

Welcome to the Fourth Industrial Revolution



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To say we are living through a period of unprecedented change in innovation and technology is an understatement. The rapid convergence and development of technological advancement is being driven by three main factors: data collection and sharing, computational power, and talented computer scientists and engineers pushing the technological limits.

As Winston Churchill noted, “The farther back you can look, the farther forward you are likely to see.” So as we delve into this extraordinary period in progress, let’s be reminded of the three prior industrial revolutions.

First Industrial Revolution: Water and steam power use to mechanize production

Second Industrial Revolution: Electric power harnessed to create mass production

Third Industrial Revolution: Electronics and information technology helping to automate production

Now a Fourth Industrial Revolution (4th IR) is building upon the advancements realized in the Third.

Klaus Schwab, founder and executive chairman of the World Economic Forum, contends that the Fourth is its own separate and distinct revolution due to its velocity, scope and systems impact. The speed of current breakthroughs has no historic precedent. Compared to the prior three industrial revolutions, this newest surge is evolving at an exponential rather than linear pace. There are disruptions in almost every industry in every country. The potential of billions of people connected by mobile devices with incredible processing power, storage capacity and access to information is unlimited.

Consider the emerging technological innovations that surround us today: robotics, artificial intelligence, the Internet of things, autonomous vehicles, 3-D printing, nanotechnology, biotechnology, energy storage, and quantum computing. Examples of these new technologies are ubiquitous: AI recommending movies and TV shows for

you to watch based on your Netflix and Amazon Video viewing history, sensors in your car warning you of the pickup truck in your blind spot, a Roomba silently gathering data and analyzing the floor plan in your home so it knows where to vacuum. In 2019, we no longer need to meet the Jetsons. We are becoming George and Jane Jetson.

As all of this amazing technological innovation explodes around us, the size of the global middle class is expanding at an extremely rapid rate. The Brookings Institute estimated the size of the global middle class to be 3.2 billion people at the end of 2016; by 2028, it is expected to be at 5.2 billion. The global middle class is spending at a rate of approximately \$35 trillion annually; by 2030, the amount will have climbed to \$64 trillion. The ramifications of this global growth in wealth as married to advancements in technological power and innovation is mind-boggling.

One of the more exciting areas of the 4th IR is the harnessing of power through artificial intelligence (AI). Global consulting firm PricewaterhouseCoopers estimates by the mid-2030s, AI will contribute up to \$15.7 trillion to the global economy. McKinsey & Company consultants estimate AI techniques have the potential to create \$3.5 trillion to \$5.8 trillion in value annually across nine business functions in 19 industries. Recently, “deep learning” has taken AI to a next level. Deep learning is a form of machine learning that uses artificial neural networks that are based on mimicking how the human brain works. A machine is now able to teach itself to perform tasks, like speech or image recognition, without being programmed to do so.

The World Economic Forum (WEF) in collaboration with McKinsey & Company is tracking several “lighthouse” (guinea pig) companies across the globe as they implement 4th IR technologies and strategies in their respective industries. Approximately 16 companies are taking part, including Johnson & Johnson, BMW Group, Siemens, and Proctor & Gamble (P&G). In three years at a P&G facility in the Czech Republic, the company realized the following improvements:

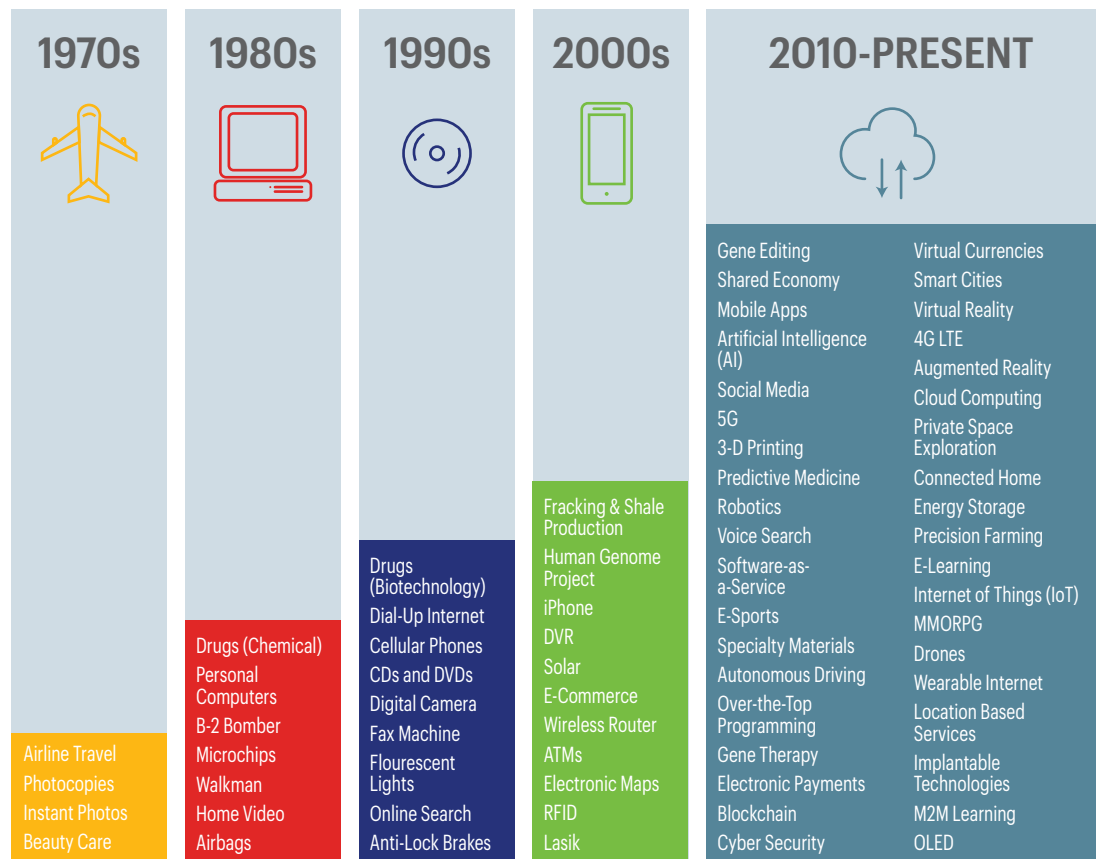
- Productivity increased by 160 percent
- Customer satisfaction increased by 116 percent
- Customer complaints were reduced by 63 percent
- Full plant cost was reduced by 20 percent
- Inventory was reduced by 43 percent
- Time for changeover was reduced by 36 percent

There are myriad issues and repercussions of the 4th IR that could disrupt global labor markets as well as enhance concerns over issues of privacy. On the other hand, the potential for consumers and investors as well as public and private industry sectors seems limitless. A high degree of collaboration among businesses, governments, academia and civil society will be required to maximize productivity benefits of this new era of innovation. The one constant in history has been and always will be change. We

now have a front row seat in witnessing one of the most incredible periods of change in history. The coming decades will provide opportunities to unlock extraordinary potential.

Consider the following as we navigate the 4th IR:

- In 1999, the first human genome was mapped for a total cost of \$2.7 billion. In 2015, the cost dropped below \$1,000.
- In 2010, spending on robotics was growing at 7 percent CAGR (compounded annual growth rate). It is expected to grow at a 23 percent CAGR through 2021.
- From 1996 to 2017, US digital advertising has grown at a 32 percent CAGR.
- In 2016, mobile payments totaled \$112 billion in the U.S. compared to \$9 trillion in China.
- It took 39 years for telephones to reach 40 percent of the population; it took smart phones just 10 years.
- When Uber was founded, the U.S. taxi market was \$2 billion. In 2018, the ride sharing market is expected to be \$17 billion.
- 100 million people boarded a plane for the first time in Asia in 2017. Worldwide, air passenger traffic is expected to reach 7.8 billion by 2036.



This information is for illustrative purposes only and is not intended as an investment recommendation nor does it constitute investment advice.

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