Inevitable & Stable Designs

Characterizing The Future to Achieve Certainty

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1 FOREWORD

As of this draft, the foreword section was made in November 2024 to repurpose the document. This doc was started Jan 6, 2023 and edited April 3, 2024, to share with a few close friends and spur some discussion, inviting feedback or checks of the logic in the discussion. Today I am adding the foreword to offer a context for the general public. Instead of making edits from April 2024 I'll just inform you that the draft was not ever totally finished to my satisfaction and that I'd love to hear feedback or purposeful rejection of the ideas in the letter, for the sake of continuous improvement.

One key reason this may hold value for the curious people from my youtube audience is that many of us are innovators looking for validation or confidence in our own ideas, or wondering if the big mysterious world will accept or discard our efforts if we pursue an idea that came to us. I would suggest that any innovator couples these ideas with all of the broad mass of small business advice, notice how they sometimes conflict and then use your internal compass to decide whether to apply this logic or the logic you found in your current advising.

Immediately following this section is the introduction, in which you will find the tone and audience is switching, and it's not a mistake it is simply a raw copy of an earlier discussion with a different audience.

2 INTRODUCTION

This memo serves to paint a picture of technology which will prevail in the near future, based on a review of historical world-penetrating technologies. The result is a *vision*, and the vision can be applied to confidently advance in tech business. Eg, how to vector one's resources towards imminent success. For the investor, we can invest along the vision. For the entrepreneur, we can build business in the vision direction. For the technology developer, we can develop along the vision.

Additionally, the deep and analytical dive is an optical tool. Fundamental matters and long-term forces must be visible despite superficial evidence in trends and changes. Business motion often contradicts broader technology motion. Two-year trends often contradict ten-year trends. The interplay of business antics, marketing, and culture causes waves, but this discussion aims to describe the tides. Tides, unlike waves, can be predicted.

Questions are presented at the end of the Section 1, which can be answered by the content within the section. Or at least, they can be answered by the underlying experience supporting this paper.

1 Chapter 1: Supply Chain

1.1 Key Components

1.1.1 Broad Claim: the winning tech uses winning components.

Analogy: The engine is to a car as the processor is to a computer. In the automotive market, the leading cars have the leading engines, without exception. Class-leading automakers leverage class-leading engines even if they need to license the design of another designer.

Example: The Volvo XC90 uses Yamaha's V8 Engine, best in class. The Toyota BR-Z uses the Subaru boxer engine block.

- Example: The F150 uses Bosch spark plug
- The Toyota Corolla uses Bosch spark plug
- Chevrolet Impala uses Bosch spark plug

The breadth of the adoption of the Bosch spark plug evidences the potency of it's underlying technology. Highly refined technology is best adopted from the leading brand, not reinvented.

1.1.2 Specific Claim: Class-leading robots will integrate class-leading computers.

Claim: the winning robots will leverage the processors of the world's leading processor manufacturers, not displace them.

2 Chapter 2: Software

Claim: Robot software will be the easiest to use.

Leading robots will use the best software, and the best software will be determined by what is easiest to use.

Example: Windows and iOS are the leading softwares in their respective markets.

We believe they are the leading softwares due to their **ease of use**, above all other metrics. Software robustness is a requirement (there is no competition for robustness, it’s pass or fail).

Also, ease of use defined the transition to the consumer space from the research space.

2.1 2.2 Claim: the robotics barrier is Easy Software

The PC became popular when the software became easy to use. Mouse, keyboard, monitor, and thoughtful software were the barriers. Technologically speaking, the barrier was only software. Mice and Keyboards could have been invented decades prior.

One must understand the technology (what-can-be-built-today) barriers and the execution barriers (what-have-we-made-into-products) to discern which technology actually holds the position as key barrier. In robotics in 2022, it is software.

Claim: the transition of robots to consumer markets will happen when software becomes easy.

3 Chapter 3: versatility

3.1 Claim: Inevitable inventions feature versatility.

The inventions which are inevitable (i-tech) are the inventions most versatile in nature.

Examples: light bulbs, wheels, cars, mobile phones, and computers… and robots

These inventions are inevitable, once the underlying tech exists. Versatility is exhibited by thousands of businesses leveraging the technology to serve thousands of needs.

3.2 Claim: I-Tech plus a feature is also iTech

the feature which more than doubles a products versatility, is also inevitable for any inevitable tech.

Adding a battery to a PC yields a laptop. Laptops exist because they double the possible use cases of a pc, thereby doubling the market value.

The barrier for the laptop was the battery. This can be seen as a discrete invention or as a continuum. Whereas; expanded battery performance yielded expanded laptop market.

4 CHAPTER 4: DEMAND

4.1 BROAD CLAIM: EFFICIENT PRODUCTS HAVE DEMAND,

Without exception. Demand exists for any invention that can be called a tool, and which also is more efficient than an existing tool with market demand.

Efficiency may be defined as maintaining performance while reducing (cost, time) or increasing (longevity) for such tool to perform its' task.

Narrow Claim: The most efficient assemblies are comprised of the most efficient parts. Thus, the most demanded assemblies have the most efficient parts.

A mobile phone with most efficient battery, plus processor, is the most demanded phone (technologically speaking)

4.2 CLAIM: SIMPLE EXECUTION WINS

The simplest execution of a function has the best guarantee of market demand, and many products with added complexity will be demanded as well.

Example: a motorboat. When motors first were added to boats, this is the simplest and it will exist with demand forever.

You can review any motorboat design, identify a way to make it simpler, then search the market, and you will find such a product exists; with permanent demand.

In other words; you cannot invent a simpler version of an existing item with two value-parts, and find that it has no demand.

- A pizza with no toppings: sold in millions
- A boat with smaller motor: sold in millions (trolling motor)
- A chair with no armrest: sold in millions.
- A car with no motor: sold in millions (a trailer)
- A shirt with no collar
- A pc with no monitor
- A bed with no frame (a mattress)

Narrow Claim: the reduced version of the product will usually have a higher demand than the unreduced product.

Narrow Claim: the simplest version of a product cannot be made irrelevant by more complex designs. It is future-proof.

5 CHAPTER 5: CONSUMER-TECH-BUSINESS

Claim: technology serves consumers, and business serves technology

Tech exists to serve consumers. Business exists to serve tech. Not any other way.

Consider a business, a technology, and a consumer. A business sells light bulbs to consumers. Now eliminate the consumer. All 3 dissolve. What if we eliminate the business? Only 1 dissolves. The light bulbs and consumers remain. What if we eliminate the technology? The tech and the business dissolve. If you eliminate business, consumers would still use the light bulb. If you eliminate the light bulb, the light bulb company dissolves and the consumer remains. The consumer would seek a candle company. If the same company were the one offering light bulbs and candles, the business is actually innovating, and the innovation of that company is the technology of formulating various solutions to the consumer's need.

6 Chapter 6: Software Enables Versatility

Inventions that interface through software will leverage the user's own desires to achieve versatility.

Inventions span more market share each time a software is created that enables the user to self-determine the functionality.

Software has no purpose if the user does not wish to make any change. Then, firmware replaces hardware. The quintessential purpose of software's existence is to allow changes that have near-zero cost.

The user of a dishwasher wants clean dishes and no other function. Even though there is a microcontroller onboard the dishwasher, it is loaded with firmware instead of hardware.

Example:
The portable MP3 player entered the market after the portable CD player during the 1990's and 2000's. The mp3 player adds the versatility of changing the music inside the product. Both devices had microcontrollers and firmware onboard. However, the mp3 player, having software, gains more capabilities.

The product for Beatles listeners was the cd player+ beatles CD. The product for Metallica listeners was the cd player + metallica CD. In it's versatility, the MP3 player became the product solution for both customer groups.

7 Chapter 8: Role of Software and Hardware

Broad Claim: Software is best elected over hardware for any function, if execution of function is equivalent.

No business uses hardware to achieve what can be achieved with software. the underlying value of software over hardware is:

- rapid evolution of design

- vast design tree of use cases
- duplication without cost

Example in Hardware: Wood screws; Hardware stores stock hundreds of wood screw types. The variation in length, drive-type, steel, and coating are design parameters. A screw company, on design-side, designs 1 screw and implements parameters in the digital design which generate a product array by perturbating the parameter. If a screw could be made digital, hundreds of screw products would become one product.

Since 2000, digital screw designs became a product in a sense. Companies now offer CAD models of screws. When you download the screw, you find that it is one design with a parameter changed.

This means if screws could be digitally manufactured (3d printed or otherwise) then the company overhead would be reduced and one would find one high-value product instead of many lower-value products, available in the market.

Example in Software, mixed: The mobile phone, deep down, is a device that combines what was 100 separate inventions in 1900.

- A thermostat: a mechanical device, replaced by software
- A panoramic camera: a mechanical device, replaced by software
- A shopping cart: a mechanical device, replaced by software

Each of these inventions are ubiquitous in the hands of consumers after low cost was achieved by conversion to software. In the cases where hardware instantiations still exist, it is due to insufficient performance of software tech.

Example in software, pure: Safety Computers.

Where can you find a clear example of a bifurcation of software and hardware utilization in modern machines? In safety controllers.

In infrastructure, safety circuits control mechanical safety devices. A storefront door at your local store has made a transition: In 1970, the computer was analog (made from hardware circuitry) to close the door after a customer has passed. When software became sufficient, the computer was changed to purely digital computation, wherein the proximity sensor inputs information and the halting of door closure is commanded by software, keeping the customer safe.

Software controls the door because software technology is now sufficient.

In high-speed safety circuits, analog (hardware) devices are still used. Industrial machines with high speeds are equipped with safety curtains (a light-emitting sensor indicates a user is too close). The circuit that decides to halt the machine is not operating software; rather, it is a computation made by hardware (still electronic) called an FPGA. The FPGA is a hardware device that carries current and does not rely on software to perform it's function. Determinism in response time cannot be achieved by a software.

Hardware controls the machine because software technology is insufficient.

8 THE PATHWAY

Money can be made where value can be created

Value can be created where efficiency can be implemented

Efficiency can be implemented in any space where new technology raises efficiency

New technology can be implemented by any innovator who understands BOTH the technology and the needs

One can understand the needs by understanding why an existing technology adds value.

We understand why the ingredients add value, so we understand where to apply new technology.

9 HOW TO FAIL

9.1 WHEN TO USE PROPRIETARY TECH:

If proprietary inventions are made, the result will come from limited resources (that which lies in 1 company) and there will be inefficiencies.

If there are discoverable inefficiencies, the open-source engineering community will find them and improve on them.

Definition: deep tech is any technology that requires tools to invent outcomes are exclusively afforded by large institutions. Examples: microprocessors, advanced chemicals, paints, adhesives, and precision-manufactured technologies like modern combustion engines.

Claim: Proprietary technology should only be used when the tools to invent outcomes are exclusively afforded by large institutions.

Corollary: If the outcomes can be executed by consumers, the technology should be developed in collaboration with the consumer. We call this open source.

Example: Gingerbread House

The following product has both open and closed-source materials. Near Christmas season, popular stores sell kits for gingerbread houses, with decorations made of candy. The product is not a food; it is an experience. The outcome cannot be delivered without customer involvement. For that reason, the instructions for customization are provided along with the kit. The instructions for formulating the ginger cookies are not provided. The customer is not hindered by the missing instructions because their experience does not require it.

In reality, the industrial baking system for the included cookies is a high investment with a deep expertise. To provide instructions for producing identical cookies, this documentation would be expensive and costly, and additionally produce no gains.

9.2 DEEP TECH IN TECH EVOLUTION

Deep tech is what separates products, brands, and designs.

Claim: ability to identify deep tech will reveal the stability of a brand.

Example: A Milwaukee tool is a brand. The brand is shallow tech meaning the value of the brand lies within the brand's understanding of the user + use case.

Deep Tech Compiled: Products can be examined by segmenting deep tech.

Example: A Competitive circular saw carries a number of deep technologies. The battery, the computer, the blade teeth. The value which Milwaukee brings to the product offering is not in any deep tech. The brand value can be summarized by "understanding the customer use-case, and configuring the tech elements to best serve the use case." The proprietary knowledge which solidifies the brand's value lies within data about the customer, their decision-making metrics, and their preferences.

Narrow claim: deep tech must serve multiple industries.

The deeper the technology, the more likely it is that the consumer brand outsources the component. Also, the more likely the component supplier serves multiple brands.

Tech which is deep AND versatile is usually carried by dedicated companies that serve multiple industries.

Businesses which are not centered on deep tech have the least stability. When the market changes, the businesses may A) pivot, if their value was based on customer understanding, and customer needs remained in the scope of the company's value, B) fail.

Example: Blockbuster Video. This company had all of it's value centered on customer behavior, which changed. They had no assets or team expertise invested in deep tech. As deep tech changed, the foundation slid out from under the company's full foundation.

Lithium battery cells from the strongest companies (Sanyo, Panasonic, etc) will be found spanning many industries, many brands, and many products within the brands. Battery cell tech is so deep and so versatile that the leading brands are unlikely to be displaced and unlikely to contract as the markets evolve, as society evolves, as use-cases change.

Looking at the tooth of the blade, it is likely that the most competitive saw on the market sources their blades from a deep tech company. The deep tech lies in the metallurgy of the cutting tooth, for which the microstructure, hardness, and material can only be achieved with a heavily dedicated effort in manufacturing, design, and evaluation.

When the deep tech evolves, Milwaukee can readily pivot the source of that tech element, such as changing the outsourcing of battery technology.

Claim: the most stable businesses rely on a diverse array of deep tech.

Example: Toyota's product value rests on the deep tech in many spaces. Batteries, tires, computers, sensors, airbags… That means that the customer's needs can only be met (competitively) by integrating all these elements, and that even if a new technology arrives (such as new batteries, yielding a startup like Tesla) the foundation of the company sits securely on a diverse array of other deep tech. It is highly unlikely that each tech element would have a breakthrough in one decade, therefore no new company leveraging the new tech can displace Toyota, even if they are the most competitive in converting value from the deep tech to the customer at-hand.

10 ANSWERING OUR QUESTIONS:

- Which technology will be used in leading robotics products?
  - Long-standing brands carrying deep tech
- Which designs will be invented that secure value that cannot be displaced by competitor?
  - The simplest execution
- Which current technologies will be replaced by robots?
  - All for which software allows greater efficiency
- Within the design of leading robots, which components will be outsourced and which components will be new designs?
  - Components carrying deep tech will be outsourced.
- Which companies exist today that offer technology which will be implemented in robots?
  - Tech with strong versatility
- Which brands today offer technology that will remain relevant as robot components?
  - Brands centered on the lowest-level consumer value
  - Products for which the consumer is only present to activate the core function.
- Which product offerings today are suited to become attachments for robots?
  - Products that currently embed fewer deep tech elements.
- Which products today are suited to be pivoted into being a robot?
  - Products which can be granted broader versatility via software
- In robotics, which tasks will be executed by software and which by hardware?
  - Software for all which tech enables sufficient performance to meet the need
- In a modular product, which elements will be modular and which will be monolithic?

- Modules will be divided at versatile deep tech

11 Applying the Philosophy

The philosophy described above only serves a purpose once implemented with action. Framing our beliefs takes a pathway to action in this form:

a) Know what the future holds for technology businesses
b) Align our business goals with the most certain aspects of the future
c) Convert our stance from "building the future" to "observing the future and contributing without uncertainty"
d) Create value & remain in a position of openness to exchange the value

11.1 The orchard:

The wise farmer knows how his apple trees will grow. He plants rows of saplings at increments that appears to waste soil for the first four years. During those years, the soil between each tree offers nutrients, water, and solar flux that is not captured by the trees. His actions appear to be wasteful.

If we didn't know the future, we would plant our trees at least 3x more densely. The crop yields in year number three would be more than double. More sunlight captured, more nutrients converted to fruit.

For the years 4 through 14, the wise farmer takes a massive, consistent lead. His decision was optimal for the decade, not for the year. Caretaking, fertilizing, pruning, efforts are vastly smaller and returns are larger.

Investing our technology efforts in a solid direction is a matter of optimizing for the long term.

If the farmer was the **world's first apple grower**, he would struggle to seek investment while drawing his plans that do not yield returns in the first 3 years. He may struggle to prove his observations of the peach and the pear grower are suited to an apple farm.

Then, he may need to act alone for some time and he may need to pursue his optimal plan to make returns, but with small acreage and a small investment. His alternative is to change his plan to suit what is superficially and immediately optimal.

SECTION 2: Technical Operations

This section to be treated as a second document. It is in progress as of 2023.01.15

1 T1 – DIGITAL MANUFACTURING

Digital manufacturing (DM) is not well understood by the broad community. Digital manufacturing carries an entire global movement in the manufacturing industry. It is a paradigm shift in technology.

Definition: Digital Manufacturing describes a process in which skills, artistry, artisanship are completely removed from the manufacturing process. And, in which repeatability, process control, and quality control are executed by numeric, digital parameters.

Examples:

- Arrowheads – hand crafted; rely fully on skilled craftsmanship
  - No DM
- A modern wrench – produced by automation; but a design change requires engineers to manually redesign tooling.
  - Partial DM. The settings for the forging press are digitally stored. The toolpaths to carve the die are digitally generated.
  - To produce the dies requires a skill and craftsmanship. Therefore, an adjustment to the design cannot be defined purely with data.
- A 3D printed model boat – produced by automation, and having a manufacturing process which is also generated autonomously. Design changes can be implemented without any human action on the manufacturing side.
  - Full DM. The designer has full control.
  - The manufacturing process consists of many incremental movements of the printing machine motors. All of the movements are updated by a repeatable process if the design is adjusted.

Claim: digital manufacturing will do to products what online news did to newspapers.

In e-news, a creator makes new content and the remaining path to reach the consumer is entirely digital and is executed with no human action and almost no cost.

The impact:

- 10,000 copies and 10,000 variants of content can be generated at no additional cost.
- New audiences will receive the product. The new audience may be even larger than the entire previous audience.
- The new audiences will have new preferences.
- Creators of content will more rapidly borrow and implement ideas from good quality works.
- The new market will be flooded with thousands of low quality creations. The cost of production is low.

- The high quality content will become the most circulated.

1.1 THE ROBOTICS STARTUP

Following the vision, we will take these actions:

- **Implement the best computers**
- **Implement the most versatility possible without adding complexity**
- **Create the simplest robot that achieves the targets**
- Make the robot a platform**, enabling more outcomes.**
- **Utilize digital manufacturing**