**The Engine of Progress: How Human Innovation Shapes Our World**

Innovation is a uniquely human trait. Unlike every other species on this planet, through culture, humans are no longer bound by the Darwinian model of random mutations. Recombining existing ideas into elemental inventions such as tools, weapons, warm clothing and simple watercraft has allowed humans to overrun every corner of the planet. The ability to create novel solutions to existential problems has allowed humans to s evolve significantly quicker than random mutations alone.

**The dawn of civilization.** The story of human success is one of constant innovation in response to changing needs and environments. Starting with the hand axe more than three million years ago and passing that knowledge on through the ages has led to us to today’s digital age where artificial intelligence continues to evolve our creativity ever faster.

It is impossible to explain why innovation happens, let alone predict when and where it will happen. We do know that innovation happens when people with ideas collide through serendipitous encounters where opportunities and preparation meet. DaVinci’s success as a renaissance man was due to the many city states that existed within Italy at the time. This diversity and competition of cultures combined with an active trade amongst cities resulted in an exchange of wealth and ideas leading to a spike in innovation and rapid progress.

**Empires.** Empires are not particularly friendly to innovation despite being effectively giant single markets for ideas to spread. Empires preside over a gradual decline of inventiveness as central power ossifies, technology stagnates, elites resist novelty, and funds get diverted into luxury, war or corruption, rather than enterprise. They lack the desire to change and actively hang onto the status quo. The Otteman Empire for example banned the Gutenberg Press for more than 200-years (1483 - 1729) on penalty of death.

**Industrial Age,** As Empires moved into the industrial revolution the role of innovation moved from Government to industry which was responsible for most of the innovations that rapidly changed our world. Few innovators were trained as scientists. Many were poorly educated and of humble origins. Science doesn’t innovate, it studies the invention afterwards, determines how and why it works, and provides the data that will allow us to continually improve upon the invention and spark new ideas.

Government incentives are largely ineffective in the innovation process due to their artificial, politically driven restrictions and narrow focus on jobs creation at any cost.

In the early 1900’s Samuel Pierpont Langley a well known and respected academic received close to $1 million, in today’s currency, to design and build a heavier-than-air flying machine. He built 2 large versions of his aeroplane, both of which crashed into the Potomac River after being catapulted from a houseboat. Meanwhile the Wright Brothers spent several thousand dollars of their own money to systematically iterate multiple small prototypes over several years until their first successful flight on **December 17, 1903.**

In 1924 the British Imperial Airship Scheme was project was conceived to build an airship capable of reaching the far reaches of the empire. Two experimental airships were built. The R100 built by the private sector under a fixed price contract and the R101 designed and constructed under the direction of the air ministry. The R100 made a successful trans Atlantic flight from England to Canada while the R101 crashed in France on its maiden voyage killing 48 people on board.

A more recent example is in our quest to commercialize fusion energy and ITER, a multi-nation project to build the world’s largest Tokamak is now significantly behind schedule and over budget has yet to fire a single shot and stifling funding for alternate approaches. At the same time the private sector is exploring multiple smaller approaches at low cost allowing them to iterate at a much quicker pace in their quest for a DEMO plant that will lay the foundation for a fleet of fusion machines. Startups such as General Fusion, Helion Energy and Commonwealth Fusion Systems are a few of the leading companies making significant progress towards a viable fusion energy demonstration plant. Yet the G7 working group on fusion energy has no members from the private sector thus relying strictly on academia and government funding to innovate.

**Large Corporations.** The modern empires are the monopolistic international corporations, some with annual revenues that exceed some countries. These organizations stifle innovation by smothering it in bureaucracy or using their monopolies to suppress its adoption.

At the same time large corporations can get blindsided by agile competitors if they fail to innovate or recognise and adapt to a changing environment. Recent examples include Kodak that owned patents on digital cameras, Olivetti that produced the worlds best typewriters and owned word processor software and Blockbuster that passed on an offer to purchase Netflix for $50 million at a time they were not yet turning a profit.

The word “innovation” is invoked with alarming frequency by companies trying to sound up to date with no understanding that innovation is a bottom up process of adoption over time. Not a novel idea or invention. According to a recent McKinsey survey, 85% of CEO’s rank innovation as a top priority. They also report a high implementation failure rate.

Innovation is hard and large corporations are too big to fail or be innovative.

**The future is small and agile.** Today’s big governments, multi-national corporations and confirmation bubbles severely suppress our freedom to experiment, iterate and postulate about the future. The Bank of Canada has been warning us for several years about the lack of productivity caused by our lack of innovation.

Innovation comes from the outside. Small groups of disenchanted individuals looking to affect change. As Margaret Meade put it “never doubt that a small group of thoughtful committed individuals can change the world. In fact, it’s the only thing that ever has.”

Some successful examples have been the skunk works at Apple and Lockheed where small groups of dedicated individuals freed themselves from the stifling approval processes, so they could experiment and iterate often and cheaply.

If we want to reinvigorate our creative and innovative muscles, we must identify our real existential problems such as climate change, adverse outcomes from AI and the polarization of ideas, and find practical and novel solutions. This will not happen through government incentives or new thinking from large multi-nationals but will come from small teams of creative and dedicated individuals that can come up with myriads of viable solutions and scale them into innovations that change our world for the better.