop new technology in existing entities. There's something wrong with big companies, governments, and non-profits. Perhaps they can't recognize financial needs; the federal government, hamstrung by its own bureaucracy, obviously overcompensates some while grossly undercompensating others in its employ. Or maybe these entities can't

handle personal needs; you can't always get recognition, respect, or fame from a huge bureaucracy. Anyone on a mission tends to want to go from 0 to 1. You can only do that if you're surrounded by others to want to go from 0 to 1. That happens in startups, not huge companies or government.

Doing startups for the money is not a great idea. Research shows that people get happier as they make more and more money, but only up to about $70,000 per year. After that, marginal improvements brought by higher income are more or less offset by other factors (stress, more hours, etc. Plus there is obviously diminishing marginal utility of money even absent offsetting factors).

Perhaps doing startups to be remembered or become famous is a better motive. Perhaps not. Whether being famous or infamous should be as important as most people seem to think it is highly questionable. A better motive still would be a desire to change the world. The U.S. in 1776-79 was a startup of sorts. What were the Founders motivations? There is a large cultural component to the motivation question, too. In Japan, entrepreneurs are seen as reckless risk-takers. The respectable thing to do is become a lifelong employee somewhere. The literary version of this sentiment is "behind every fortune lies a great crime." Were the Founding Fathers criminals? Are all founders criminals of one sort or another?

C.   The Costs of Failure

Startups pay less than bigger companies. So founding or joining one involves some financial loss. These losses are generally thought to be high. In reality, they aren't that high.

The nonfinancial costs are actually higher. If you do a failed startup, you may not have learned anything useful. You may actually have learned how to fail again. You may become more risk-averse. You aren't a lottery ticket, so you shouldn't think of failure as just 1 of n times that you're going to start a company. The stakes are a bit bigger than that.

A 0 to 1 startup involves low financial costs but low non-financial costs too. You'll at least learn a lot and probably will be better for the effort. A 1 to n startup, though, has especially low financial costs, but higher non-financial costs. If you try to do Groupon for Madagascar and it fails, it's not clear where exactly you are. But it's not good.

VI.   Where to Start?

The path from 0 to 1 might start with asking and answering three questions. First, what is valuable? Second, what can I do? And third, what is nobody else doing?

The questions themselves are straightforward. Question one illustrates the difference between business and academia; in academia, the number one sin is plagiarism, not triviality. So much of the innovation is esoteric and not at all useful. No one cares about a firm's eccentric, non-valuable output. The second question ensures that you can actually execute on a problem; if not, talk is just that. Finally, and often overlooked, is the importance of being novel. Forget that and we're just copying.

The intellectual rephrasing of these questions is: *What important truth do very few people agree with you on?*

The business version is: *What valuable company is nobody building*?

These are tough questions. But you can test your answers; if, as so many people do, one says something like "our educational system is broken and urgently requires repair," you know that that answer is wrong (it may be a truth, but lots of people agree with it). This may explain why we see so many education non-profits and startups. But query whether most of those are operating in technology mode or

globalization mode. You know you're on the right track when your answer takes the following form:

"Most people believe in X. But the truth is !X."

Make no mistake; it's a hard question. Knowing what 0 to 1 endeavor is worth pursuing is incredibly rare, unique, and tricky. But the process, if not the result, can also be richly rewarding.