Novel Hardware

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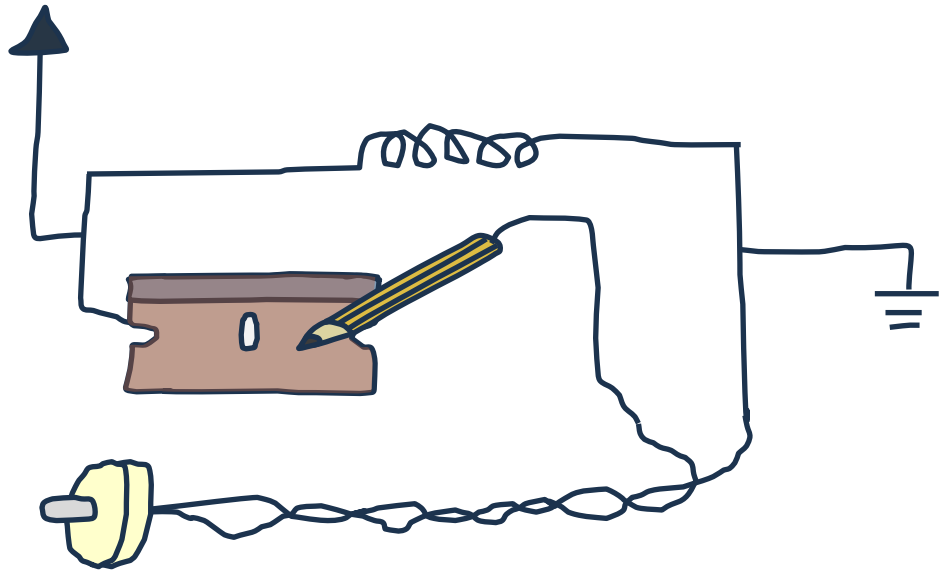
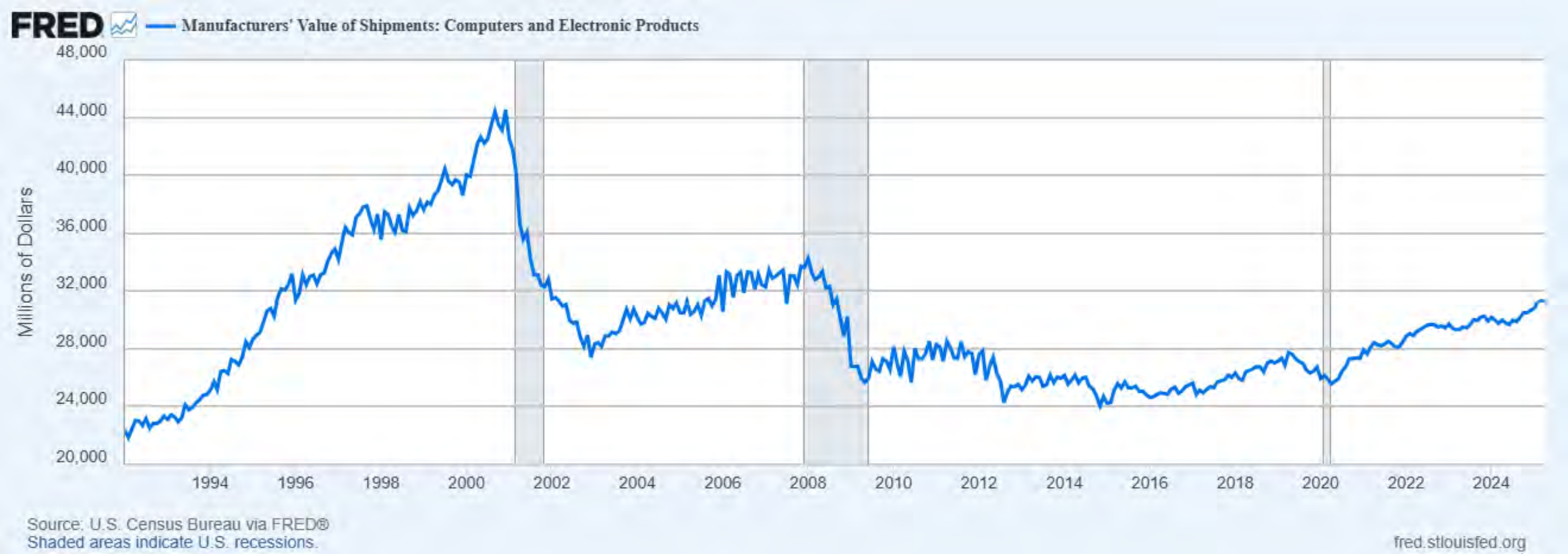
Foxhole Radios – Compute Out of Junk?

- During WWII, soldiers built foxhole radios from safety pins, wire, rusty razor blades, pencil graphite, etc.
- The graphite pencil and the razor blade were repurposed to create a crude crystal detector capable of AM reception
- What looked like useless junk became a lifeline of information on the edge, assembled on the edge



US Manufacturing Data - Losing an Edge?

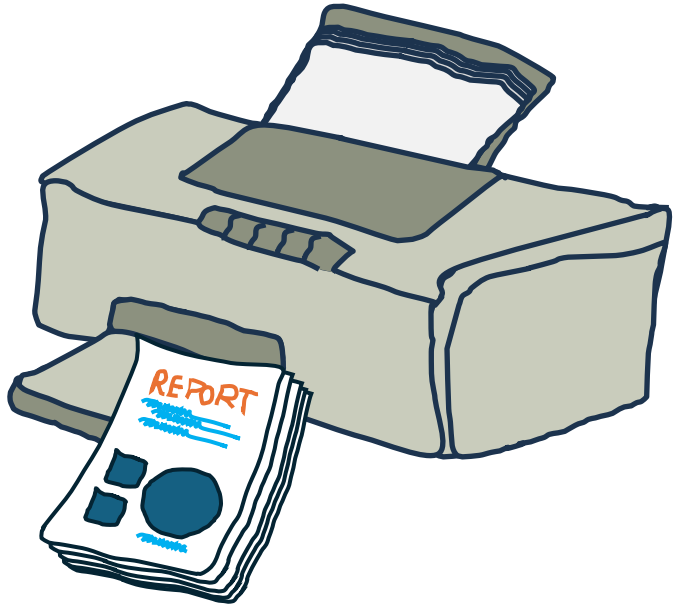
U.S. Computers and Electronic Products Value



FRED: Federal Reserve Economic Data

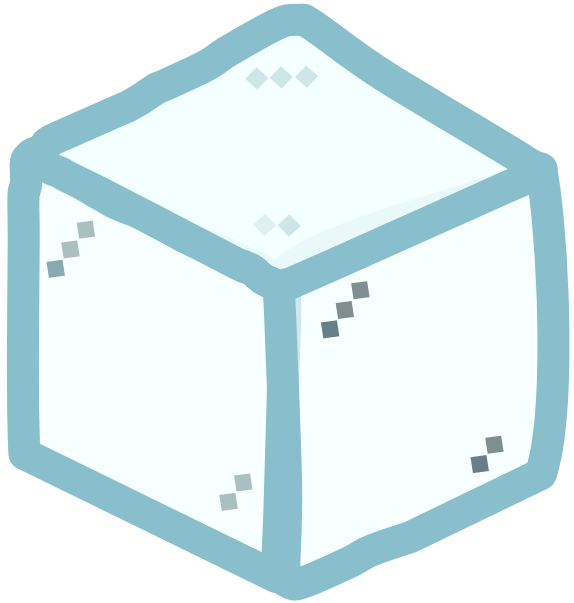
So, What Are We Good at Making? – Paper

- The U.S. is a global leader in high throughput paper production with nationwide capacity and logistics already in place
- Paper lines support advanced processes like lamination, embossing, micro-perforation, and roll-to-roll handling – all micron scale controlled
- These same techniques align with microsystem needs, and with minimal adaptation paper lines could produce microsystem substrates, packages, and many components in between



So, What Are We Good at Making? – Glass

- The U.S. is a global leader in producing high-quality glass at industrial scale
- Glass production lines already meet the demands of the modern substrates used in circuit boards, storage platters, and optical systems
- If tuned for advanced packaging and microsystems, it would unlock a high-precision fabrication platform hiding in plain sight



So, What Are We Good at Making? – Sugar

- The U.S. sugar industry produces over 8 million tons annually, offering a scalable, and domestically sourced product for microsystem manufacturing
- Caramelized sugar and corn syrup enabled NIST to transfer microscale gold lettering onto a human hair, demonstrating sugar's viability in advanced microfabrication
- Sugar-based transfers conform to curved surfaces like the tip of a pin or a milkweed fiber without leaving behind any toxins

Image of gold lettering printed on hair follicle from NIST - 2022

So, What Are We at Risk of Losing?

Not all underutilized infrastructure is old – some of it is brand new

From the Washington Post: A Toyota plant in North Carolina, where the company is producing batteries for electric vehicles. (Allison Joyce/AFP/Getty Images)

We've Been Here Before

***"[We were a little shocked] in 1983, and we were a bit complacent then. However, I believe we are now guided more by our needs, our capabilities, and the idea of having a consistent, balanced program with other sciences and industry"* – Kermith Speierman**

Various newspaper clippings from The New York Times (circa 1983-1997)

From MacGyver "The Enemy Within" - 1986

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