2018Q3
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Technology Of The Future Part 2: Investments Of The Present

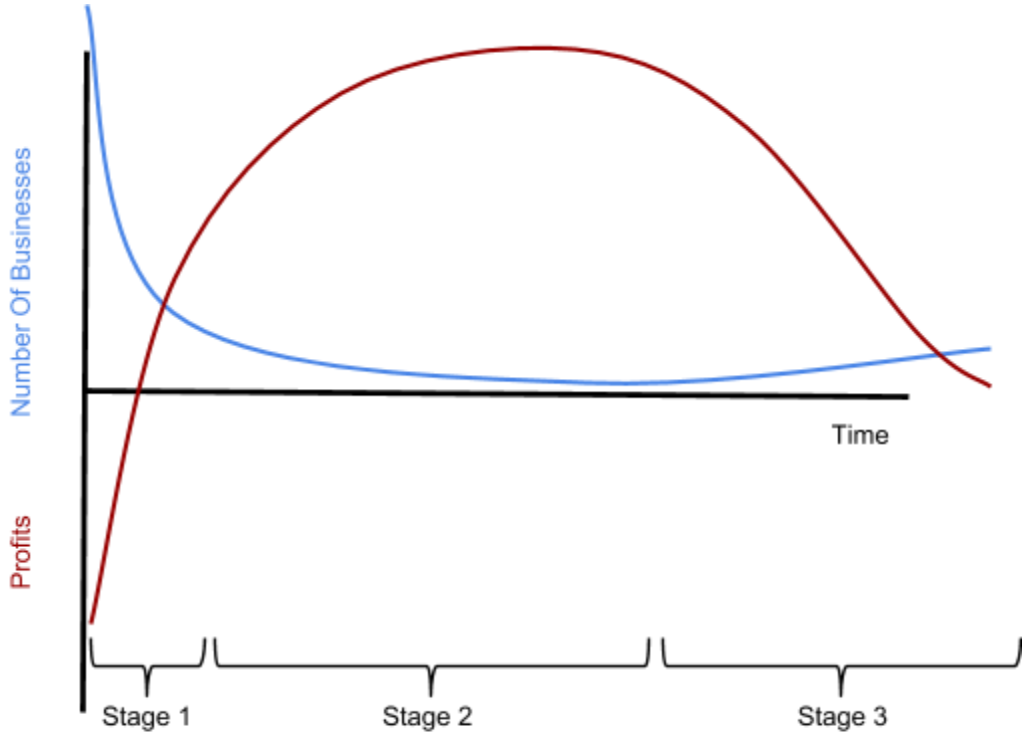
In last quarter's letter (2018Q2 "Technology Of The Future"), I explored four new technologies -- CRISPR gene editing, self-driving cars, nuclear fusion, and quantum cryptography -- with the potential to change our world. In the future, these technologies will make our health better, our commutes safer, our energy cheaper, and our computers more powerful.

If the future looks so bright, and if we know what technologies might change the world, then why not invest in them? Unfortunately, it is far easier to predict which technologies might change the future than it is to predict which particular early-stage company might get lucky and make it big.

To illustrate this principle, let us consider a world-changing technology of the past: cars. In the late 1800's, cars were the hot new technology, and Detroit was the Silicon Valley of its day. The auto industry went from one-off, expensive, hand-built, wooden buggies, to technological wonders produced by the millions. Today, Americans buy almost 20 million new cars each year.

Many of the cars that U.S. consumers buy are produced by the "American" brands of GM, Ford, and Chrysler. What we forget are all of the dead American car companies. Have you ever heard of DeLorean, Duesenberg, Packard, Studebaker, Auburn, Edsel, or Tucker? How about Bacon and Beggs? In total, there have been about 3,000 U.S. car companies whose names range from ABC to Zip. Almost all of the 3,000 companies had died by 1920. When car technology was new, automobile innovation exploded. In turn, this innovation led to an explosion in the number of car manufacturers, but eventually, this multitude of options collapsed into just 3 major players. Would you have been able to pick the 3 winners out of 3,000 choices? Only 0.1% of U.S. auto businesses became winners.

Similar dynamics occur during other technological revolutions, and in broad terms, we can divide these dynamics into the three stages of an industry's life cycle. In the first stage, the new technology creates a proliferation of both ideas and businesses trying to profit from those ideas. Many of these businesses never turn a profit. In the second stage, the dust settles from the explosion of new businesses, and a few winners begin to dominate the industry. These winners typically enjoy a period of steady growth and solid profits. In the third stage, the once-hot technology becomes commonplace and easily reproduced. At this point, new businesses appear, which compete to produce the good at the lowest possible price (think cheap Chinese knock-off). During this second proliferation of producers, margins significantly decrease.



Industry Life Cycle

It is possible to profit by investing in each of these three stages, but each stage requires a different investing strategy.

Most first-stage investments go to zero, but there is an occasional huge winner. This is where Venture Capital (VC) funds invest. A VC fund may invest in 10 businesses. When the VC fund managers select investments, they must make sure that each of the investments has the potential to increase by at least 10x. That is because, in a typical fund made up of 10 businesses, 7 will die, 2 will return about zero, and 1 will succeed. If the fund ends up with 2 big winners, then investors are very happy. First-stage investing is a game of low odds and high variability.

As an industry transitions from the first stage to the second stage, the weak businesses fail, leaving a few winners. With less competition, these winners have higher odds of success. Second-stage companies can potentially grow 10-30% per year for decades. This is a game of higher odds and lower variability. These are my favorite investments.

Eventually, industries transition to stage three. In stage three, the technology becomes common, competition increases, and margins decrease. The winners of stage three are the businesses that can produce the technology at the lowest cost. For example, at one point, knitting textiles was high tech. The US and the UK were the global leaders, and New England

was the Silicon Valley of its age. However, eventually textile technology proliferated globally. Now, the US and UK cannot compete with third-world sweatshops. Textile technology is cheap, common, and available. Today, winning textile businesses are low-cost producers that have the lowest labor costs.

It is tough to invest in stage-three companies. Competition abounds, and a stage-three winner must sustain low production costs, or its razor-thin profit margins, and its profits, will evaporate. This is a game of low odds and high variability.

Occasionally, a stage-three business has built-in advantages which give it an edge in the marketplace. Saudi Aramco is one such example. Everyone has the technology to pull oil from the ground, but very few can produce a barrel of oil for less than $10, like Aramco does. Aramco won the geological lottery, so it is able to profit no matter what happens to the rest of the industry. This illustrates what makes a good stage-three investment.

It is possible to make good investments in emerging technologies, but most of these opportunities look more like lottery tickets than wise investments. In the first stage, the vast majority of investments lose, while only a few win. Instead, I prefer to concentrate on the second stage -- a game of higher odds and lower variability. Warren Buffett explained it this way in his 2000 annual letter:

> *At Berkshire, we make no attempt to pick the few winners that will emerge from an ocean of unproven enterprises. We're not smart enough to do that, and we know it. Instead, we try to apply Aesop's 2600-year-old equation to determine opportunities in which we have reasonable confidence as to how many birds are in the bush and when they will emerge ...*

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