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Hi everyone.

There is a concept in business called red ocean, blue ocean. It's a reference to sharks in a feeding frenzy.

Blue ocean means the sharks haven't shown up yet, meaning there isn't much competition.

Red ocean means it's too late to go swimming.

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Abstract

In Entrepreneurship, "Blue Ocean" refers to a market with many opportunities and few competitors. This talk breaks down the first principles of technology revolutions and how they form, gain momentum, and prosper. By understanding these principles, we can build start-ups and incubators for the coming Mars Age of interplanetary settlement and commerce.

The talk will also include practical advice on getting small projects off the ground and gaining critical mass to start a larger, pioneering business. We can also understand how a simple crossroads becomes a thriving city whereas some enterprise zones fail to attract investment. We will also discuss how modern and future lines of communication will impact these dynamics in the coming decades.

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We are going to get into the mechanics of technology revolutions, the cities that spawn them, the start-ups that build them, and the things we can do personally to prepare for the future.

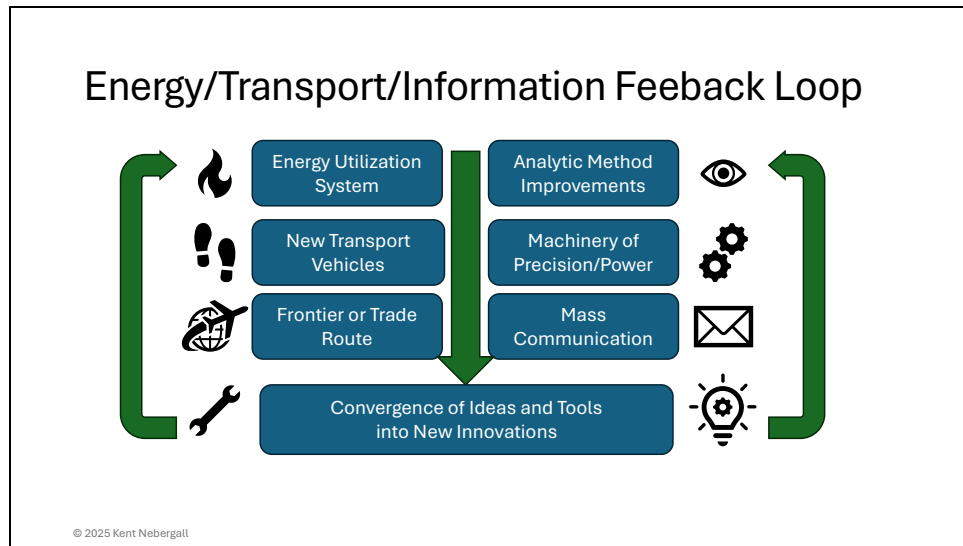
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Energy Density, Invention, Information		
Energy System	Utilization Inventions	Information
Human Power	Hunting, Gathering, Migration, Villages, Basic Farming, Textiles	Language
Animal Power	Farming, Roads, Cities, Travel, Mass Warfare, Writing, Trade	Math
Fire	Metallurgy, Basic Chemistry	Metallurgy
Wind Power	Ocean going vessels, Navigation	Navigation
Steam (Wood)	Fast transport on rail/oceans. Paddle-wheels/wood boats.	Telegraph
Steam (Coal)	Ironclad ships with screw propellers. Steel and other alloys.	Fast News
Petroleum (Kerosene)	Indoor lighting, advanced industrial chemistry of petroleum.	[Radio]
Electricity	Indoor lighting, Distributed mechanical/heat power.	Telephone
Petroleum (Gasoline)	Internal combustion, Cars, Aircraft, early rockets.	[Television]
Chemical Rockets	Moon landings, Solar system exploration, etc.	Satellites
Nuclear Power	Nuclear power plant, Submarines/Aircraft carriers, NERVA.	[Computers]

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Here are three thousand years of technological revolutions in one slide. One thing we always see historically is that there is a revolution of invention, energy, and information in concert.

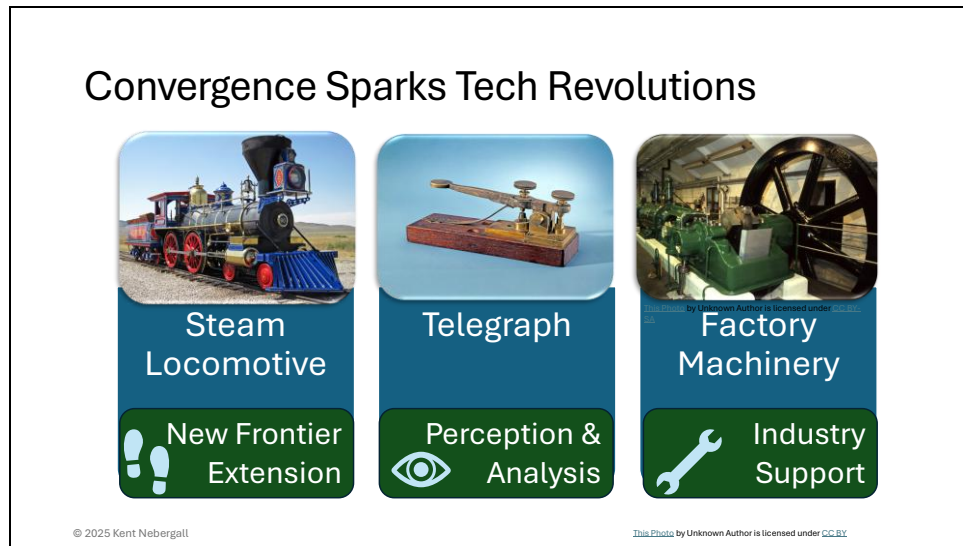
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Typically, a new energy source drives new transportation method, which drives new engineering and navigation. It also forces the engineering of the time to become more precise. These get refined iteratively and extend trade routes, which feeds the system. Faster physical transportation either allows or requires faster communication, and more widespread publishing of discoveries and inventions.

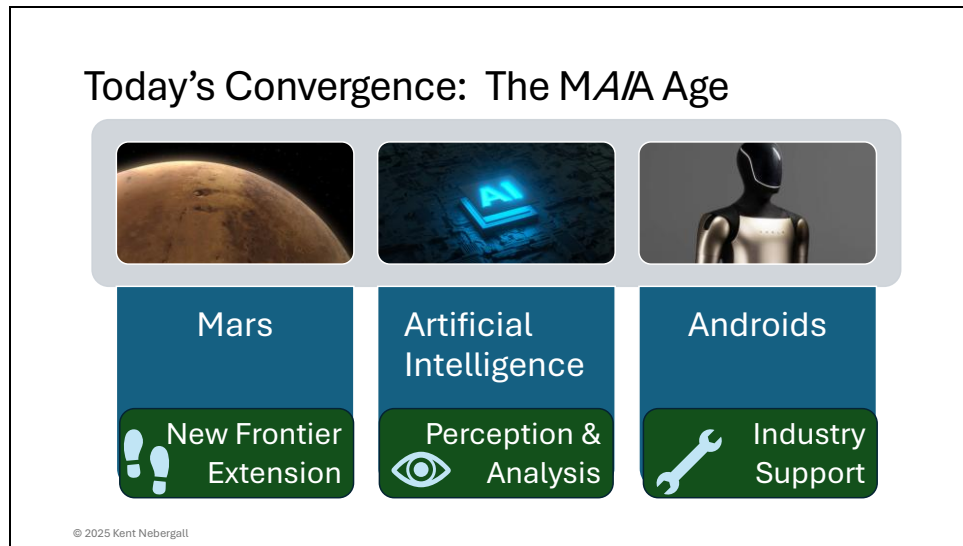
So here are nine elements that can drive a technology revolution. You need at least three to spark a tech revolution. The rest will follow.

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Here is a simplified example from the early steam age. We were able to transport large loads over land at higher speeds without work by humans or horses for the first time. Thanks to the telegraph, we also had rapid communication along the same routes. So industry output expands, the knowledge of what's going on nationally also accelerated from days to minutes, and we can move large loads by land steam trains and by river using paddle wheeled boats. This became the first age of steam.

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The reason I bring up that specific revolution is because of the parallels here in the formula. We are entering a similar triple revolution with Mars Settlement, Artificial Intelligence, and Android robots. It has an exploration component, an intelligence accelerator, and an industrial output magnifier arriving in concert. The frontier creates new challenges for humans to solve. Intelligence provides new solutions, and the industrial support builds the solutions in bulk.

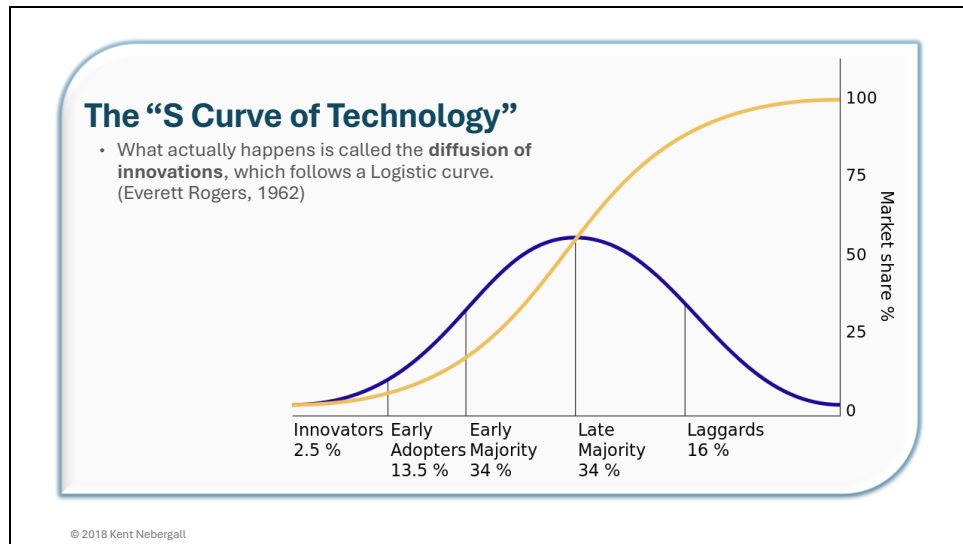
I call this the MAIA Age for Mars, AI, and Androids.

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Tech revolutions tend to make a few massive successes and a lot of secondary markets flourish.

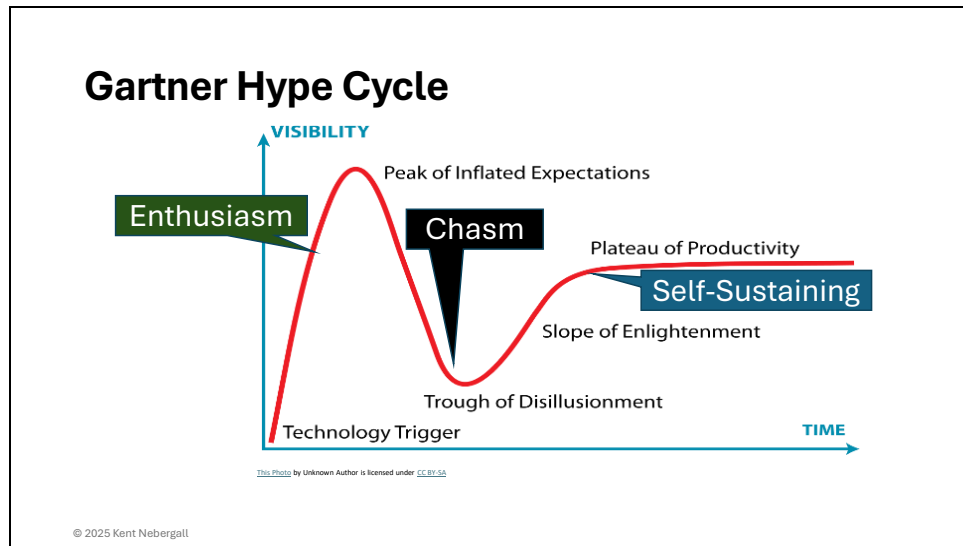
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This is the diffusion of innovations curve. Also called the S Curve of technology. When early adopters start buying the technology that hasn't existed up to that point, they tend to fund the next wave. What starts as slow growth seems to grow exponentially for a decade or so before tapering off. This rapid growth drives hype, which drives new companies into the industry hoping for quick return on investment.

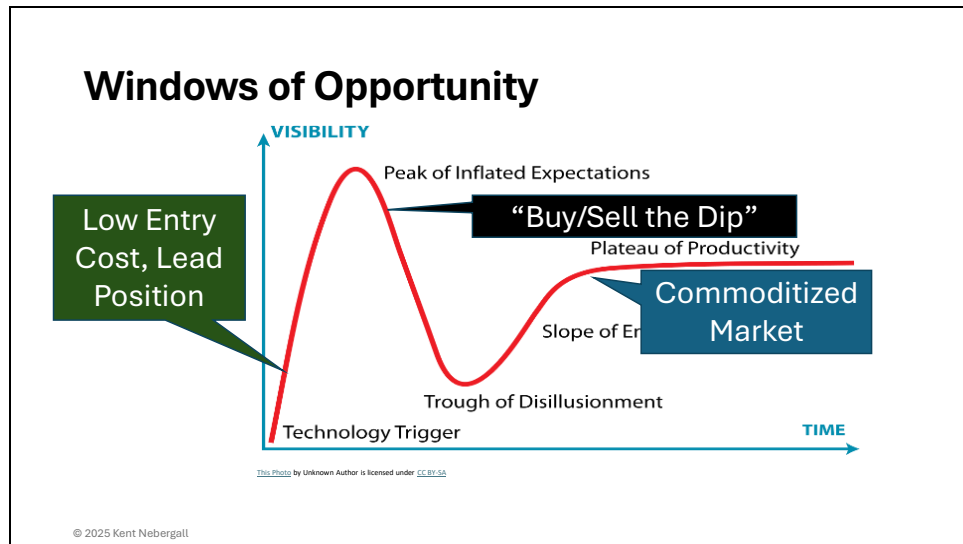
But no tech revolution lives up to the hype, because the possibilities eventually collapse into things that can and cannot be done. So that brings us to the next chart.

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This is the Gartner Hype Cycle. It shows where that exponential growth and excitement hits a wall of unrealized expectations. This results in a sharp drop in sales and attention just as the most competitors are hitting the market. This is where the blue ocean of opportunity becomes the red ocean of more competitors going after fewer clients. This then results in larger competitors swallowing smaller ones through mergers and acquisitions. Many companies, frankly, are built for the sole purpose of getting bought up during this collapse.

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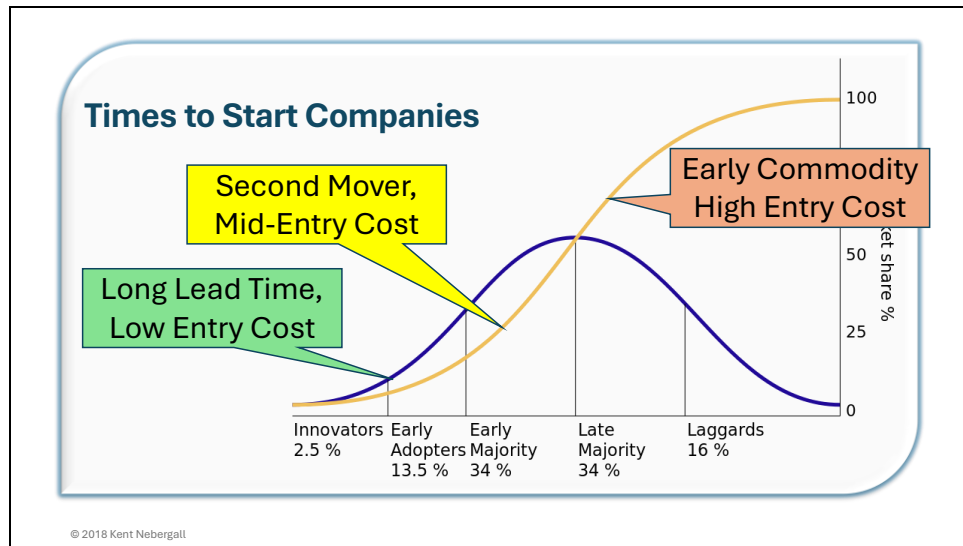
During the first part of the wave, the cost to build a company can be very low. These businesses can start in a garage, but they can't stay there very long. They must have deep enough financial reserves to survive the dip while creating a product people will still want when it's ready.

The second-best time is when investment is fleeing, shown in black. This is when short-term start-ups cash out if they win, or sell assets at a loss to the winners. Recruitment should also be a bit easier because early stage people with experience are looking for new options.

The third best time is to build secondary products in mature markets. This is low risk, low value, but still has a high start-up cost.

The worst time to buy in is when approaching the peak, when costs are the highest. Thus the best and worst times to get started look identical right up until the hype wears out.

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With any tech revolution, the household words are the early movers – the Apples, the Googles, etc. The second movers pick up the slack for lower profit margin options, and can still be quite successful.

But slowly there is a tendency by the leaders to build moats around markets. The leaders in tech will be happy to create marketplaces to encourage innovation to support the flagship products. But you can never become the next Apple or Google by paying them 30 percent of what you make as a marketplace fee. They make their potential competitors into revenue streams.

Naturally, with the same companies leading AI, this is happening again.

With AI, there are some opportunities, but we can't just casually build a massive data center.

With Androids, again, a competitor needs a quarter billion in investment to be in the top five manufacturers.

So that leaves the Mars age...

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MAIA – Finding Blue Oceans

	Mars Settlement	Artificial Intelligence	Android Construction
Startup Cost	Any	• Software – Any • Hardware - \$500M	• Software – Any • Hardware - \$300M
MVP Launch Target	2029-2032	Mid 2026	Early 2027
Commoditization Year	2100 +	2040	2035
Sub-Revolutions	31	29	10
Low Cost of Entry Markets	• Food Production • Radiation protection • Field Serviceable Systems	• Edge Computing • Composite AI	• Android Contracting • Support Hardware

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So here's the rub- The Android market has a high cost of entry and is likely to hit saturation quickly with commodity hardware. AI has a high cost of entry for hardware, but there is still room to grow on software and edge computing. It will play out over a decade. Mars is the only one of the three where you can start with nothing and build something that leads the industry. The red planet is the only blue ocean. As revolutions go, it has many years and pivots ahead of it.

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Grand Challenges of Space Independence

Launch/LEO	Deep Space	Moon/Mars	Settlement	Independence
Affordable Launch	Solar Flares	Moon Landing	Air/Water	Transport Autonomy
Large Vehicle Launch	GCR: Cell Damage	Mars EDL	Power and Propellant	Chem-E Autonomy
Orbital Refueling/ Mass Fraction beyond Earth Orbit	Medication/ Food Expiration	Spacesuit Lifespan	Base Construction	Construction Autonomy
Space Junk	Life Support Closed Loop	Dust Issues	Food Growth	Food & Medical Autonomy
Microgravity (health issues)	Medical Entropy	Basic Power/ Propellant Production	Surface Mining and Extraction	Mining Autonomy
	Psychology	Return Flight to Earth (speed, mass, etc.)	Hybrid Manufacturing	Manufacturing Autonomy
	Mechanical Entropy	Planetary Protection	Reproduction	Genomic Sufficiency

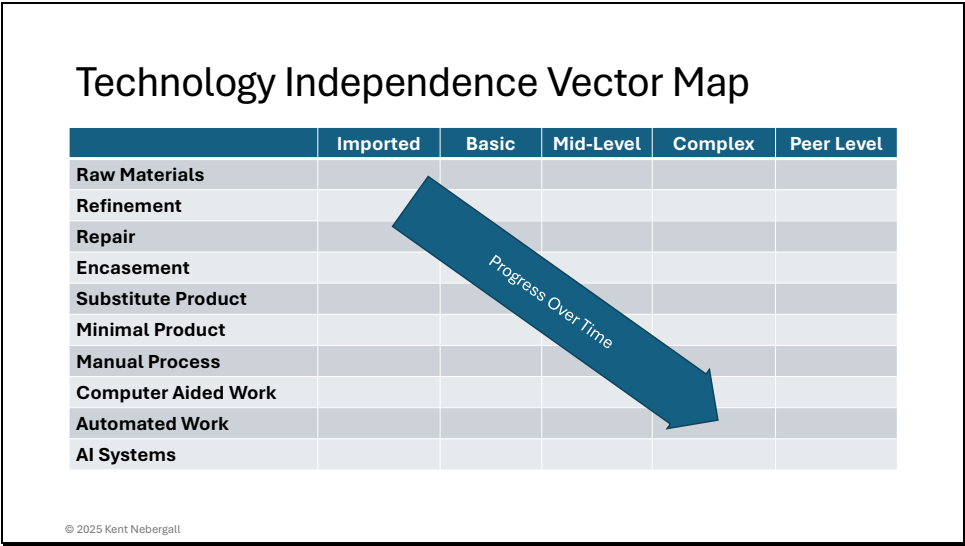
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For space settlement, we must reinvent every aspect of human survival – food, shelter, transportation, communication.

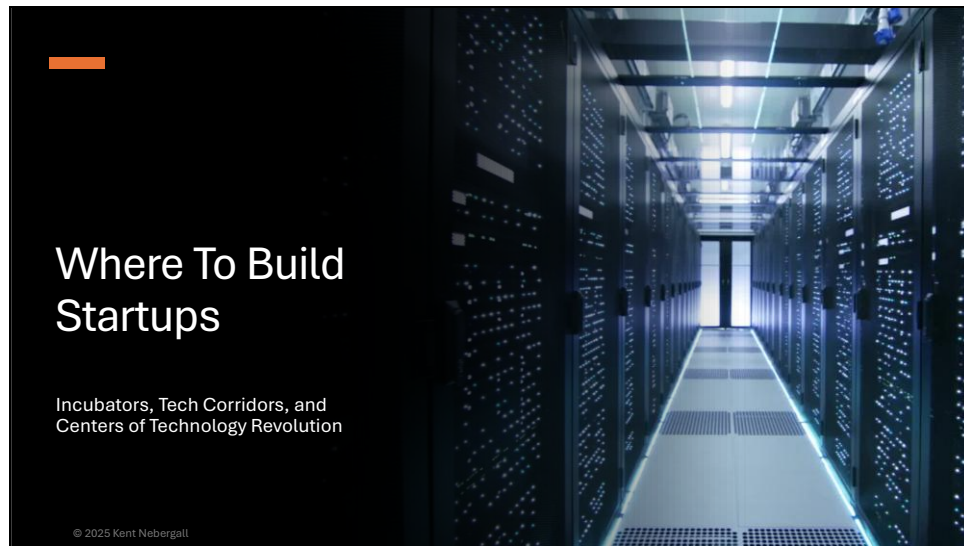
Here are the grand challenges of space settlement, color coded by cost of entry divided by market lead time. Obviously things more than ten years out are all green because you have so much time to get there. Some near-term items like radiation protection and life support are affordable for small companies.

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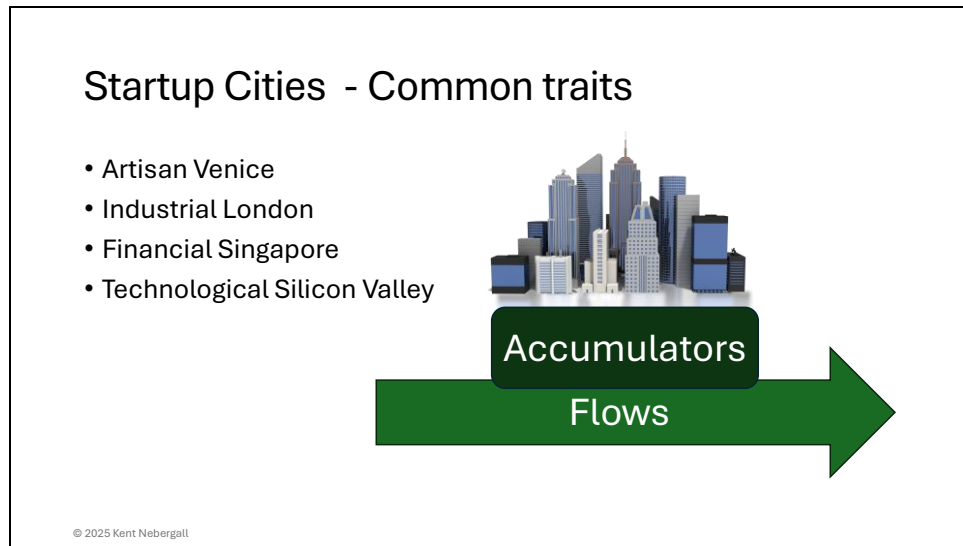
So here’s another view of progress on space independence. Civilizations will grow as boxes from the top left to the bottom right. Think of every cell on this chart as a business that moves goods, services, and energy to the cells to the right and below it. Each box contains entire industrial ecosystems.

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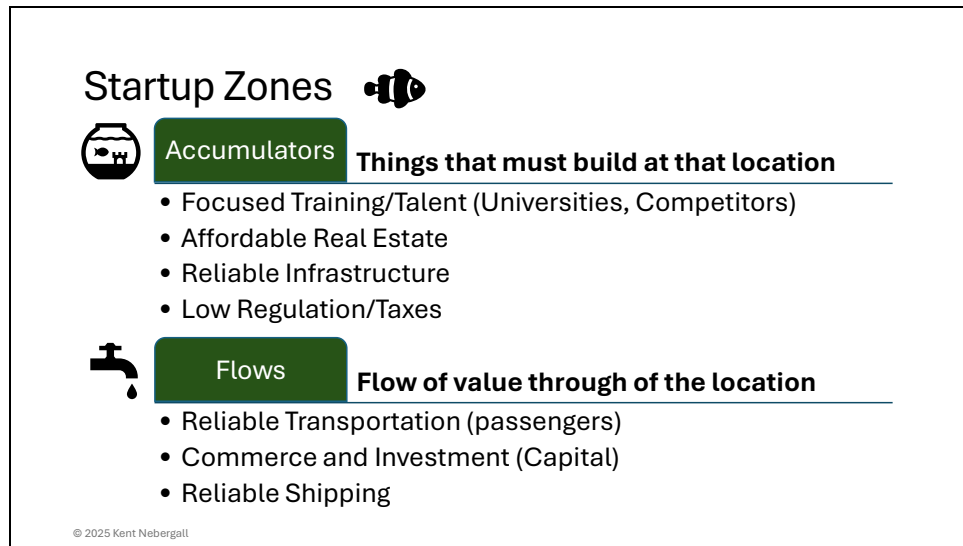
So where to build a startup?

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Historically, technology revolutions have at least one convergence location, Note that in each example here, there is a common theme. Glass artisans for Venice led to the optics revolution. Steam-age London, computer age Silicon Valley, and so on. These are places where the nine elements we discussed before can be consolidated. Any successful startup center has certain flows in and out, and certain local accumulators of value so that it pools and spurs further investment.

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An effective technology hub attracts talent, has affordable and reliable infrastructure. It is often built up with the intention of advancing a given science, though it may pivot to different ones over history. It provides a reliable flow of services and funding.

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Shut-Down Zones



Accumulators

Things that Destroy Location Value

- Unskilled Labor/Founder Pool
- Real Estate Issues (low value/price ratio)
- Temperature Extremes (Need Air Conditioning)
- Civil and Cultural Atrophy (Crab Bucket)



Flows

Erosion from Movement of Cash, Power

- Port Cities are Crime Magnets
- Financial Centers are Corruption Magnets
- Political Centers are Regulatory Capture Magnets

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Conversely, startup cities eventually die out. This is often under the weight of camp followers who are more attracted to success and wealth for its own sake than the innovation and hard work that created those successes. We see this at the corporate level when MBAs replace engineers. Keep in mind that from the dawn of civilization, any trade center is also a theft center, because it is so easy to say something “fell overboard”. This is also true with financial and political systems where funds can go missing and not crash the system immediately.

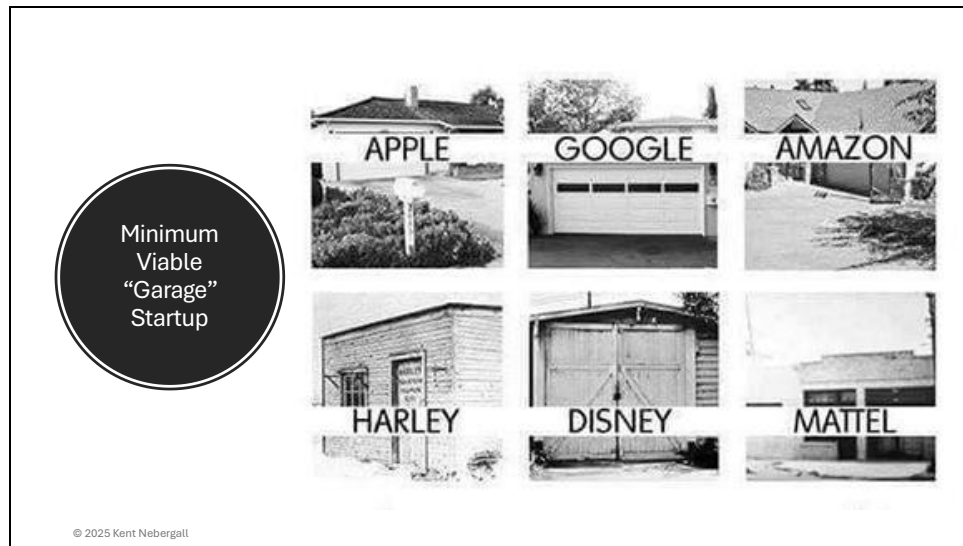
Once a company is big enough to attract talent by name recognition, it can exit the tech incubator and go somewhere with fewer problems.

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Let's move onto how to make the startups themselves.

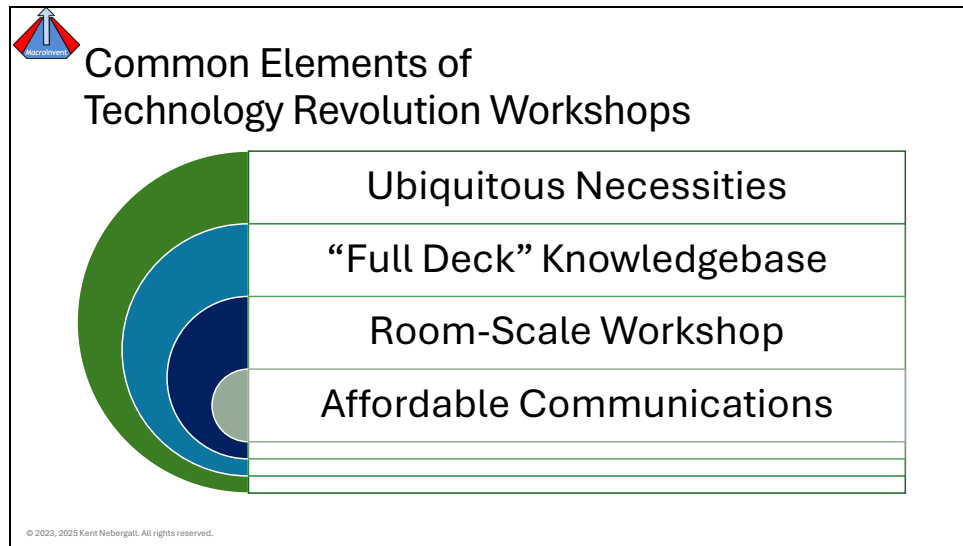
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WHY did these companies start with small teams in small spaces?

We can add the Wright Brothers and the glassworks and machine shops of Europe a few centuries ago to this list.

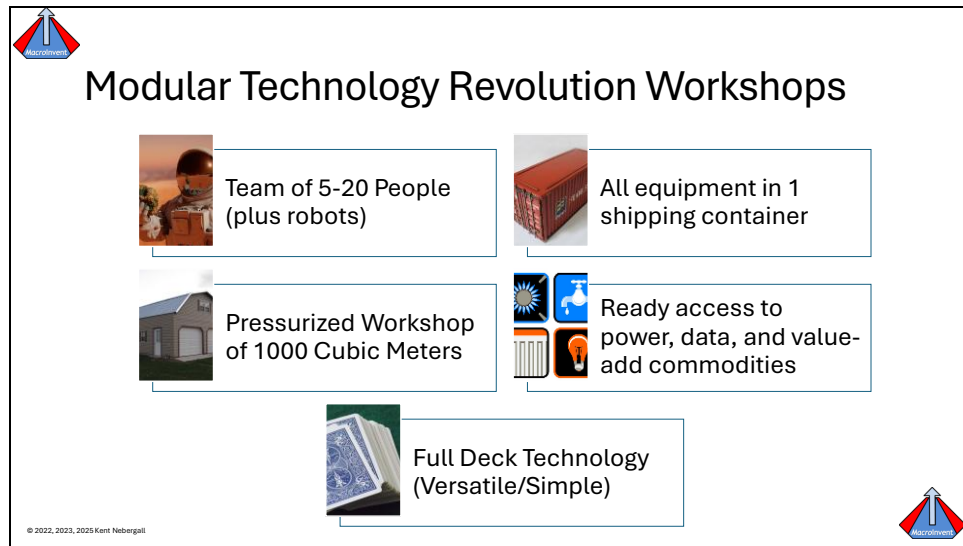
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Technology revolution workshops throughout history have common elements. Notice this list mirrors that for the start-up communities that can support them.

- First, you need to take for granted things like food, power, shelter, and other infrastructure.
- Second, you need a tool set that is both easy to understand and incredibly powerful, which I’m calling Full Deck here. A deck of cards has enough parts to build a thousand games, whereas dice or a Scrabble set are either too simple or too specialized for such adaptation. It should be something that can be understood in a few minutes and mastered in a few weeks at the user level.
- Third, you need to fit the workshop and the team within speaking distance of each other.

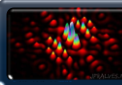
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A target goal for a garage startup should be full control of their technology stack during development, limited space demands, and ready access to commodities like food and power. Given the small scales here, a start-up could be built anywhere with even basic infrastructure, and literally anywhere on Earth if the product is digital and they can afford off-grid power and utilities.

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Design Principles



Bits are Free, Atoms are Expensive

- Start with digital products
- When capital reserves expand, consider material products



Full Deck Design

- Offer roughly 50 features – simple enough to learn fast
- Make those 50 “Turing complete” so users can do anything



Own Your Toolbox, Sell copies of your Tools

- Have reliable, well supported, owned infrastructure
- Have the right to modify or expand your tools as needed.



Keep Your Products Easy to Use

- An easy tool set for customers will have much wider adoption
- An easy tool set for employees will be easier to support



Make Tools that Profit the Users

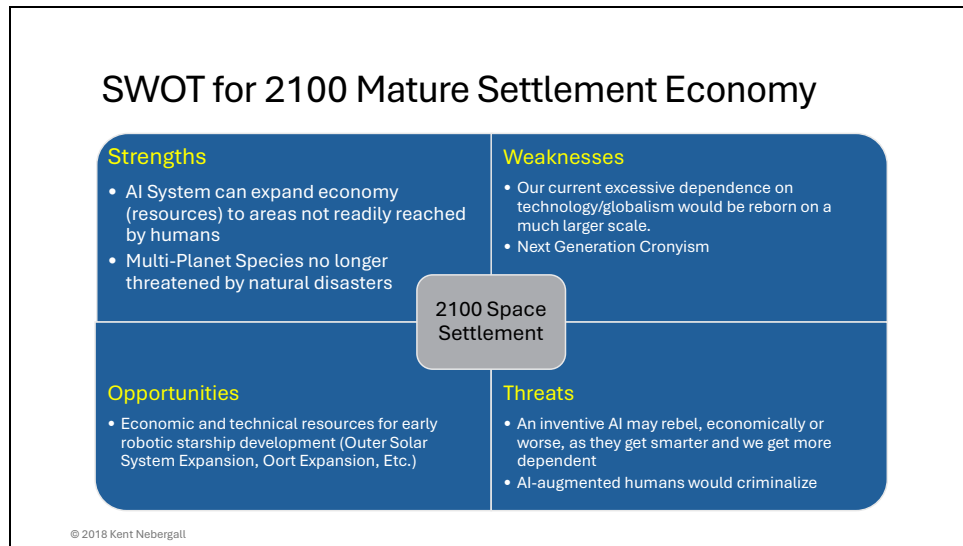
- All successful technology lets people do more with less
- Products that benefit the user financially are easier to sell than cash sinks

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Here are the core design principles I would use with any start-up without deep pockets.

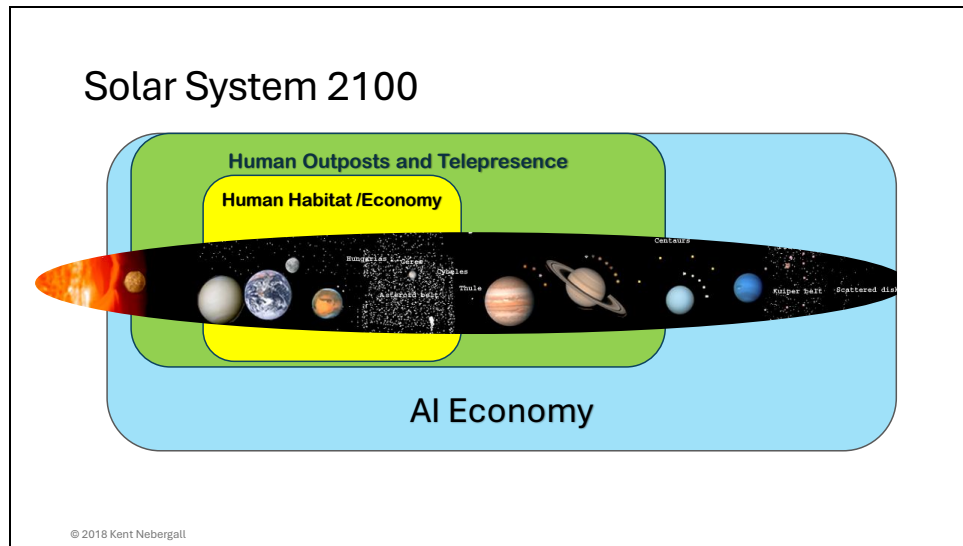
- First, start with a digital product line. Bits are free, but atoms cost money.
- Second, Full Deck Design is my term for making something that has 50 or less elements to understand, but is still “Turing complete” relative to the work being done.
- Third, own your toolbox. Do not have a model dependent on the mercy and whim of suppliers who can cut you off, poach your clients, or steal your IP.
- Keeping products easy to use is also key, because that will vastly increase your market.
- Lastly, make the product profitable to customers. A purchase of such things is a no-brainer from a balance sheet perspective.

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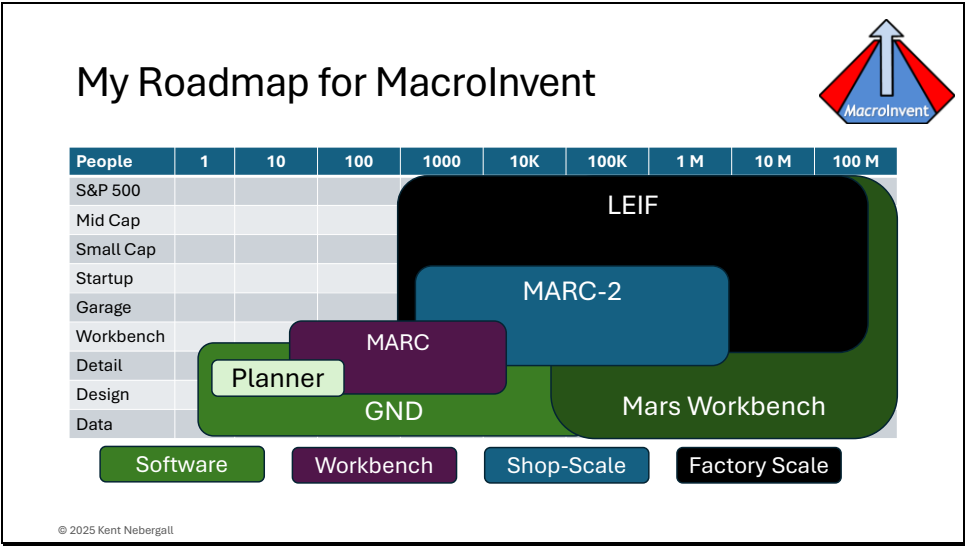
So what does the future hold in seventy-five years, when my youngest children retire? After expanding into the frontier again like we did in the past, we may go to a comfortable new normal of blind technology dependence like we are now.

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Our end result will appear like this graph I made seven years ago. The Human economy will be enveloped in an AI and Robotic economy. Our biggest existential risk would be finding out we were backing our financial decisions with a deepfake economy beyond the farthest human settlement. A typical problem may be robots auditing other robots and their risk analysis estimates on Pluto.

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Here is my personal roadmap. Look it over and come up with your own, or talk to me about mine.

Step one is to find something that you can do by yourself with no money to escape the Toolbox Fallacy of thinking you can't do anything until you have all the parts in place. So I started GND, with one person concept. Now I have a small team of talented professionals working on it. The purpose of GND is to help all of you thrive in the future along the roadmap I've described in this talk.

GND will also fund bigger things and ultimately be replaced by Mars Workbench. This is analogous to how the Macintosh replaced the Apple II computer lines. Everything sunsets into a far better replacement solution, even the projects that haven't been built yet.

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So here is my web site with this and other presentations.
Thanks! Any questions?