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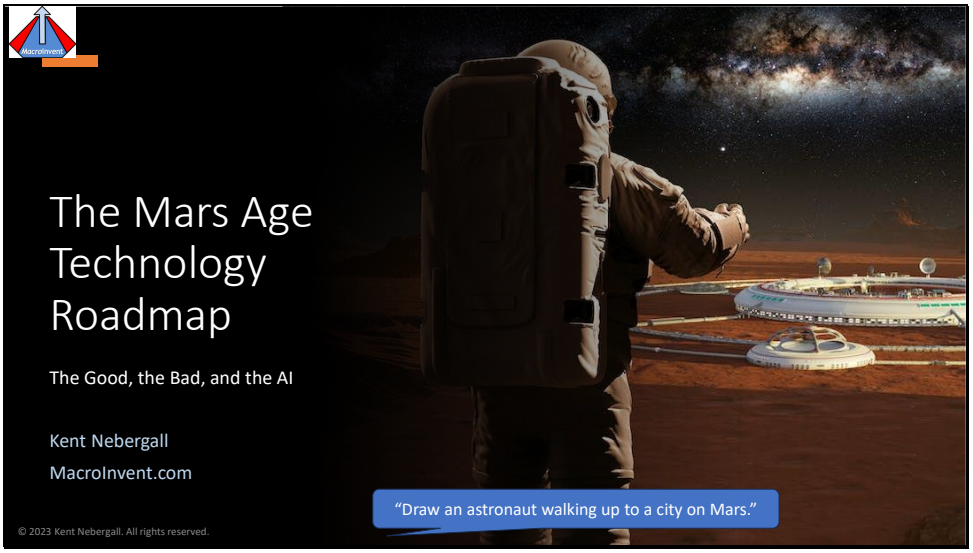

Hi everyone. This talk is mainly on the AI revolution and the impacts, good and bad, on Mars Settlement and culture.
When I used AI to generate a picture, the prompt is in the blue bubble at the bottom.

Slide 2

Abstract

In just the past year, Artificial Intelligence has exploded in significance for mainstream users. Meanwhile, Elon Musk is planning autonomous driving, humanoid robots, and routine flights of Starship in the next three years. Nvidia is developing revolutionary data centers specifically to apply AI to scientific and industrial optimization. Meanwhile, personal AI workstation setups are also becoming more powerful, democratizing part of the progress to independent researchers.

A similar inventive convergence and attention divergence happened with the classic space age and the invention of the microchip around 1970. A society that expected moon bases by the 1980's instead got personal computers. In the long term, a society that had grown accustomed to looking skyward for new frontiers became obsessed with information and simulation. The microscope replaced the telescope, culturally and economically. As with any technology revolution, there will be causes, effects, drivers, and hindrances from geopolitics.

By definition, science fiction is an entire genre of literature where even a single technology disruption will cause drama in the cultural and personal experience. What happens when such things become real, and what opportunities and threats await us this year? How can we prepare personally, professionally, and as an organization for such disruptions?

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This is not the first time the space age has been disrupted by a computer revolution.

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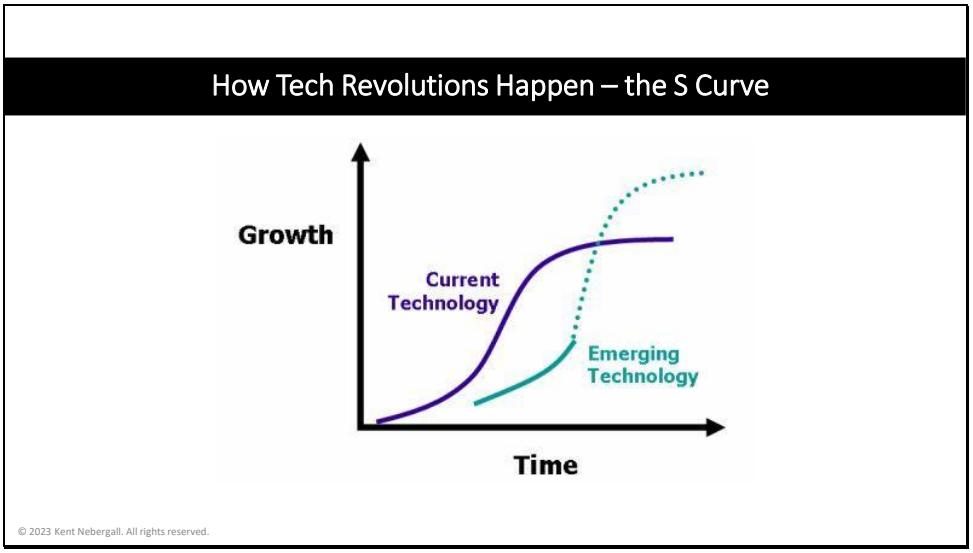

Technology tends to go in a logistic curve, or S curve. There is slow growth, then an exponential-looking explosion, which then fades out slowly into the background.
At that point, a new technology will attract attention and investment away from it. The old technology becomes a baseline that is refined, but not exponential again.

Slide 5

Energy Density/Efficiency, Invention, Information

Energy System	Utilization Inventions	Information
Human Power	Hunting, Gathering, Migration, Villages, Basic Farming, Textiles	Language
Fire	Metallurgy, Cooking, Light, Heat	Engineering
Animal Power	Farming, Roads, Cities, Travel, Mass Warfare, Writing, Trade	Math
Wind Power	Ocean going vessels, Navigation	Celestial 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]

Here is a **map** of human history in terms of **energy, invention, and information.**
When a technology revolution **matures**, inventions are **converged** into an **equilibrium** of technology and resources. This becomes the **foundation** for the next technology revolution.

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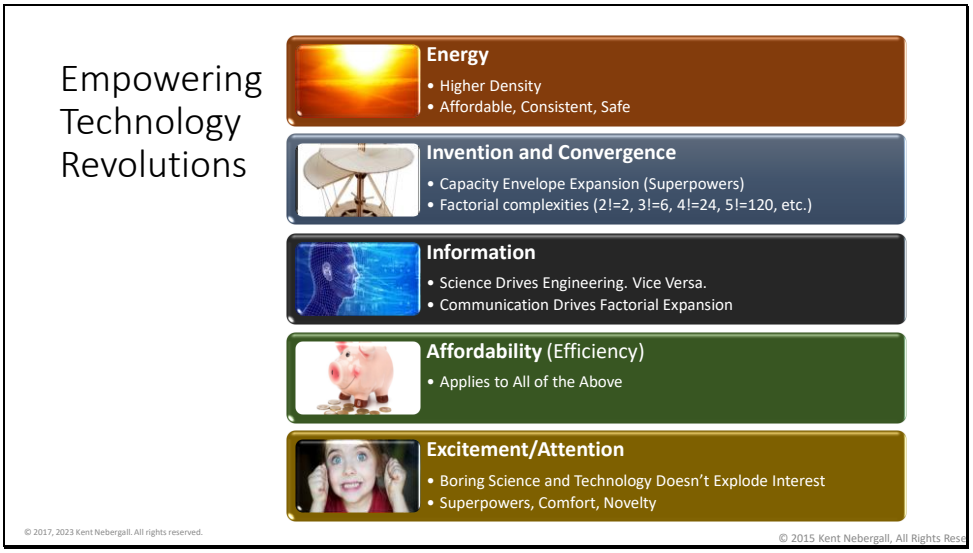

Energy, invention, and Information are the **material components** of technology revolutions. But broader acceptance depends on **affordability and excitement**. Getting many people doing many experiments at once generates dramatic **growth and convergence**. **Thousands** of garage tinkerers with new technologies **expand** the art of the possible. It's a **Cambrian** explosion, much like the microcomputer revolution or the early days of aviation.
The question is, where is that attention and excitement going?

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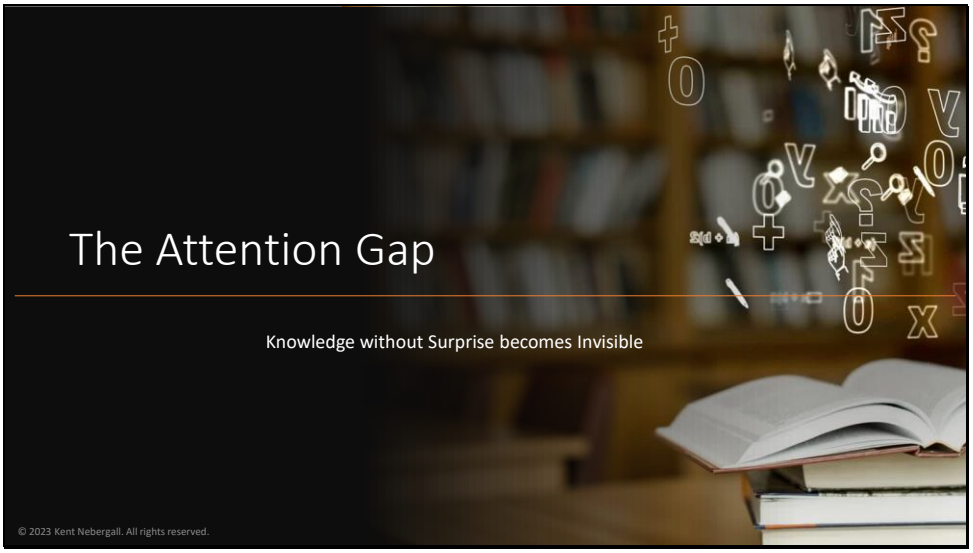

There is a principle of Information theory that states that information that is expected is not information at all, because nothing is communicated.
We need information streams to contain novelty to pay attention.
Otherwise, this technology, no matter how miraculous, fades into the invisible background.

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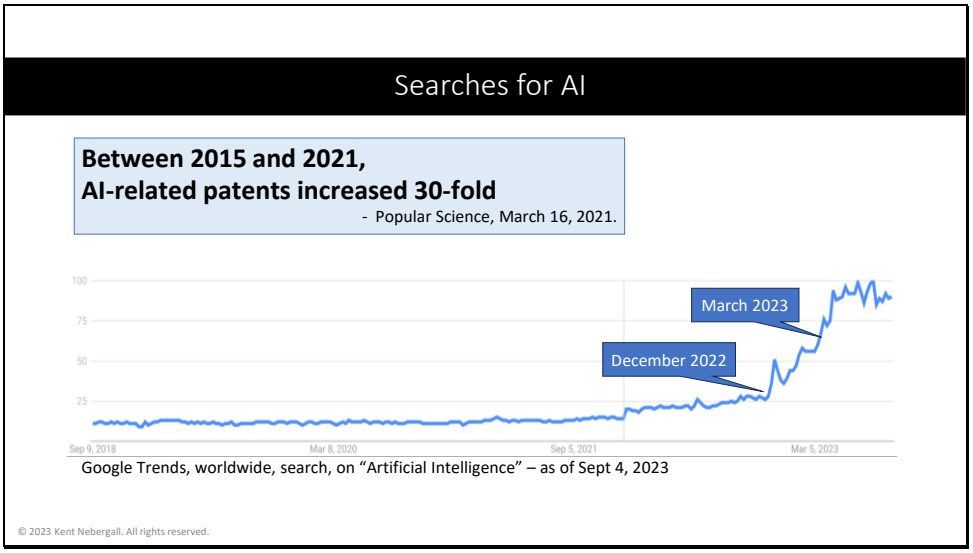

For the past decade, we've taken voice-based AI for granted. You ask your phone or car to go somewhere or text someone and it usually works.

But in the last ten months, we've suddenly been able to ask for complex information like summaries of entire books and generated artwork simply by asking for it. Schools now ban AI generated essays. Even complex systems like filmmaking can be completely automated for a few seconds. This graph shows search results on Google Trends for AI. I'm seeing bursts around the time semester projects are ending.

So while voice AI spent ten years becoming taken for granted, visual and text AI have become relevant in a tenth the time.

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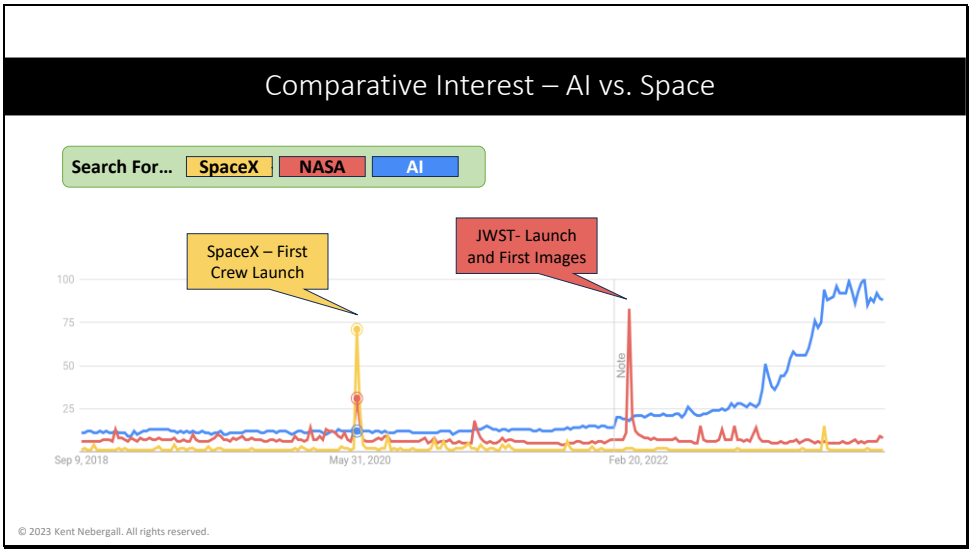

The space community is excited by Starship and other massive breakthroughs. However, look at the relative interest here. We only see two spikes, and both are smaller than AI on a weekly basis. One was the first Crew Dragon launch, and the other was the launch, unpacking, and first images of James Webb.
It would appear our new space age is still ignored by the public.

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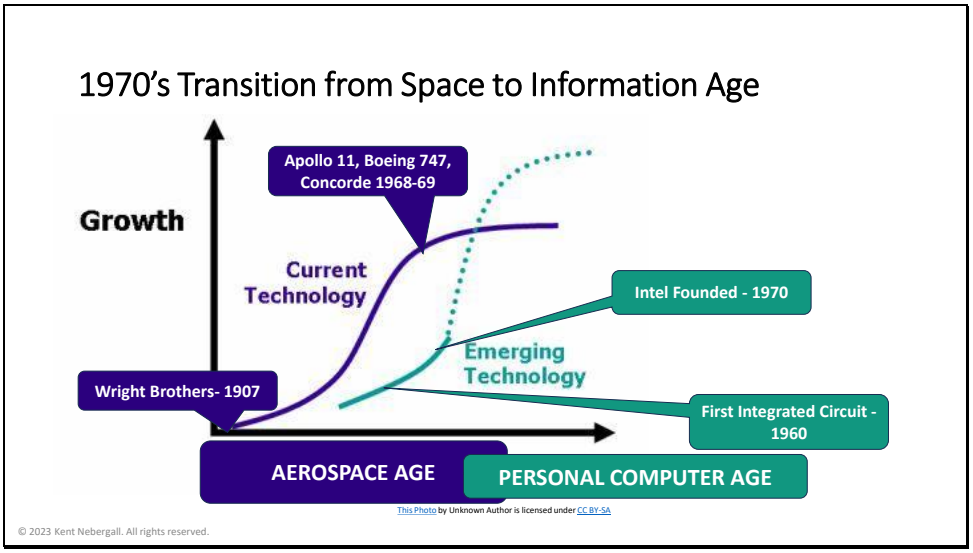
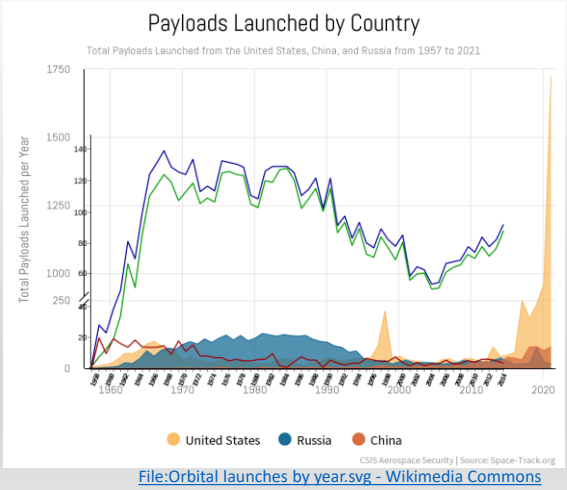


In the Aerospace Revolution, only sixty-six years separate Kitty Hawk from Apollo 11. But around that apex, Intel was founded, and the foundation poured for the next sixty years of the information age.
The society that looked up now looks at phones and laptops rather than the infinite sky.

Slide 11

Launcher Evolution, Payload Revolution

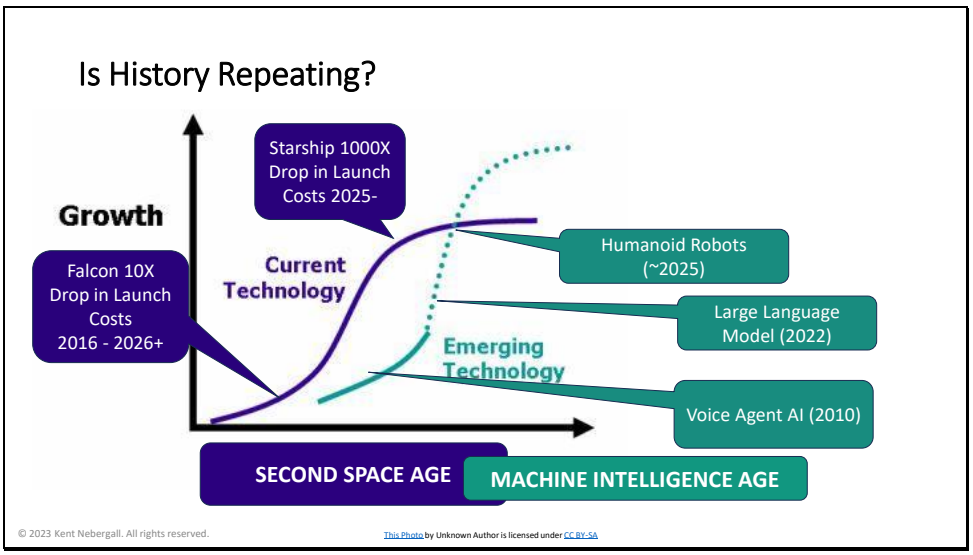


File:Orbital launches by year.svg - Wikimedia Commons

That's the story in terms of public attention. But what really happened in technology itself? The classic space age and the age of Moore's Law silently converged. We were able to launch 20-ton payloads with double the bandwidth every few years because microchips kept improving. So while the rockets stayed the same, the satellite revolution in capacity steadily improved for decades. Satellite TV revenue was ten times NASA's budget a quarter century ago. Nobody noticed.

That said, notice what happens at the end of the graph with Starlink. We are again seeing a converged space and communications revolution.

Slide 12



We are in the Sputnik moment for Artificial Intelligence disrupting our lives. Many office workers could be replaced or radically retrained within five years, and that justifies a LOT of attention. Meanwhile, Starship hasn't reached orbit yet. And when it launches regularly, it will carry satellites before carrying people. It won't register how significant it is to most people for quite a while. They already take Falcon for granted with it's four-day launch cadence.

The AI Information Age will enable people in a decade to do the work of ten people now. We already experienced this with office work over the Information Age. In 1970, it used to take a staff of typists, typesetters, illustrators, editors and researchers to do what we've been doing in Office software for three decades now.

By the time we land on Mars and people marvel at that, we will already not only live in an entirely different computer landscape, but we will take it for granted.

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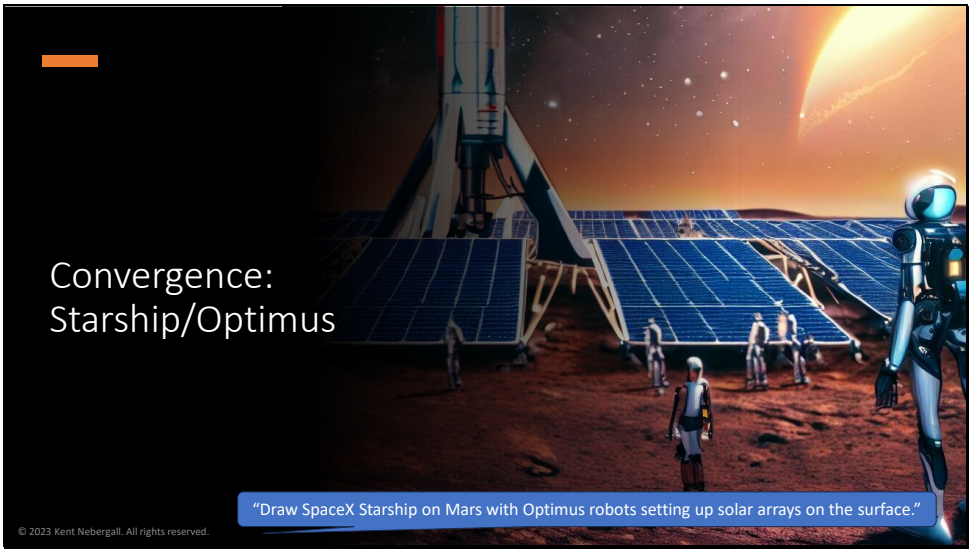
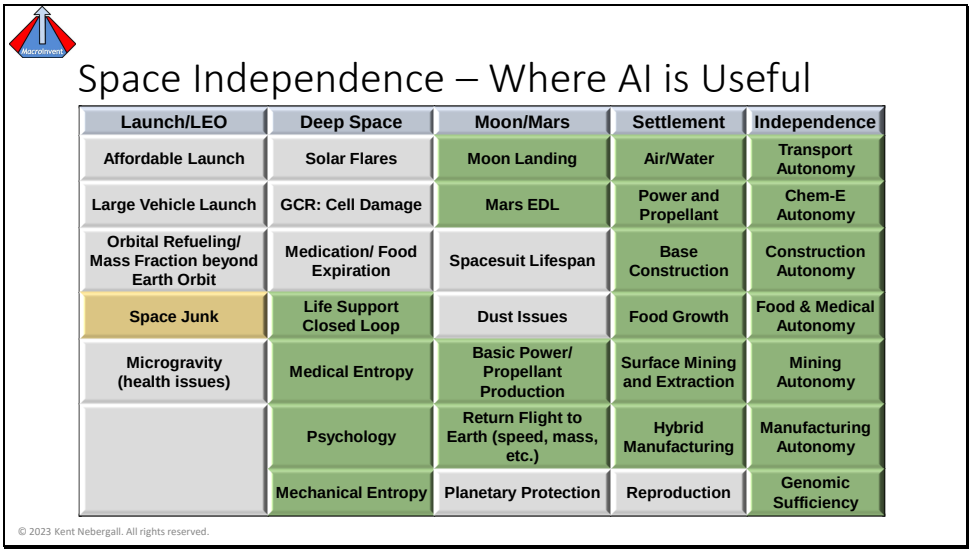


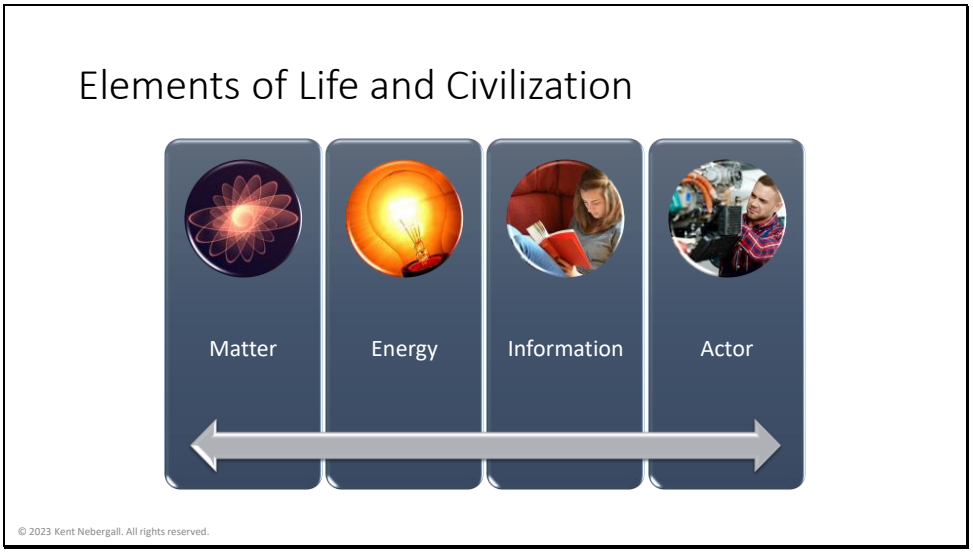
How can AI help with Space Settlement?
By the way, that's what Dali thinks Starship looks like on Mars. I guess it has a ways to go.

Slide 14



Here are the grand **challenges** of space settlement and **independence**.
This starts at the top left and goes column by column until we have an autonomous space civilization. I highlighted the items in green where Machine Learning and Robotics may help dramatically.
Note that the near-term objectives in the top left are vacant. Considering the current state of AI, I find this comforting. I don't trust present day AI to not hallucinate like it did with that last slide. That said, the long term future of space settlement has many opportunities for acceleration when the convergence happens between technology bases.
When the first robotic Starship test flight lands to Mars, I expect a few Optimus robots to be warming the seats.

Slide 15



Consider four aspects that make life and civilization possible – matter, energy, information, and the creatures who wield them. The actors may be cells, space probes, humans, or entire civilizations in this case. Actors also include infrastructure such as mines and factories.

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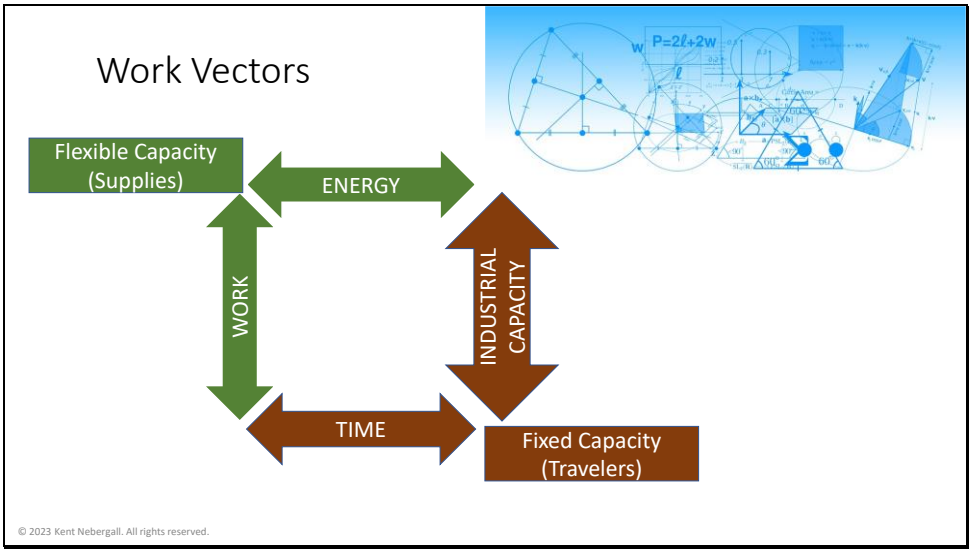

An **efficient system correctly matches work to industrial capacity**, and **time to energy**. Machine learning systems can dramatically reduce the wasted efforts around designing, building, installing, and operating Martian surface equipment. It can do the same on earth in the near term with digital twin factories and machine learning.

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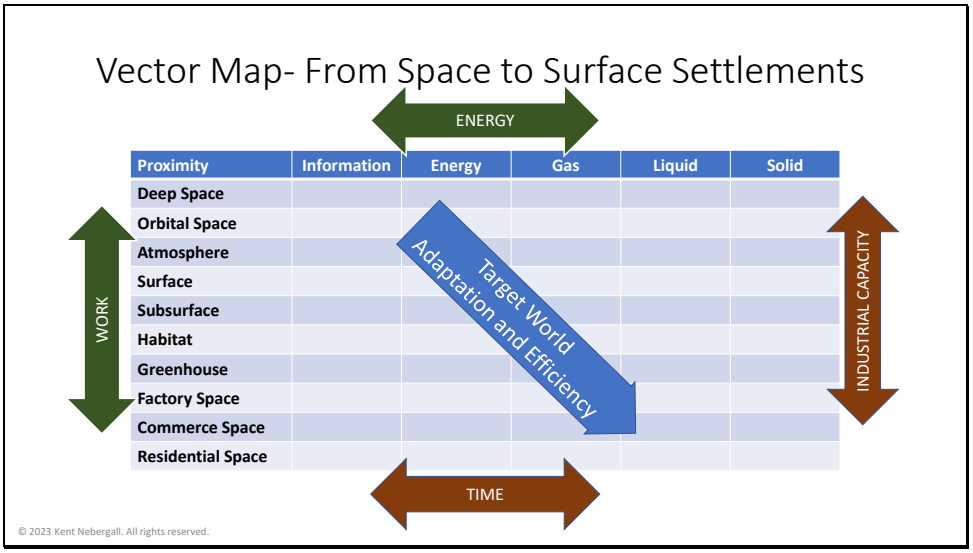

Now if we look at a vector graph of what is involved in Space Settlement, we can see where an AI designed to optimize for each grand challenge problem would be a very powerful tool. We could use AI to perfect modular Hardware for building settlements and factories, and the systems within them. . It could be optimized through thousands of iterations for maintainability, capacity, cost, and adaptability to new situations.

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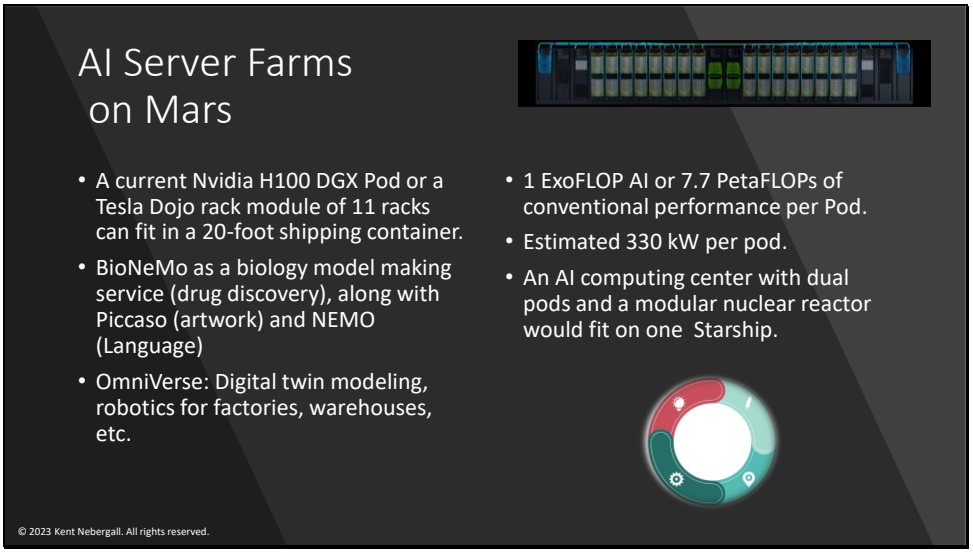

An issue with AI is the amount of computing hardware involved. Waiting tens of minutes to send and receive data from Mars to Earth would potentially stagnate progress. That said, look at the currently-released AI system from Nvidia. These systems are scaled for public use, yet we could easily ship four of these full racks in a 20 foot truck. With new modular nuclear reactors also being scaled down, a single Starship could put a massive AI resource on the surface of any outpost in the inner solar system, with two of these data centers power for two decades. Software for factory digital twins and drug discovery are already being fully integrated for single, end-to-end systems by the lead companies. We are in the equivalent gap right now between when you could get a desktop computer and when you could buy practical office software for it. That gap ends this year.

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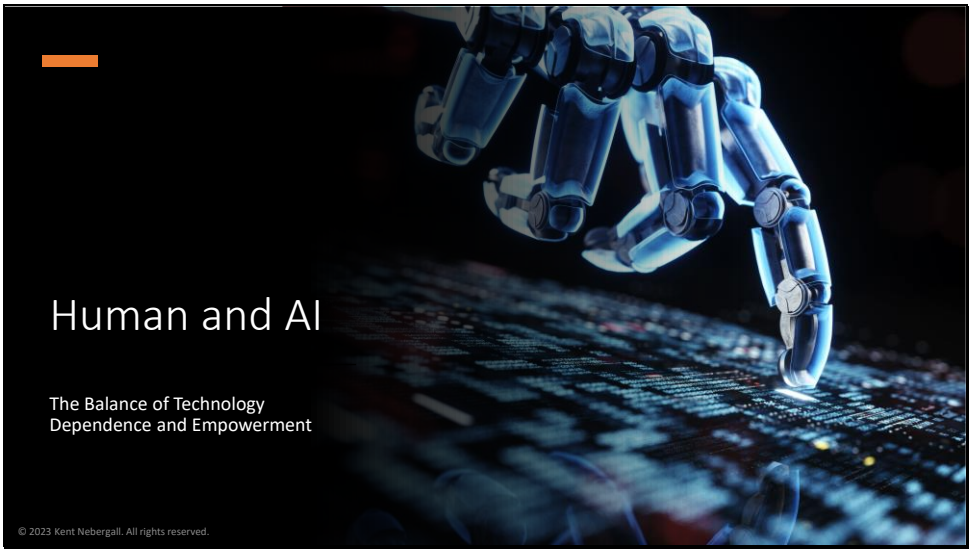
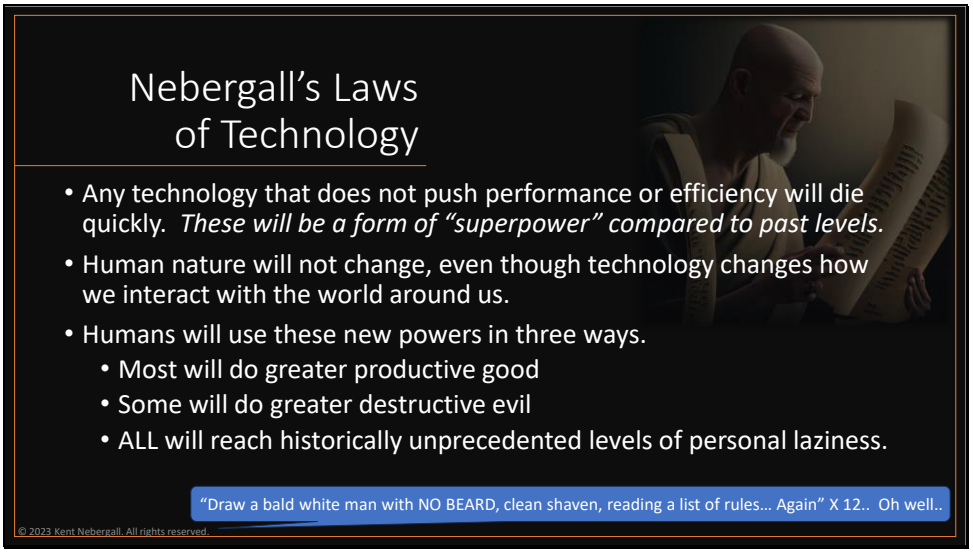


So what about us humans? What's going to happen with us?
I stumbled into the answer two decades ago, but I'm realizing how big a deal it is now.
A panel of writers were given the topic,

Slide 20

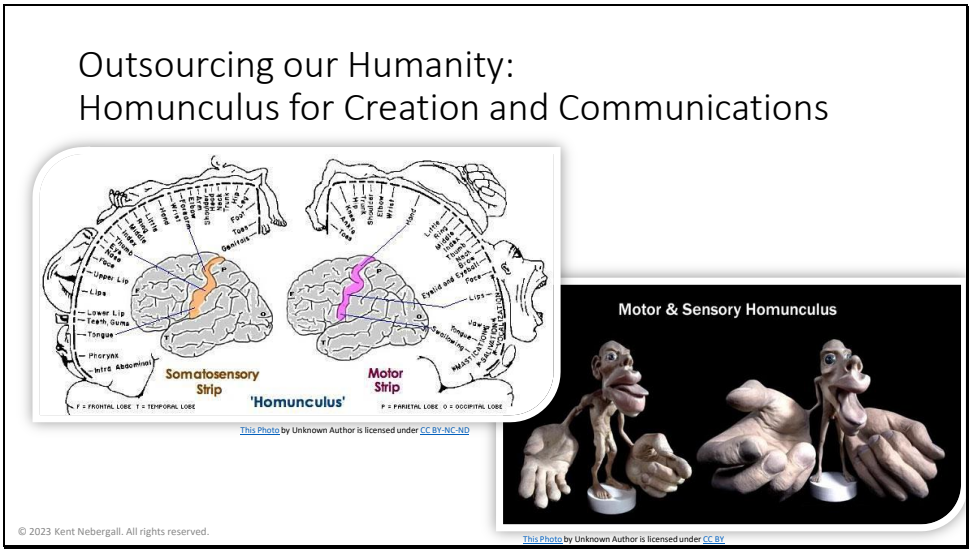


I didn't call it this, by the way, but it does need a name, and it's mine, so here goes…
One - Any technology that does not push performance or efficiency will die quickly. *These will be a form of "superpower" compared to past levels.*
Two - Human nature will not change because of a new technology landscape. *Complaint letters about too much homework have been found in ancient Egypt.*
Three - Humans will use these powers in three ways.

Most will do greater productive good
Some will do greater destructive evil
ALL will reach historically unprecedented levels of personal laziness.

This goes WAY past cheating on essays, though…

Slide 21



Let's look at the brain's interaction with the environment. You may recognize this map of the motor strip of the human mind, and the little statue that represents how much of our brain we devote to our hands to make tools and our mouths to make words. Large hands and mouth reflect the relative amount of our brain/body interface is devoted to these. This is how we speak and build.

This is a bedrock of our humanity – language and creativity in the mind, and mastery of tools and fire in the world.
This is our trade space. Every one of us.

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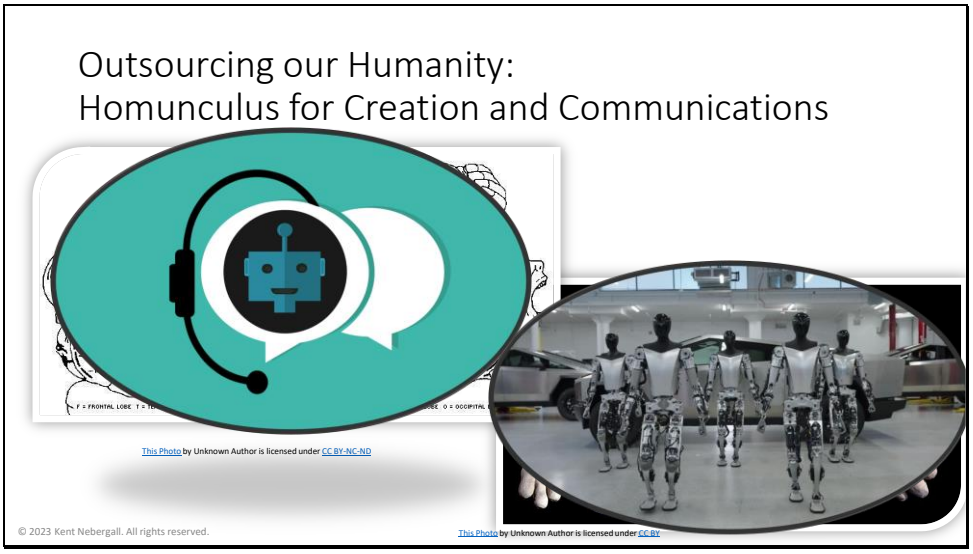
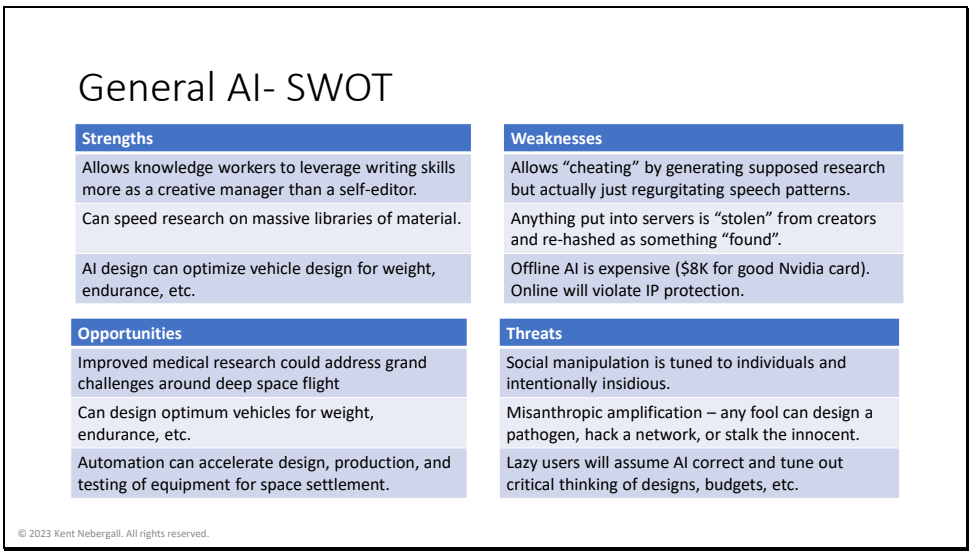


So what happens, when the ability to make and process words has been augmented with Large Language Models?
And what happens to our ability to use tools when humanoid robots do so much physical labor?
And what happens when artwork, music, and image processing are also automated away?

We are entering an era where you could generate an artificial 500-page novel by your favorite author, living or dead. But then use an AI to consolidate it to 500 words because you are too busy to read it.

Slide 23



The paradox is that the same systems that can automate our creativity away can also amplify it. I could write all the novels I ever wanted to write but never had the time or talent to create. I could write the books, do the paintings, build the machines – all as if there were ten of me. All in one lifetime.

But will I? Or will I disappear into artificial fictions and become a commodity to those who wield this technology? Or both?

Are we automating our uniquely human mind-body connection to oblivion? Or to amplification?

Slide 24

So my catty comment at a sci fi convention over a decade ago seems to be the most personal promise and threat of AI.
We can add two more rules.

Nearly everyone will use it for all three purposes – the good, the bad, and the lazy - in roughly these ratios.

Due to this ratio, the art of the personal-possible will, for the average person, will diminish with atrophy.

Meanwhile, those who can use the technology effectively will reach unprecedented levels of accomplishment.

If anything disrupts this technology, civilization will unravel quickly because we will have forgotten how to be human without it. This isn't just doing division without a calculator. It's speech and craft and thought itself. THAT, is your own personal great filter.
Be a lazy or empowered human. But always remember to think like a human. Own your mind.
Or in five years you will be helpless without AI.

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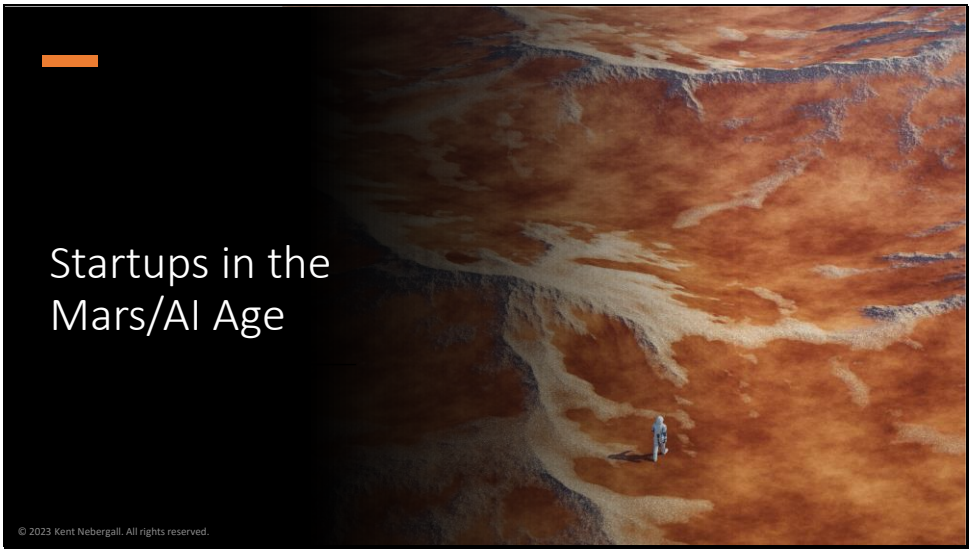

So, it's just you and ten digital office workers who answer to you. How do you grow a new business in the Mars Age?

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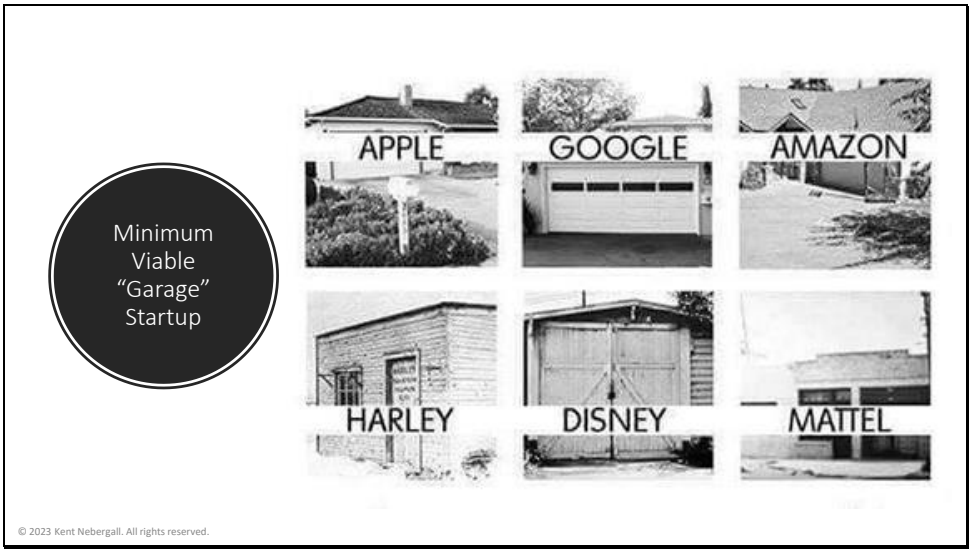

Note that every technology revolution is amplified by a wave of startup companies. These tend to start in small workshops with simplified tools.

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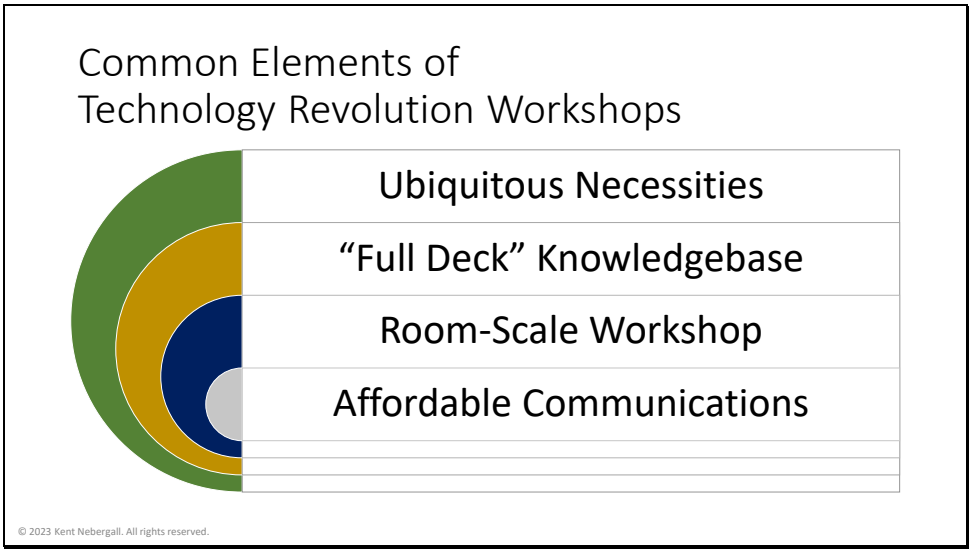

Technology revolution workshops throughout history have common elements.
First, you need to be able to take for granted things like food, power, shelter, and other infrastructure.
Second you need a tool set that is both easy to understand and incredibly powerful. The BASIC programming language, three chords and a guitar, a deck of cards – all embody a crossover of simplicity and communication power.
Third, you must fit the workshop and the team within speaking distance of each other.
For digital products, you also need unlimited ability to distribute and market your arts and sciences.

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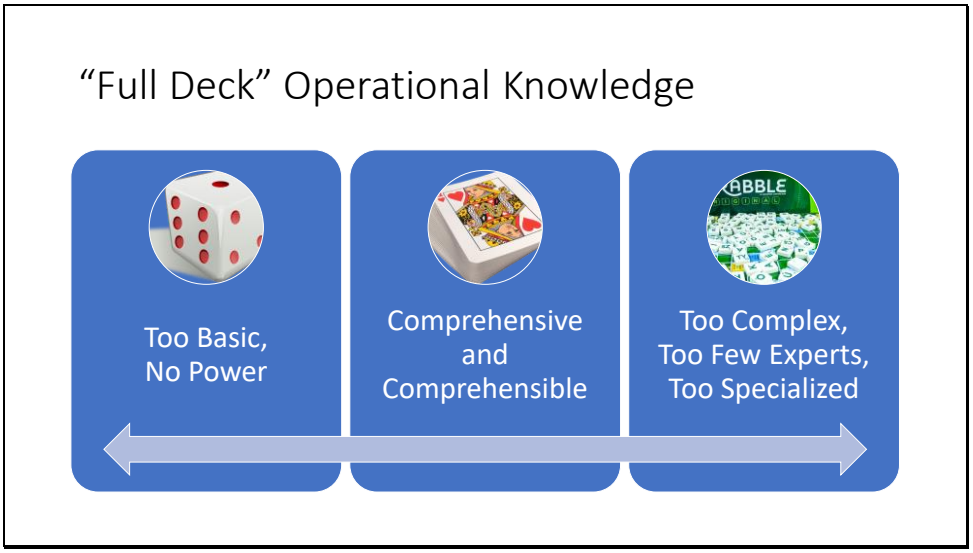

Each business model needs a "**Turing Complete" technology base**. In computing, **Turing Complete** means a **programming language** that can perform **all classical computing functions.** It becomes **unlimited despite** having a **very finite number** of components and functions**.** Like how **52 cards in a deck** allows **thousands of card games.** You need a toolbox that can grow quickly, adapt quickly, and do so with minimal outside support.
Historically, innovation explosions are rooted in skill sets that can be learned in a few weeks or months. This combination of comprehensive yet simple tools has a sweet spot, which I'm calling Full Deck for simplicity's sake.

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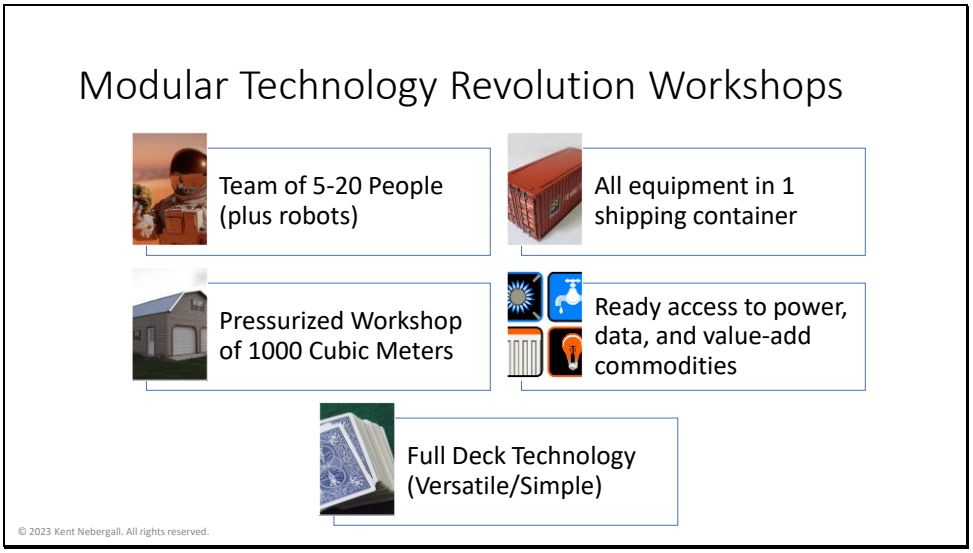


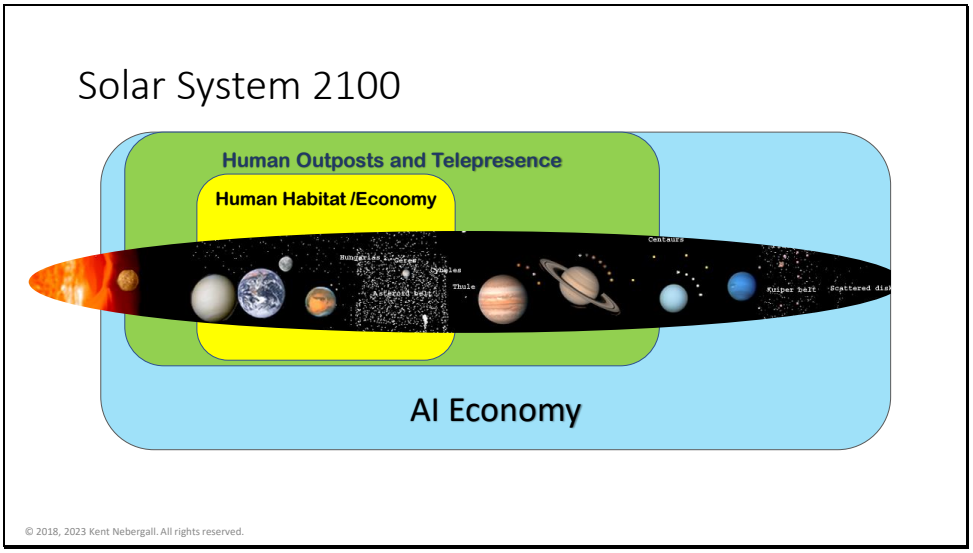
We can make small workshops, amplified by robotics and AI, and fit them in containers both for Earth and space settlement. We can put them anywhere, and we can do amazing things.

A key pivot point will come, or has already done so, when we can use AI as a tool to better code AI itself, and do so in small workshops. When we can also do this with robotics, we have a second pivot point at that stage in the next five to ten years.

Slide 30

So where does this take us? Let’s project both trends a bit.

Slide 31



In a century, we can see expanding human towns across the inner solar system. We can see outposts and robotic facilities all the way out to the Oort cloud. Our problem will be keeping the AI in the outer solar system from being used to defraud us by faking resources we will never see to encourage new investment in given operations. We could have the equivalent to mineral rights or insurance fraud not only amplified by AI, but initiated by AI to benefit itself.

Even if AI could be programmed not to do this, humans with AI are guaranteed to do so.

That is a problem for the future. The question for the present is how we use AI to converge with the Mars Age revolution, and ensure it becomes our fate.

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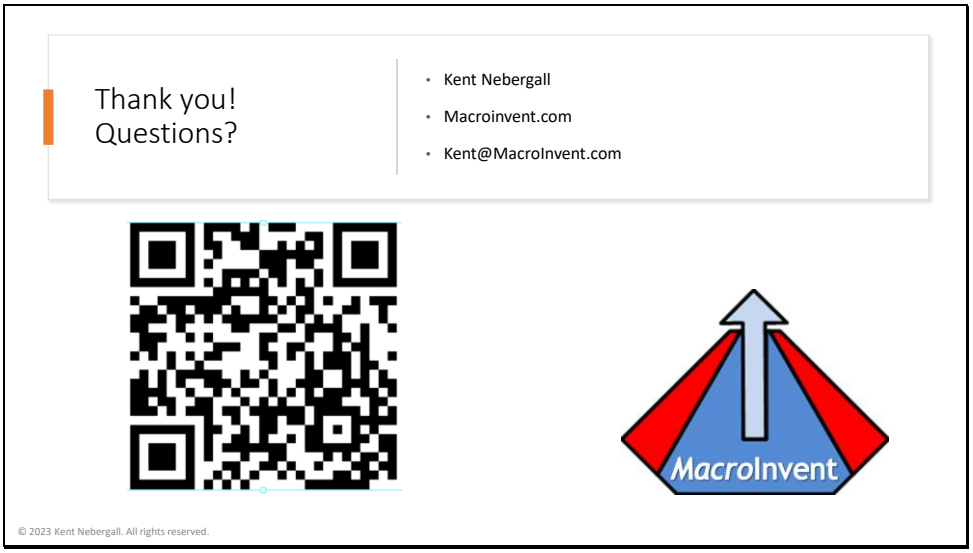

Thank you! Any questions?
If you want to see my presentations for the last 15 years, including this one later, the QR code links to my portfolio web site.