Innovation Arbitrage

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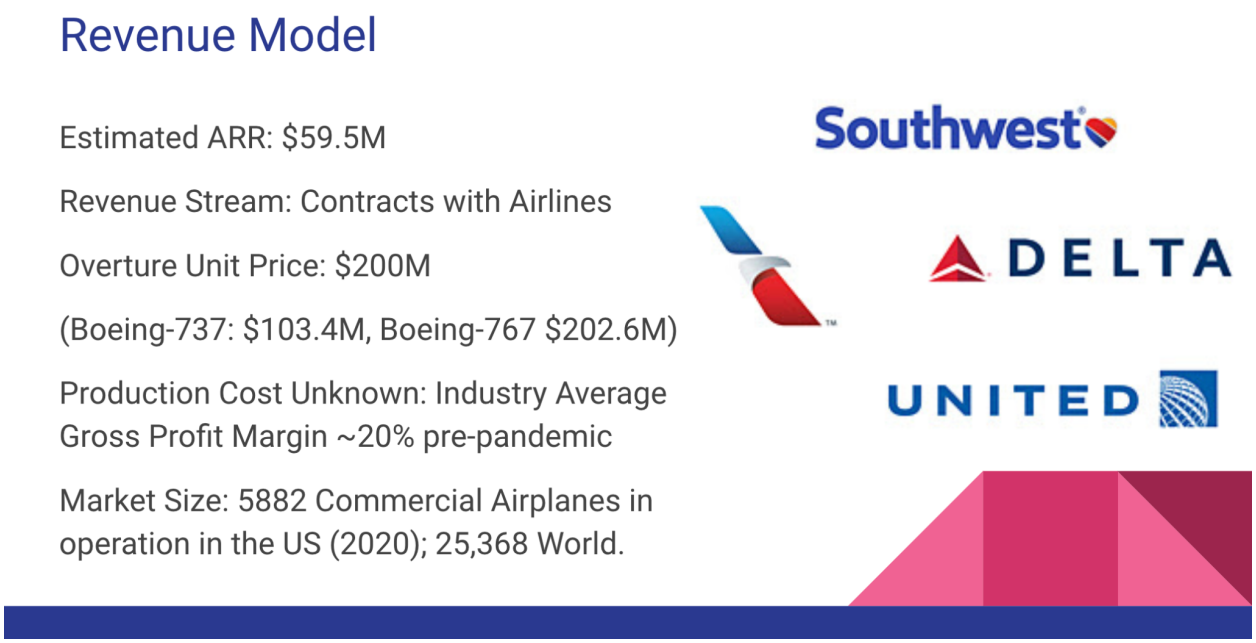
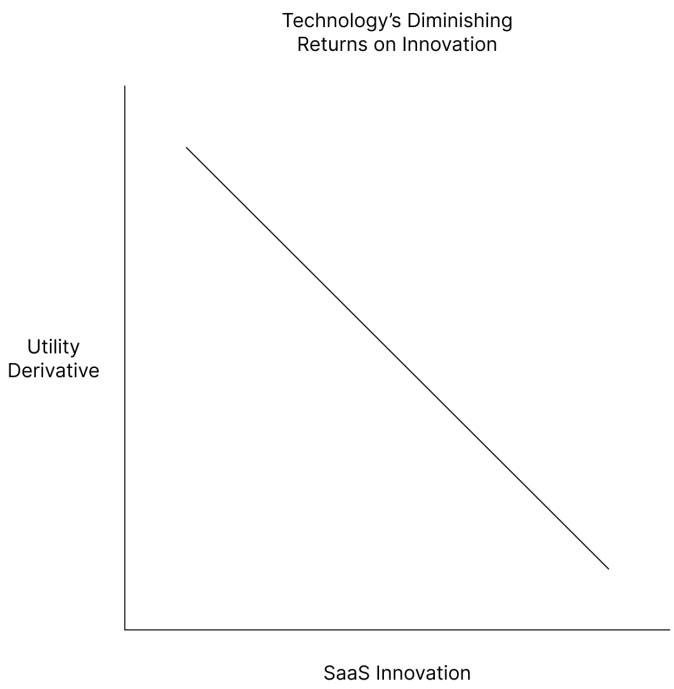
Having been a student of startups and Venture Capital for almost a year now, I often reflect upon the rapid iterations of knowledge and the growth I've experienced so far. I came into college as a wide-eyed 18-year-old knowing I wanted to be in/near/around startups - so I walked into the NYU Entrepreneurship Institute on Washington Place and asked for a job. Soon after, I applied to NYU Stern's Entrepreneurship Club, where applicants are asked to make a pitchdeck for a startup of choice. I remember distinctly that out of over a hundred applicants, I stood out because I chose Boom Supersonic for my deliverable while everyone else chose software startups. A few months in, I was lucky enough to find my passion in Aerospace and Defense, which eventually led to a passion for deep tech.



Looking back now, one reason ConsumerTech and Enterprise SaaS ceased to interest me is the formulaic playbooks developed in these verticals. At the time it seemed apparent that there were two trends happening in technology: digitalization and globalization. Every startup I came across seemed to be packaging together some existing software solutions into a product for some

traditional industry. This usually took the form of either a dashboard-centric workflow management solution (Atlassian, Stripe) or a scroll-interface-based B2B2C marketplace play (DoorDash, Airbnb). These startups fall under the umbrella of digitalization. They're utilizing software to optimize and automate actions that otherwise would take place offline or locally. While this was taking place in the states, the success stories would soon after be replicated in geographically differentiated markets (globalization). Being a first-generation immigrant, I saw this firsthand during my childhood in China (Amazon to Alibaba, Uber to DiDi).

As I got deeper into the startup world and started keeping up with the current headlines of the Valley, I began recognizing another interesting trend. I started having to take more time to understand the core utility provided by the "new wave startups": Bolt, Modern Treasury, Linktree, etc. It seems that these startups are building on top of the recent digitalization of their respective sectors, and forcefully creating more utility by compressing the JTBD or creating a more polished UX. I call this phenomenon "technology's diminishing returns on innovation", but perhaps that will be another essay.

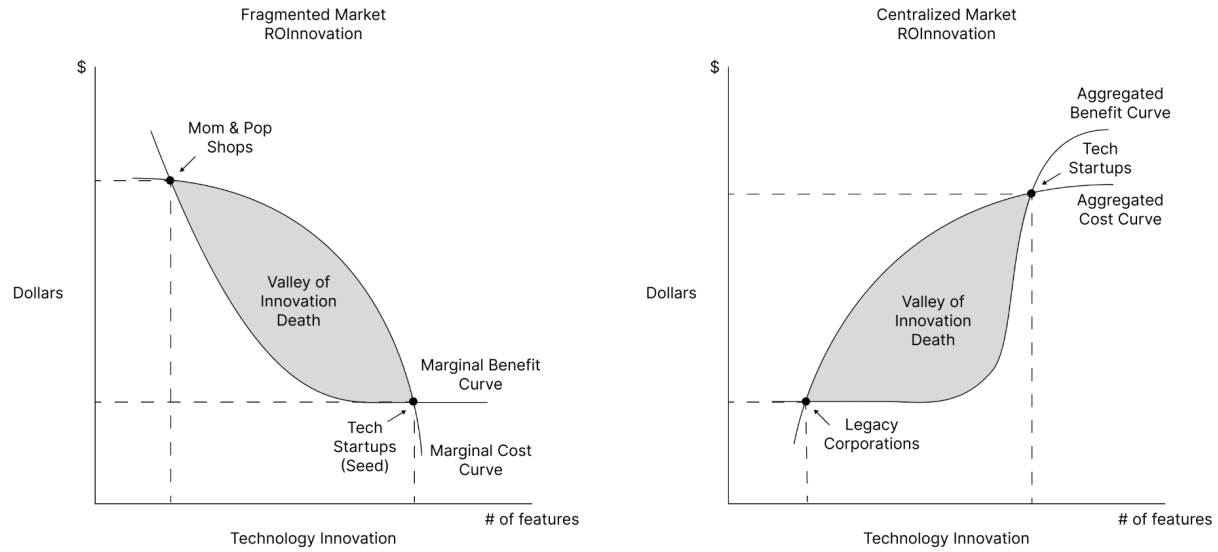


Both digitalization and globalization exploit clear information arbitrages. In the case of digitalization, no new technology is invented, but instead, existing information from the software world is organized and applied in a different corner of the economy. Globalization exploits a similar information disconnect, only geographical by nature. If you're not a Gen Z, you're probably thinking: "this has been a thing since the dotcom era." And you're right, only I (born in '03) made the backward association and came to the conclusion of "why are we still doing this twenty years later".

The answer I arrived at is what I call Innovation Arbitrage. The concept is simple: players in traditional industries don't have the incentives to innovate, so founders and VCs reap the returns on innovations instead. But as a Math major at heart, I wanted to put this in numbers and charts. This led me down a fascinating path of game theory, incentives, and macro trends, leaving me with more questions than I started with.

To dive into the weeds of this phenomenon, let's first identify the players. On the one side, there are the legacy industry participants who do not innovate despite clear value propositions. These legacy industries often take two common shapes. The first one is the classic Keith Rabois highly fragmented, low NPS industry structure. Markets that exhibit this behavior often profit from their respective geographic or demographic niches and have little competition within their bubbles, but immense competition beyond said bubbles. Think of the manufacturing, clinics, and flower shop industries. The second common structure is a highly centralized oligopoly where large legacy corporations set the market supply and have relatively low competition with one another. Think of the aerospace and defense, insurance, and media industries.

In the first case, each player in the industry has an upside cap in their local markets, so even though technology innovation will increase that cap, the upfront and opportunity costs of innovation plus the uncertainty of competition beyond localized niche outweighs the potential returns on innovation. This is why in 2022 you still have to call your local flower shop to order flowers (I did this for mother's day). On the other hand, large corporations have amble resources and relatively low opportunity costs of innovating, but they have already each captured a large portion of the market so the increase on their upside cap also marginally decreases as innovations occur. This is paired with the fact that any successful attempt to innovate will just result in competitors copying the strategy (since everyone's out in the open), leaving the first-mover holding the market testing costs (R&D, market research, user onboarding) while paving the way for competitors to swoop in and hit the ground running. This leads to low incentives for small marginal innovations: no point if it's not a game changer. That's why insurance is such a pain in the ass and Lockheed Martin takes thirty years to develop one aircraft.

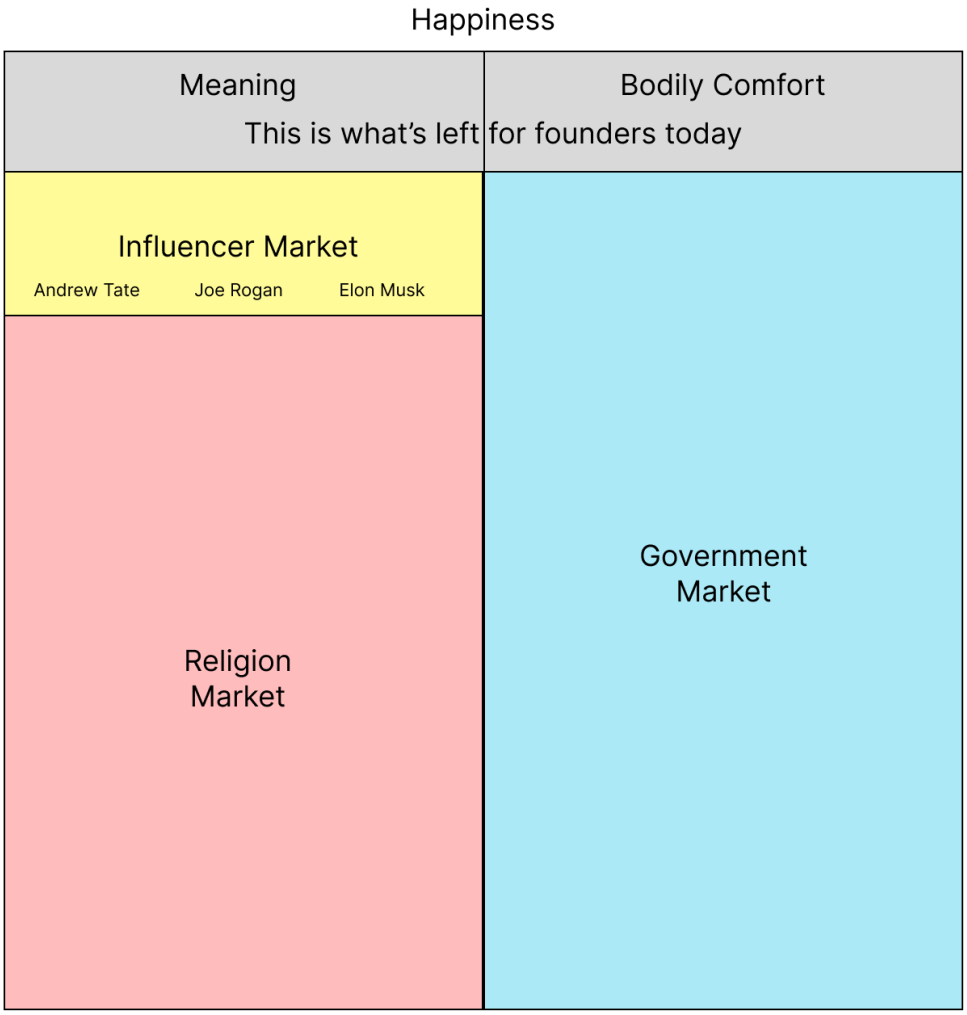


On the disruptor's side, these "Valleys of Innovation Death" are clear arbitrage opportunities. Founders can tough it out with VC money during these periods when either marginal cost is higher than marginal benefit or aggregated costs are higher than aggregated benefits (often both), and get to the unit economics promise land. Founders who are visionaries see a clear path to profitability where the cost of maintaining software diminishes to virtually none, while the marginal benefits to new users stay the same. VCs eyeing archaic industries are already familiar with 10-year investment horizons and are more comfortable with long periods of losses since LPs are less likely to be on their asses than boards on corporate leaderships' (this became a weird analogy). This is amplified by the historically low cost of capital post '08, hence why Innovation Arbitrage has been the name of the game in the Valley in the 2010s.

The earliest success stories exploiting Innovation Arbitrage are most notably Paypal, Square, and Stripe. Today, big headline examples of this can be observed in Aerospace (SpaceX) and Defense (Anduril), and more recently, Healthcare (Galileo), Insurance (Lemonade), and Agriculture (Vosbor). But the markets that Innovation Arbitrage can be applied to are becoming ever more niche. I worked with a founder building personal trainer matching software earlier this

year; I helped a Uber-for-return-services startup narrow down their go to market; I met a founder building digital marketplaces for used cars; I exchanged ideas with the founders of a precision-part-assembly-tracking software startup; I'm currently working with a few friends to bring digital tools to the doctor notes writing process. These corners of the market are still easy wins for competent founders and VCs (pending execution of course), but they're noticeably shrinking in magnitudes of the pain points and markets. What does this mean?

As an aspiring founder (and maybe VC?), I tend to view the world in problems and products. Startups solve users' problems by selling products - that's YC's *How to Start a Startup* in seven words. Through this lens, I constantly ask the question of "What do people want?". The summit on the list of answers is happiness, which simply equals bodily comfort plus meaning. The earliest entrepreneurs saw this and built a product that solves half of happiness equation - they built something called religion and sold it to people looking for meaning. As a result, they enjoyed thousands of years of affluence and influence. The other half of the equation was mostly solved by the corporations known as governments - they packaged together a product that for the most part gives users security (also a very sticky and high willingness-to-pay product). The rest of the history of human innovation has been about filling whatever gaps are left in the two categories - the Green Revolution, Silk Road, and Industrial Revolution all helped fill the gap in the Bodily Comfort market. Fast forward to today, all the big problems like meaning, food, shelter, etc are largely already solved. Founders today are stuck with the small problems like one-click check out and five-minute grocery deliveries. If we study problem-solving from a historical perspective, it's clear that there are less and less problems to solve in the world.



If this trend continues, there are two possible outcomes. One is the Ian M. Banks Culture series utopia where everyone has everything forever - yet they still struggle with intangible emotional problems. In this future, the Bodily Comfort market has been completely filled, while the Meaning market retains a huge gap. You can argue that this is the state of America today. The second outcome is the Neal Stephenson Snow Crash dystopia where most people don't have bodily comfort, but has found meaning in their digital/physical-hybrid lives. In either case, technology will play a big role in shaping the future (granted I'm heavily biased). So what does this mean for founders and investors?

Pandemoniums create problems, problems create products, products create profits.

Software startups reduce entropy, while deep tech startups create the potential for more entropy. If you're an optimist, you can argue that entropy is ever diminishing and thus profits will too. In this case, your time to be a VC or founder is running out as there is less and less chaos out in the world. If you're a pessimist like myself, you'd argue that entropy is human nature. Thus, entropy fluctuates with man's baseline capability: in prehistoric times, the peak entropy of human society is cavemen hitting each other with sticks; today, it can be nuclear holocaust and societal eradication. The only way to increase pandemoniums, and in turn profits, is to increase our baseline capability.

This macro trend of Innovation Arbitrage shrinking as a byproduct of human problems diminishing as a byproduct of the entropic apex being limited by our technological capabilities is the logical reason I've decided to devote my career to deep tech (the emotional reason is that it's just cooler). Only by raising the bar on what we as a species can do with technology can we create new markets and not be constrained to the ever shrinking arbitrage opportunities out there. The Manhattan Project raised that bar, and with it came nuclear power and nuclear medicine. This isn't an advocate for more mass destruction weapons, but to quote Josh Wolfe, "technology isn't good or bad, but the existence of it makes it a little more good than bad."

Although deep tech is indisputably where the world is and will always be heading towards, there are still Innovation Arbitrage opportunities out there today. As an investor, spotting these opportunities can mean easy wins in the portfolio. As a founder, viewing the world through this framework can lead to harvesting low hanging fruits - but grab them while you can, there aren't much left.