STEVE BROWN

THE INNOVATION ULTIMATUM

HOW **SIX STRATEGIC TECHNOLOGIES** WILL RESHAPE EVERY BUSINESS IN THE 2020s

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For my parents, who ultimately made everything possible for me.
For my lovely wife, who supported me every step of the way.
And for the inimitable Richard Tonn,
who so wanted to read this book but never saw it finished.

CONTENTS

FOREWORD
DON'T FEAR THE FUTURE . . . PREPARE FOR IT

Would you like to know a secret about the future?

The future isn't fixed. There is not a single future that we are all running toward, helpless to do anything about. The future is built every day by the actions of people and organizations. This is why it is so important to be an active participant in the future. People should not be passive. No organization should sit back and let the future happen *to* them—that never ends well. The first step to becoming an active participant in your future is gaining knowledge, and this book is a great place to start.

All too often when people learn about the future it is cloaked in a shroud of fear and dread. Artificial Intelligence. Blockchain. Augmented Reality. The Internet of Things. 5G networks. Autonomous Machines. Each of these advances will reshape the world. No industry will be untouched. But these changes are not organization-ending events. These transformative technologies don't mean the end to your business or organization. They will however mean that you will need to adapt and to prepare your teams for change. By learning about these technologies today, understanding their possible and potential impact, you can prepare for tomorrow.

Once you have done this, then you can ask yourself and your organization: What is the future you want to build? What is the future you want to avoid? If you are reading this, I believe you know that you will have to do *something*. Organizations that ignore the future are the ones

that find themselves disrupted, rudderless, and obsolete. This informed, active participation means that you get to decide your own future and then begin to stake out the prudent and pragmatic steps to get there.

Would you like to know another secret about the future?

Fear makes you stupid. When humans are fearful, their brains can only make one of three decisions: Fight. Flight. Freeze. We have all seen really poor business and life decisions that have been made during these three paralyzing states. Knowledge and informed commentary about the future can help to dispel this fear.

Beware of anyone who tells you that you should be scared of the future. Instantly be suspicious of anyone who tells you that because of some technology, the world will never be the same again and that you are powerless to do anything about it. Ultimately, what this person is trying to do is disempower you, to scare you into making poor decisions, or worse . . . to frighten you into inaction.

This is the power of Steve Brown's work as a futurist. He has spent years empowering organizations to make well informed decisions about the future. Sometimes they might be difficult decisions, but ultimately his goal is to give organizations the vision and perspective to not only plan for the future but get excited about it. This book is a valuable tool for people to become informed about the future and begin the necessary conversations about how to prepare for—and thrive in—the coming tomorrows.

Brian David Johnson, author and futurist

Arizona State University

INTRODUCTION
TO SURVIVE, EVERY COMPANY MUST BECOME A TECH COMPANY

Innovate—or die.

This business maxim has never been truer than it is today. Consumers are demanding and fickle. Their expectations are set by the best and most recent experiences they've had. They have no tolerance for companies that skate by and that don't constantly strive for excellence. Consumers expect brands not only to deliver, but surprise. There is a massive and rapidly widening gulf between the capabilities of companies that invest in technology and those that don't.

It is a time of reckoning. Emerging technologies will empower brave innovators to make giant leaps forward, while those without vision, courage, and agility will wither and perish. Winners will change the world.

The Innovation Ultimatum

It's no coincidence that most of the companies on the *Brand Z* list of the top 100 most valuable global brands invest heavily in technology to drive innovation into every aspect of their business: product development, operations, marketing, and customer service.

In the next decade, a suite of six strategic technologies—artificial intelligence (AI), Blockchain, the Internet of Things (IoT), augmented reality, autonomous machines, and 5G networks—will drive unprecedented innovation into products and services, creating entirely new business models along the way. Investment in information technology (IT) will be a strategic imperative for every company. Every company will become a technology company, and every company will become a data company. Business operations will be retooled using both process automation and worker augmentation.

Automation and Augmentation

Automation will speed business processes, improve quality, and reduce costs. Augmentation will elevate the capabilities of workers, blending machine and human intelligence. Artificial intelligence will assist us, partner with us, guide us, inspire us, and make us even more capable. We don't need to merge with technology to collaborate closely with it.

Product, Service, and Business-Model Innovation

New products and services are the best way to retain existing customers and gain new ones. In the next decade, expect significant innovation in products and services as technology becomes embedded inside anything and everything. Companies will use data, sensors, and machine intelligence to elevate business models and get paid more for their efforts, moving upward from products to services, services to experiences, and experiences to transformations.

The Innovator's Palette

In the coming years, we will see the broad deployment of six important technologies. Think of these technologies as six new colors being added to your business innovation palette. To some extent, your ability to innovate will only be limited by your imagination.

Six Technologies Intimately Connect the Digital and Physical Worlds

Each of these six technologies builds a bridge between the digital world and the physical world. Computing capabilities, and value created in the digital world, both advance exponentially. As we build ever more intimate connections between the digital and physical worlds, more of that value flows across the bridge to be experienced in the physical world.

Engineers have been building this bridge for several decades now. This, in itself, is not a new story. But the next decade will dramatically accelerate the building of the digital–physical bridge. Trillions of sensors will enable the digital world to understand what's happening in our physical world. Robots and other autonomous machines will enable the digital world to act within the physical world. Artificial intelligence will give digital devices eyes and ears so they can make sense of the world. Distributed ledgers and Blockchains, combined with arrays of sophisticated sensors, will track the movement of physical goods around the planet. Augmented reality will blend digital objects and information with our visual perception of the physical world. Finally, 5G networks and satellite constellations will tie everything together, allowing everything to connect with everything else.

This is an exciting (and daunting) time to be in business. Competition is fierce. Customers are never satisfied; neither are shareholders. In the 2020s, the companies that thrive will be the ones that never rest on their laurels. These companies will fully embrace every one of these six technologies and combine them in creative ways to leapfrog competition. Those that hesitate risk irrelevance. Nobody is immune, not even today's titans. Winners will create massive value in the digital domain and use the six technologies to bridge that value into the physical realm, streamlining operations, delighting customers, and creating exciting new products and services.

Winners Will Wield and Combine These Technologies Like Artists Use Color

The six technologies that are the focus of this book aren't all brand new. The term "artificial intelligence" was coined in the 1950s, the ideas

behind the Internet of Things have been around since the last century, and Blockchains were first created more than a decade ago. For various reasons, each is only just coming to maturity. It is the creative combination of these technologies that will lead to breakthrough innovation. For example, IoT sensors are made exponentially more powerful with AI. Next-generation, massively scalable distributed ledger technology will combine with ubiquitous low-earth-orbit satellite networks to transform logistics and the supply chain.

As innovators seek to reimagine how they create value, serve customers, and operate their businesses, new technologies act like new colors in their creative palette. The most impressive innovations will be painted using a creative combination of many colors. *Uber* was created at the intersection of apps, GPS sensors, cloud services, and the gig economy.

Expect More Change in the Next 10 Years Than the Last 40

New technologies change the innovation landscape forever. Some technologies have a much larger impact than others. Since the 1980s, four major technological leaps defined the innovation landscape for business IT: the PC, the web, mobile, and the cloud. When IBM launched its personal computer in 1981, it kicked off an upward spiral of innovation and productivity. In the early 1990s, the rise of the web meant that every business had to open a new front door, online. Steve Jobs kicked off the mobile revolution in 2007 and put a portable supercomputer into the pockets and purses of billions of people around the world. Finally, the cloud computing era, which occurred concurrently with the mobile era, made it easier for companies to create digital value, scale it on demand, and innovate rapidly. Sure, there were other technologies that were stirred into the mix, but those were the big four. Four decades, four big leaps forward, four new colors in the innovation palette. In a single decade, the 2020s, six technologies will combine to fuel more innovation than in the last 40.

Should I Be Afraid or Excited?

From my time on the speaking circuit, I've learned that whenever I talk about future technology, particularly AI, it engenders a wide range of emotions in my audiences. Some people are energized and excited by the potential AI holds for humanity. Others are filled with fear. Most manage a healthy balance of both.

Technology has the potential to reshape humanity and propel it forward in giant leaps. AI may help us cure major diseases and unlock the secrets of the universe. Automation may also displace hundreds of millions of people from the workplace, and some tech luminaries warn that AI may ultimately destroy the human race.

Movies about aliens, killer robots, and pandemics sell tickets. Dystopian stories outsell utopian stories and strong stories are driven by conflict and drama. So, for decades, Hollywood has been fascinated by the darker side of technology's potential. Audiences love the spectacle of a *Terminator* stomping on human skulls, Mr. Anderson fighting Neo inside *The Matrix*, or Ava manipulating and killing her way out of captivity in *Ex Machina.* Directors want to tell a rollicking-good story; they're not there to accurately portray reality. We must recognize that our preconceptions and fears about technology are grounded in our exposure to these fictional stories. In part, this book is an attempt to counterbalance the Hollywood storytelling machine. Overall, technological advancement is a very positive force.

Our ancestors were afraid of telephones, televisions, and rock music. In the nineteenth century, people refused to ride trains believing that if your body moved faster than 30 miles per hour you would melt. Fire can warm a home or burn it to the ground. A split atom can power an entire city or devastate it. Technology is not the culprit; it's how we use it that matters. We must deploy technology responsibly, thoughtfully, and in a manner that benefits humans without posing *unreasonable* risks.

We are right to be cautious about the development of technology, but we must not fear it. Technology promises incredible potential to serve humanity. It may help us to address the challenges of climate change,

eradicate diseases, improve transportation safety, eliminate fraud, limit waste, lower the cost of education, and deliver breakthroughs in the future of energy, materials science, and biology. Somebody reading this book—you, or your kids, or their kids—may have their lives saved by pharmaceuticals developed by a future AI. Should we deny you life because we've seen *The Terminator* a few too many times? We must retain healthy skepticism and ask tough questions about new technology, but remain open to the bounties it will bring. The six technologies described in this book will bring incredible innovation to every part or our lives. This is an exciting time to be alive! While automation will inevitably destroy some jobs, technology will create many new ones and elevate human work by taking on dull, routine tasks. New technology will create entire new career paths and make work more meaningful, challenging, creative, and rewarding.

Getting the Most Out of This Book

In the first part of this book, we cover each of the six technologies in turn: artificial intelligence, the Internet of Things, autonomous machines, Blockchains, augmented reality, and 5G networks. If you are already well-versed in these technologies, you might skip to the second part, but note that there are many stories included in these early chapters that demonstrate how these technologies are already being applied to solve real business problems.

In the second part, we review the high-level business implications of these technologies—automation strategies, the strategic importance of data, and the future of work.

In the third and final part of the book, we review specific examples of early innovation using the six technologies. Each chapter is focused on a particular industry. They describe the unique challenges of each industry, how technology is already solving real business problems in that industry, and the key lessons readers can learn and apply elsewhere.

No matter which industry you are in, I strongly encourage you to read this final section of the book. If you're in healthcare, read about manufacturing and transportation. If you're in retail, read about

construction and supply chain, and so on. Steal ideas with pride. Lessons can always be learned from other industries. I hope you will read about something happening in another industry and think, "Well that's nothing like what we do, but it's given me a great idea. . . ."

Please read this book with a mind-set of exploring a world of possibility. Every businessperson, no matter their seniority, line of business, or role within a company, needs to understand the six technologies described in this book. Businesspeople don't need to understand the technical ins-and-outs of how these technologies work—that's a role for the IT department—but they must understand the practical and strategic implications of these technologies, and how their capabilities will evolve with time. Armed with these insights, business leaders can guide informed conversations with their teams as they build their medium- and long-range plans.

Collectively, these technologies will transform business operations, customer expectations, customer relationships, labor strategies, and the competitive landscape. No industry is immune. No company is exempt.

Don't Panic; Don't Wait; Get Help

Every business should prepare for widespread turmoil and change. Standing still is no longer an option, especially for industries that have stagnated for years, or decades.

Resist the temptation to panic. This level of change can feel overwhelming but remember that every company is in the same boat. By virtue of reading this book, you already have an advantage. That said, there is no time to waste. Don't wait to embrace the technologies described in this book. Start strategic discussions today. Connect your IT department with your strategic planners and task them to drive innovation across every aspect of your business. Fund pilots and try new approaches. And remember that unless you are a tech company, you can't be expected to understand and implement artificial intelligence and other technologies on your own. So, get help. Push your suppliers for solutions that embrace these technologies and deliver the capabilities you need. If they don't respond, find new suppliers.

To summarize: Don't panic. Don't wait. Get help.

Above all, prepare your organization to embrace change and get them excited about driving innovation into everything you do.

The Innovation Ultimatum is both a call to innovate for survival in a rapidly evolving competitive environment, and a moral imperative to use these six technologies to serve people, elevate work, and make a lasting, positive impact on the world. Let's dive in.

Part I

Six Technologies That Will Reshape Business in the Next Decade

1 Artificial Intelligence

Artificial intelligence (AI) is all around us. It underpins speech recognition, natural language processing (NLP), and machine vision. AI is behind the sophisticated spam filters that keep your inbox (mostly) free of junk mail. It flags unusual usage patterns on your credit card and assesses your credit score. It suggests tags for people in photos you post to Facebook. It offers intelligent suggestions when you use the search bar. AI is all around us, yet we have only scratched the surface of AI's future potential.

Like a femme fatale in a classic movie, AI seems simultaneously sexy and scary. While artificial intelligence may help us to unlock cures for diseases, discover new wonder materials, and predict the future, some people worry that it threatens human life as we know it, either economically or existentially.

What Is It and Why Is It Important?

Artificial intelligence is the umbrella term that describes the effort to mimic human skills and replicate human intelligence with machines. Various approaches have been used to build artificial intelligence over the years. In the 1980s and 1990s, "knowledge systems" were all the rage. Today, most modern AI uses a technique known as machine learning.

Machines learn from examples in the form of training data. Most machine learning systems are built with artificial neural networks (ANN), also known more simply as neural networks.

Electricity, Digital Computers, and Artificial Intelligence

About 120 years ago, electrification changed the world. Electricity refrigerates our food, washes our clothes, lights our homes, and powers our factories. Electricity transformed every industrial sector and now powers modern life.

Roughly 60 years ago, the first digital computers were built. Initially limited in their capability, computers evolved into powerful machines that brought us word processing, spreadsheets, the internet, video games, social media, streaming media, and smartphones. Like electricity before them, computers transformed business and changed our lives.

Artificial intelligence will have an impact as profound as both electrification and the digital computer. AI luminary Andrew Ng is the former chief scientist at Baidu, former lead of the Google Brain project, and now runs Landing.ai, a company that solves manufacturing problems using AI. In 2017, Ng observed, "Just as electricity transformed almost everything 100 years ago, today I actually have a hard time thinking of an industry that I don't think AI will transform in the next several years."

Artificial intelligence is a huge deal, worthy of the first and longest chapter of this book. Sundar Pichai, CEO at Google, once said, "AI is one of the most important things humanity is working on. It is more profound than, I dunno, electricity or fire." While hyperbolic, this statement from the head of one of the world's most powerful tech companies should make us all sit up and listen.

AI's hype is largely justified. Just as digital technology was a vital component of any successful business strategy in the 1990s and 2000s, so AI must be central to strategic plans of the 2020s.

The Next Era of Computing: Traditional Digital versus Artificial Intelligence

Artificial intelligence and traditional digital computers are complementary. Importantly, AI solves problems that are costly or impossible for traditional computers to solve. The two technologies will coexist and work side-by-side, each solving a different set of problems. For a language translation app on a smartphone, traditional computing presents an attractive interface, while AI handles voice recognition and language translation functions.

AI solves problems using a radically different approach from traditional computers. Traditional computers are programmed to solve problems. Programs apply a set of rules to data and compute results. Said another way, they take rules and data as input, and output results. AI solves problems without using preprogrammed rules. Machine learning, a popular form of AI, takes data and results as its input and infers rules as its output. Through a complex training process, AI finds patterns and associations between data and results and divines its own rules for how they connect. This trait lets us solve entirely new problems with AI. It's why AI can seem so magical: It solves problems we don't know how to solve ourselves.

To find complex associations in data and build rules, AIs must be trained with thousands or sometimes millions of examples. Today's AIs are not like human brains. While some of the organizing principles are the same, human children learning about the world don't have to see a million automobiles before they can recognize one and adorably yell the word "car."

A 1950s Concept and 1980s Algorithms Meet Modern Computing Horsepower

The term "artificial intelligence" was first coined in the 1950s. The core algorithms behind today's AIs were first proposed in the 1970s and popularized in the mid-1980s. But it was 2012 before the recent

crop of AI breakthroughs began to appear. Why the quarter-century delay? Older computers lacked the performance to run AI applications. High-end graphics processors, GPUs from companies like Nvidia, eventually provided the computing horsepower needed. Their parallel number-crunching architectures, designed to create realistic video games, turn out to be pretty good for training an AI. As well as fast computers, AIs need training data to learn from. As digital storage costs fell and broadband speeds increased, data flooded in from many sources: billions of industrial sensors, millions of smart cameras, billions of people sharing trillions of photos and billions of videos, and trillions of clicks on social media. Users upload 500 hours of video to YouTube every minute and more than 1.2 billion photos to Google Photos every day (Source: Wikipedia).

With cheap, powerful computing, an avalanche of training data, and a small army of AI-savvy researchers and developers, artificial intelligence is now poised to solve myriad problems and create many exciting new capabilities.

What Can You Do with It?

Artificial intelligence can solve a wide variety of problems. Considering all the possible applications of AI can be overwhelming. I've found it helpful to cluster AI applications into eight broad categories:

1. Machine vision
2. Natural language processing (NLP) and voice platforms
3. Exploration and discovery
4. Better-informed decision-making
5. Predicting the future
6. Seeing the world through a new lens with super sensors
7. Solving complex problems by learning from experience
8. Creating and co-creating content