The Technological Age Is Upon Us

A decade from now, your job as you know it may no longer exist. People who work in nearly every industry on the planet will feel the effects of modernization: software programmers, caregivers, lawyers, deliverymen, interior decorators, advertisers, teachers, designers, farmers, even prostitutes might not recognize the job market ten years in the future. This is because there is an accelerating wave of change impacting almost all areas of human activity, and this change is being driven by disruptive entrepreneurial companies or startups working on advances across a whole range of emerging technologies—3D printing, artificial intelligence, machine learning, genetic editing, nanotechnology, robotics, solar, battery, lidar, computer chip speed, quantum computing, blockchain, 5G wireless, human machine interface, and voice recognition, to name just a few. The industrial revolution

of the twentieth century is giving way to the technological age of the twenty-first.

Here's one industry example: banking. The first jobs starting to disappear are back-office support positions: work that requires basic data processing and repetitive calculations is increasingly being done by artificial intelligence (AI). In fact, J.P. Morgan announced in 2016 that it had replaced 140 people tasked with resetting passwords and creating data reports with robots.[1] Next, the company launched what it calls the Contract Intelligence Program, or COIN, which interprets commercial-loan agreements, eliminating in seconds the need for in-house lawyers and loan officers. Even asset managers aren't safe: the management consultant company Opimas suggests that 30 percent of the asset management workforce will be replaced by machines.[2] Soon, AI will be capable of reasoning and explaining unexpected events, examining patterns to identify fraud, and using voice recognition to manage security. Meanwhile, J.P. Morgan is one of a handful of companies reading the message in the tea leaves and acting now by investing heavily in the latest technologies in the hope of embracing the change rather than bracing for it.

Creatives aren't immune to the coming changes, either. Artificially intelligent programs are capable of "deep learning," in which

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1   Hugh Son, "JP Morgan Software Does in Seconds What Took Lawyers 360,000 Hours," Bloomberg, February 27, 2017, https://www.bloomberg.com/news/articles/2017-02-28/jpmorgan-marshals-an-army-of-developers-to-automate-high-finance.

2   Axel Pierron, "AI and Alternative Data: Moving to Trading's Next Model," Opimas, July 24, 2017, http://www.opimas.com/research/267/detail/.

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they go through such massive amounts of data that now they can write their own algorithms and improve upon them. This means that you can show a computer an image of a hummingbird in flight in front of a tree, and it will identify it with greater accuracy than a human being could.

Deep-learning artificial intelligence can produce a picture of a hummingbird without seeing one. From nothing other than the algorithm, that computer will produce a picture of a hummingbird.

Computers with this capability, which is known as a "neural algorithm," are just starting to be able to write a Beethoven symphony that Beethoven didn't write. Take AIVA the AI composer, for example. Created by a musical startup team in Brussels and the United Kingdom, AIVA (which stands for Artificial Intelligence Visual Artist) has been taught how to compose music.[3] In fact, AIVA now composes scores for movie soundtracks and is the first virtual artist to be recognized by an author's rights society.

Here's how it works: First, AIVA concludes that it's listening to a Beethoven symphony.[4] (Listen for yourself at http://www. aiva.ai/.) Then, armed with that "knowledge," the computer can write music *like* Beethoven. It will write a symphony based on that learned algorithm.

3   Bartu Kaleagasi, "A New AI Can Write Music As Well as a Human Composer," *Futurism*, March 9, 2017, https://futurism. com/a-new-ai-can-write-music-as-well-as-a-human-composer/.

4   Leon A. Gatys and Alexander S. Ecker, Matthias Bethge, "A Neural Algorithm of Artistic Style," Werner Reichardt Centre for Integrative Neuroscience and Institute of Theoretical Physics, University of Tubingen, Germany, August 26, 2015, https://arxiv.org/abs/1508.06576.

Above is a sample of AIVA's composition, "Opus 3 for Piano Solo," created on March 26, 2016. (Reproduced via Creative Commons Share Alike License.)

A similar AI took less than an hour to create artwork in the styles of Van Gogh and Picasso.[5]

This kind of learning is a two-way process. The computer not only hears a song and knows what it is—it mimics creativity.

Even the oldest industry in the world could see robots taking over. An Amsterdam brothel recently purchased Fanny the sex doll, and her clientele has grown to the point that the brothel owners are ordering a second one.[6]

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5   Matt McFarland, "This algorithm can create a new Van Gogh or Picasso in just an hour," Innovations, *The Washington Post*, August 31, 2015, https://www.washingtonpost.com/news/innovations/wp/2015/08/31/this-algorithm-can-create-a-new-van-gogh-or-picasso-in-just-an-hour/?utm_term=.8aa45b8201c8.

6   Anthony Joseph, "Austrian brothel buys second sex doll after its first became more popular with customers than real women," *The Daily Mail*, August 21, 2017, http://www.dailymail.co.uk/news/article-4810660/Austrian-brothel-buys-SECOND-sex-doll-high-demand.html.

People suffering from Parkinson's disease and other neurode-generative brain disorders are now being treated by implanting a simple human-machine interface. By stimulating areas of the brain, the probes essentially remove the symptoms of Parkinson's.

The US military has spent billions of dollars to enable this mind-controlled technology for artificial limbs.[7] Now, amputees can not only regain movement of an artificial limb, but they can also gain sensation in that limb and tell whether the glass they are holding is hot or cold. To a soldier who lost his limbs in Iraq, imple-menting brain-robotic interfacing probably sounds pretty good.

CHANGE AND DISCONTENT

Experts like Art Bilger are predicting that up to 47 percent of all current jobs in developed countries will vanish,[8] and perhaps most sobering, not a *single* government is prepared for the massive and rapid changes about to take place in the workforce. "The looming threat of mass structural unemployment is everyone's problem," Bilger wrote on his website, workingnation.com:

> *Nearly half of the country could be affected directly and the rest could suffer from consequences of a devastated US economy. Many people fail to realize that it won't just be factory workers and unskilled laborers who lose their jobs.*

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7   C. Todd Lopez, "DARPA's mind-controlled robotic arm does everything," Army News Service, May 11, 2016, https://www.army.mil/article/167735/darpas_mind_controlled_robotic_arm_does_everything.

8   Art Bilger, "Working Nation," October 16, 2016, https://workingnation.com/welcome-to-workingnation-2/.

Technology is eliminating highly skilled positions in white-collar industries as well.[9]

Bilger's comments can easily be applied to every other developed country in the world. Combine these facts with globalization and longer life expectancies, and we've probably got a period of significant and disruptive change coming. It is clear most governments are simply unprepared and not moving quickly enough to cope with the arrival of the tech age.

That does not mean that there will be no jobs. Bilger and other experts believe that, in fact, there will be all sorts of job opportunities—we just don't know what they will be.[10] We do know, however, that those new jobs will require new skill sets and abilities.

In ten years, it is highly unlikely that people will follow the traditional paths to steady employment—why bother earning a master's degree in accounting if many accounting jobs (maybe most) will cease to exist? We're *all* going to have to rethink and retool our skill sets to adapt and thrive in the years to come. Plus, we're likely going to have to accept less job security in this economy, meaning we'll go through periods of employment, then a period of retooling, then enter another period of employment.

Just how do you prepare for a profession that does not exist yet? How are teachers supposed to tell their students, "Well, you

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9   Ibid.

10   Dom Galeon, "Ray Kurzweil Says Machines Won't Take Over Our Jobs," Futurism, September 26, 2017, https://futurism.com/ray-kurzweil-says-machines-wont-take-over-our-jobs/.

might want to be an author, but that may not exist as a profession in twenty years."

Wouldn't you want your kids to know that they're going to have to be entrepreneurial, and that they're going to have to retool every few years, and therefore, have the skills to retool?

Wouldn't you want them to at least have the vocabulary and awareness to engage in these conversations rather than listening to Grandma, who always wanted a lawyer in the family?

RETOOLING FOR THE TECH AGE: ENTREPRENEURISM FOR THE MASSES

To succeed, it is likely that people are going to have to retool four, five, or even ten times in their lives and be more entrepreneurial about managing the work they choose to do, and that work is going to have to be integrated with technology as it evolves.

Once you understand how the tech age will function, it's up to you to make it work. This is a world that is not going to spoon-feed you; it's going to move way too quickly for that. That may be uncomfortable, but it is the truth. People are going to have to rely on themselves and be self-starting and *self-re-restarting* in this startup-driven tech age.

In this world, you'll probably spend more time working for yourself as an entrepreneur. That means most of us will see a lot less job security. There is *no* period of stability in the future.[11]

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11   Mikael Tessema, "No Work Left to Do," *Harvard Political Review*, October 7, 2017, http://harvardpolitics.com/covers/no-work-left-to-do/.

We're not going through a change period that flattens off. We're going through an exponential change process that gets faster and faster and faster with each iteration.

I'm sure a few of you reading this may say you want nothing to do with what's coming, however, this is going to happen whether we face it head-on or dig our heads in the sand. It's already happening, and communities are being ravaged by high unemployment rates.[12]

If we are to avoid having an increasingly significant group of disenfranchised people, then society is likely to have to rethink the social contract. We'll discuss some of those changes in the last chapter, but for now, consider Donald Trump's election in 2016. He tapped into the anger of people in areas negatively impacted by the changing world and channeled it into a political victory. As more and more people's lives are disrupted by these changes, there is a danger that even more radical voices will emerge and lead to extreme leaders being voted into power.

But that doesn't have to happen. We can meet the changes and challenges of the tech age head-on if we start to learn about the coming changes and are willing to act *now*. To solve some of the biggest problems facing our society, we will need to innovate and deploy disruptive solutions. Truly innovative solutions are unlikely to come from big public or private companies—they are simply too busy running their current businesses or have too

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12   Jennifer Levitz and Valerie Bauerlein, "Rural America Is Stranded in the Dial-Up Age," In Depth, *The Wall Street Journal*, June 15, 2017, https://www.wsj.com/articles/rural-america-is-stranded-in-the-dial-up-age-1497535841.

much inertia to be able to make these giant leaps. Plus, there are few economic incentives for executives in these companies to take these risks and do this work.

I believe the most innovative part of our society is the startup ecosystem. Startups bridge the academic world, where many innovative ideas are born, with investors who provide capital and company founders who bring those ideas to reality. Unlike established corporations, startups accept the huge risks of failure inherent in each individual innovation because, at the ecosystem level, the financial rewards for both founders and their investors are large enough to make it all worthwhile.

MASSIVE CHANGE AND THE LAW OF ACCELERATING RETURNS

Change is happening faster now than ever before in human history. How fast? Computer scientist, futurist, and author Ray Kurzweil proposed the theory of accelerated change in his 1999 bestseller, *The Age of Spiritual Machines*. He expanded on that theory in 2001, in an essay called "The Law of Accelerating Returns." In short, he argues that technological change will happen so rapidly that it will be incomprehensible to humans:

> *An analysis of the history of technology shows that technological change is exponential, contrary to the common-sense "intuitive linear" view. So, we won't experience 100 years of progress in the 21st century—it will be more like 20,000*

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years of progress (at today's rate). The "returns," such as chip speed and cost-effectiveness, also increase exponentially. There's even exponential growth in the rate of exponential growth. Within a few decades, machine intelligence will surpass human intelligence, leading to the Singularity— technological change so rapid and profound it represents a rupture in the fabric of human history. The implications include the merger of biological and nonbiological intel-ligence, immortal software-based humans, and ultra-high levels of intelligence that expand outward in the universe at the speed of light.[13]
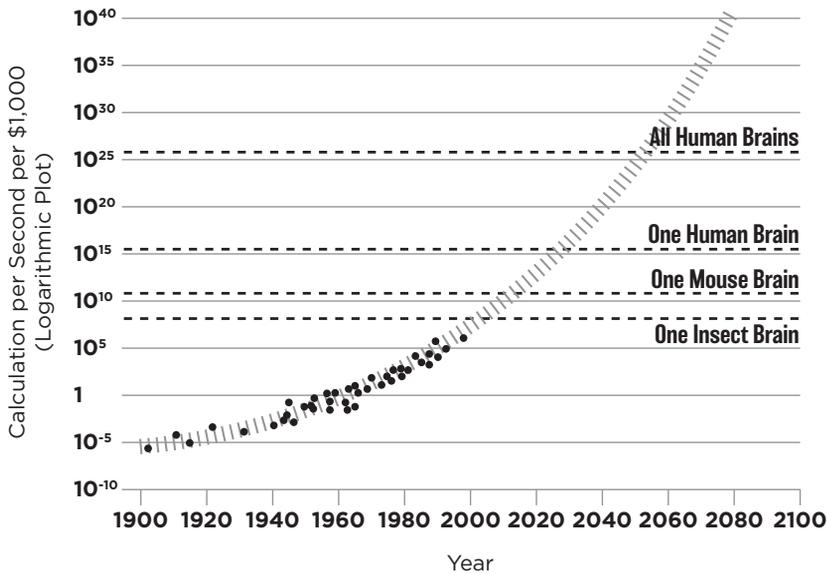
Kurzweil goes on to say that technological change in the twenty-first century will progress at a rate a "thousand times greater" than technological change in the twentieth century.

The chart on the next page illustrates Kurzweil's explanation of the accelerating pace of change through the ages:

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13   Ray Kurzweil, "The Law of Accelerating Returns," Essays, Kurzweil Accelerating Intelligence, March 7, 2001, http://www.kurzweilai.net/ the-law-of-accelerating-returns.

EXPONENTIAL GROWTH OF COMPUTING
Twentieth through twenty-first century

Calculation per Second per $1,000 (Logarithmic Plot)

| Year axis values: | 1900 1920 1940 1960 1980 2000 2020 2040 2060 2080 2100 |

Horizontal reference lines:
- All Human Brains (≈ 10^{25})
- One Human Brain (≈ 10^{15})
- One Mouse Brain (≈ 10^{10})
- One Insect Brain (≈ 10^{5})

Y-axis: 10^{40}, 10^{35}, 10^{30}, 10^{25}, 10^{20}, 10^{15}, 10^{10}, 10^{5}, 1, 10^{-5}, 10^{-10}

Year

As you can see, the time elapsed between each major change in human experience drops dramatically with each advance in technology.

Each new computer, cell phone, and TV is indicative of that rapid change—think of how many times you've had to replace your smartphone or desktop computer because they simply aren't capable of keeping up with the latest technology. We don't quite know what's happening with each new version, but we know as these machines change, we must switch them out so that we don't get left behind. But now, as illustrated above, this kind of change is happening in medicine, finance, manufacturing, automotive, music, agriculture, education, and almost every other industry on

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the planet, because these base technologies are enabling everything to evolve quicker than ever before.

All is not lost, however. Humanity has managed to adapt to massive changes before—we managed the change from an agricultural society to an industrial one—and that ability offers hope for how we navigate the course to a technological society. And I believe we're going to get through this tech revolution as well as we did when the nearly one-third of humanity that toiled in agriculture was put out of work and left destitute and starving to death. Yet society found new jobs for those left unemployed by modernization, and today, barely 1 percent of people are farmers of some sort. All that to say that though the pace of change is quicker now than earlier in history, we can adapt.

Let's not forget the scale of this change, either: the startup economy hums along to the tune of $146 billion—and is only going to keep getting bigger. The startup economy is not in the future. It is here and now, with wide-ranging implications on society.

AUTOMATION AND MODERNIZATION COULD FREE US FROM ROUTINE WORK

If we do this right, people will no longer have to do the drudgery of routine work. A certain proportion of every job is boring and repetitive; automation will make all that drudgery disappear. Indeed, many jobs will simply disappear completely, as illustrated earlier in the chapter.

However, automation and modernization could also free up

humans to be able to do things that they *want and choose* to do. Humans will add value to society in broader ways.

THE PURPOSE OF THIS BOOK

It's time to empower yourself with the skills and the knowledge necessary to succeed in the tech age. Consider this little volume a call to action—that it is vital to understand how the startup economy is driving the shift to the tech age. By understanding the shift that is taking place, you will be able to make the most of these changes for yourself, your family, your company, and your community.

The end notes provide good resources to deepen your knowledge on the various topics we will be covering.

In the next section, we'll talk about an example of the technological shift to make it real.

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TECHNOLOGY REVOLUTION

**Example #1: Blockchain and Cryptocurrency
Transform Banking**

We discussed the impact that the tech age and startups are having on our world in Chapter One. Throughout the book, we'll look at examples and how they're fostering new industries and revamping old ones.

Banks and insurance companies exist as reliable third parties to facilitate financial transactions. Currently, the way we transfer money requires moving it from one bank to another—people and businesses don't need to trust each other, because their banks do. That trust comes with costs and requirements that can be cumbersome to the average bank customer. Blockchain could eliminate the need for that trust—essentially eliminating the reason to have a bank in the first place—because blockchain moves money from one account to another without banks.

Here's how it works: the easiest way to think of a blockchain is as a public ledger where all previous forms of the ledger are visible to anyone and everyone who wants to see them. So, whenever I send someone a payment, it's recorded in this virtual ledger. Each record is called a *block*, and each block is linked to another through encrypted algorithms. Once a transaction is completed and recorded in the blockchain, that data *cannot* be retroactively changed without also changing every block created since the transaction in

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question, thus drastically reducing the potential for double-spending and fraud.

Blockchain transactions are conducted with cryptocurrencies like Bitcoin, a decentralized cryptocurrency that operates using—you guessed it—blockchain technology. Like blockchain, Bitcoin is a peer-to-peer transaction system, and since blockchain records every transaction, this means you can make a mobile payment without a PIN or card, anywhere in the world, at any time, without revealing your identity—just like a cash transaction. Plus, there are no fees to receive Bitcoins, and since they're stored in virtual "wallets," the cost of storing them is incredibly low.

Bitcoin and blockchain have the potential to change the financial landscape—democratizing it, really—by getting money to people and businesses that might not otherwise have the ability to secure money for various needs. This new way of transferring money is lowering fees, decreasing fraud, and even helping lift millions of people out of poverty.[14] And blockchain technology can be applied to many different industries where data is dispersed and parties need to rely on each other, such as in supply chains or in the healthcare community.

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14   Nikolai Kuznetsov, "How Emerging Markets and Blockchain Can Bring an End to Poverty," *Forbes*, July 24, 2017, https://www.forbes.com/sites/nikolai-kuznetsov/2017/07/24/how-emerging-markets-and-blockchain-can-bring-an-end-to-poverty/#73965bb4a0c7.

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