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BEST BUSINESS BOOKS 2015: DISRUPTION

The Machine Age

BY STEVE LEVINE

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Martin Ford, **Rise of the Robots: Technology and the Threat of a Jobless Future** (Basic Books, 2015)

Walter Isaacson, **The Innovators: How a Group of Hackers, Geniuses, and Geeks Created the Digital Revolution** (Simon & Schuster, 2014)

Paul Vigna and Michael J. Casey, **The Age of Cryptocurrency: How Bitcoin and Digital Money Are Challenging the Global Economic Order** (St. Martin's Press, 2015)

JUST AS AT THE BEGINNING of the Industrial Revolution, outsized angst over the imminent disappearance of jobs is a rampant concern in our age. When intelligent humanoid robots strip labor away from the vast majority of the working-age population, the apprehension goes, society as we know it may not make it. The *Atlantic* foretold this prophecy in a cover story titled “The End of Work”; *Foreign Affairs* exclaimed simply, “Hi, Robot.” It is demoralizing, to say

the least. In the summer science-fiction chiller *Humans*, a teenager wonders why one should aspire to a career in medicine when future robots will do the job better.

A minority of our thinkers are pushing back: Martin Wolf, the ordinarily decorous chief economics columnist at the *Financial Times*, can barely contain his scorn on this subject; certainly, no super robot race is imminent, Wolf grumbles. At *Quartz*, my colleague Tim Fernholz thinks that the panic is far overdone

— not only are robots not frightening, but we need as many as we can get to help us become more productive.

Doing the Robot

No one can predict with certainty the outcome of the torrent of fresh automation washing over us. But this is no faddish debate. As Martin Ford makes clear in his impressively researched and, yes, frightening *Rise of the Robots: Technology and the Threat of a Jobless Future*, the evidence is ample that artificial intelligence is already occupying jobs previously thought doable only by humans. That Ford writes in a terse, understated style and himself comes from an engineering background — he was chief technology officer of a Silicon Valley software company — makes his message all the more worrying. His book is my pick for the best business book of the year on technological disruption.

The degree of robots' eventual societal penetration and disruption is a matter of conjecture. By one estimate, almost half of all U.S. jobs are at risk, and Ford agrees that the scale will be profound. His favorite verb is *vaporize*. And he wields it, along with its synonyms, like a taunting wizard, to describe the destiny for whole segments of white-collar employment. Robots are a death warrant for any job whose core requirement is experience or judgment. Lawyers, journalists, Wall Street analysts? Vaporized. Evaporated. Disappeared. The same goes for pharmacists, radiologists, even computer programmers — Ford quotes a 2013 study that asserts that the number of U.S. engineering and computer science graduates that year exceeded available jobs by 50 percent.

In embracing the grim side of the debate, Ford tilts against the economic orthodoxy. Most analysts believe that technological breakthroughs, although they destroy some jobs, end up creating far more by spurring new industries and platforms. The theory of creative destruction explains why cars displaced buggy-whip manufacturers — and why far more positions were created in auto plants, gas stations, auto rental firms, and body shops.

Ford flatly calls the theory outdated. This time really is different, he says, namely because of technology. Although many people worry that artificial intelligence may surpass the human mind, the more telling development is that computers are becoming much better at performing predictable tasks. Although we don't think of white-collar work this way (especially those of us who are white-collar workers), many professions are reducible to small, repeatable components. And that makes them vulnerable to obsolescence. A paradox of the in-

formation age, Ford writes, is that “as work becomes ever more specialized, it may, in many cases, also become more susceptible to automation.”

Ford mischievously reprints a few paragraphs of sparkling prose about a Dodgers–Angels game (the Dodgers won 7–6), complete with a colorful quote from right fielder Vladimir Guerrero. But we learn this piece was “written” by StatsMonkey, a software program created by students at Northwestern University, who went on to start a Chicago company called Narrative Science. The company's cofounder forecasts that by 2026, 90 percent of news articles will be written by machines.

It gets worse. It's a myth, Ford writes, that computers can perform only as they are programmed. A technique called genetic programming, reflecting evolution and mutation, can create music, write programs, and even “think” outside the box. One huge player to keep an eye on: IBM's Watson, which famously defeated *Jeopardy!* champion Ken Jennings in 2011. Since that triumph, IBM has doubled Watson's capabilities. Next, Ford argues, robots equipped with virtual reality technology will start vaporizing face-to-face jobs (for example, those of university professors and administrators, and even white-collar managers).

In *The Innovators* (on which more is written below), Walter Isaacson cheerfully argues that all will end well because we humans will collaborate with the machines threatening our jobs. But Ford ridicules a prime bit of evidence of that claim — that joint human-and-computer chess teams are beating solo machines, and if they can work together, anyone can. First, Ford thinks that such chess team superiority will be short-lived, as computers are eventually bound to trounce traitorous machines collaborating with humans. Second, he argues, such shows of human–machine chess competition are theater — most companies are interested in much more prosaic uses for computers, such as navigating millions of legal records for big cases, a thankless (but very expensive) task traditionally handled by brand-new law school graduates.

Healthcare may in part be an exception to the coming professional bloodbath. Smart machines will be able to rapidly assess hundreds of thousands of medical cases and histories in order to diagnose a case, but it will require a technician to operate those machines. And considering the growing population of retired baby boomers, doctors will be in higher demand than ever before. But we could soon be seeing robots donning white coats. Earlier this year, after Ford's book was published,

Robots are a death warrant for any job whose core requirement is experience or judgment.

IBM said it had “been giving Watson eyes,” making it able to examine CT scans, X-rays, and mammograms, and cross-reference the results with patient records to emerge with a solid diagnosis.

What is society to do in a jobless future? Like many others, Ford advocates a guaranteed national salary for every adult. To traverse the politics, this move could be labeled a “dividend,” the same term that Alaska uses for the annual oil profits sent to every resident of the state. It would be designed not to discourage work; some people would tend to be laggards, but only those who would be so under any other system. Those who were naturally more productive would continue trying to find a place for themselves.

A Group Effort

Ford describes a future in which technology dominates humanity. In *The Innovators: How a Group of Hackers, Geniuses, and Geeks Invented the Digital Revolution*, Isaacson — author of a best-selling 2011 biography of Steve Jobs — looks to the past and describes how humanity reached this juncture. His narrative of the information revolution starts with Charles Babbage, the 19th-century inventor of the Difference Engine (the first whack at a computer), picks up with the creation of the transistor at Bell Labs in 1948, and winds up at Google.

Along the way, the author says his intention is to dispel the belief that big invention is mostly the province of sole inventors. He wanted to show that technological disruption is actually a team sport. “Only in storybooks do inventions come like a thunderbolt, or a lightbulb popping out of the head of a lone individual in a basement or garret or garage,” he writes.

Isaacson, president of the Aspen Institute and a biographer of lone geniuses such as Ben Franklin and Alfred Einstein, only partly succeeds. This is because he ends up arguing against himself. Some of the biggest leaps of the information age may not have been made by a single person. But a lot were created in pairs or extremely small groups that effectively made them “lone” — the great breakthroughs were built on the work of others who came before, but in the end did not involve casts of thousands.

Notwithstanding his unnecessary diversion into the

lone inventor theory, the book is fast-paced and compulsive reading. Isaacson is a remarkably fluent writer. We’ve heard it elsewhere, but the story of the megalomaniac Bell Labs physicist William Shockley remains one of the most breathtaking incidents of personal vanity in U.S. biography. At Bell, John Bardeen and Walter Brattain collaboratively built the first transistor, which sent Shockley (their supervisor) nearly out of his mind with envy. For months, Shockley worked feverishly — yes, all by himself — to produce a better approach. He became so unmanageable that, finally, just to mollify him, Bell agreed that any photo of Bardeen and Brattain would include Shockley. For the most famous portrait of the three, Shockley elbowed his way into Brattain’s office chair, and sat there like a mandarin, with the others looking on. The tragedy comes later in Silicon Valley, where Shockley lured a group of Bell men to make semiconductors. Shockley’s pathologies, including intense paranoia and a drive to take all the credit, drove them away. The outcome was that his protégés founded Fairchild Semiconductor — the inventor, along with Texas Instruments, of the microchip — and then Intel. Shockley himself vanished into relative obscurity.

Among the most bracing facts in the account of the microchip are these: The first prototype of the microchip cost US\$1,000 in 1959; by 1968, the cost was \$2. The same went for devices containing the microchips. The first blockbuster TI desk calculator was \$150 in 1967. In 1975, it cost \$25; by 2014, Walmart was selling one for \$3.67. (This data merits a Post-it Note on the keyboards of those who loudly criticize today’s expensive battery and electric car technology.)

Isaacson argues, as have others, that the alienation of the 1960s was a primary cultural factor leading parades of young people to electronics. Amid these stories, we get the shining core of the book, a long chapter on software in which Isaacson builds on his brilliant prior telling of the creation stories of Bill Gates and Paul Allen at Microsoft, and Jobs and Steve Wozniak at Apple. This chapter alone is worth the price of the book.

Currency Events

Isaacson’s narrative does not get to bitcoin, but a libertarian streak also lies at the heart of the computer-

generated money that's the latest technology mania. In *The Age of Cryptocurrency: How Bitcoin and Digital Money Are Challenging the Global Economic Order*, Paul Vigna and Michael J. Casey provide a much-needed account that finally explains something that, to me at least, has been a mystery: What precisely is bitcoin, and who on earth is Satoshi Nakamoto?

Vigna and Casey, both veteran reporters at the *Wall Street Journal*, take us into the world of young, tech-minded crypto-anarchists “repulsed by the excesses and abuses of the financial system.” Their people are angry about “intermediaries” who get rich by allowing people to spend their own money — an activity that ought to be free.

Who are the culprits behind these excesses and intermediations? Credit card companies and Wall Street investment banks, which charge transaction fees that may seem small but that add up to hundreds of billions of dollars in profits, and 0.5 to 1.5 percent of the GDP of many countries.

So it is that these angry folks on the marginsglom onto Satoshi Nakamoto, an anonymous figure who one day in 2008 posts an announcement of a fail-safe cryptocurrency that can't be hacked or abused. Nakamoto vanishes as mysteriously as he surfaces, but his invention — bitcoin — survives, leaving an irresistible creation myth for his growing followers.

Simply put, bitcoin is a way for strangers to buy stuff outside the usual economy. After reading this book, I am convinced of the sincerity of bitcoin fans, among whom the authors clearly count themselves — Vigna and Casey are not dispassionate observers. (Last summer, Casey left his position at the *Journal* to become a senior advisor at MIT's Digital Currency Initiative.) But I'm not fully persuaded of the need for, or the imminent triumph of, bitcoin.

The authors bring no less an intellectual figure than Larry Summers — former Harvard president, former Treasury secretary, personification of the establishment — to their defense. Summers says that those who fail to grasp the torrent on the horizon “are on the wrong side of history.” The bitcoin concept may naturally sound “as outlandish to the modern mind as the idea of self-

governance must have been to many in 1776,” Summers says. But the world has changed. Get used to it.

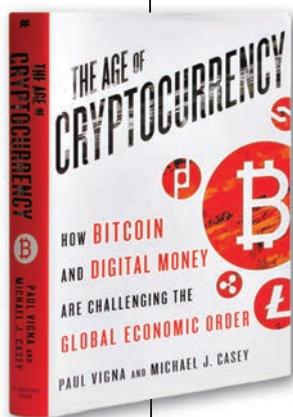
Yet Summers's take seems exaggerated and, in some spots, the authors themselves can sound a bit unhinged. They ridicule “the seductive idea that every dollar printed is an interest-free loan flowing from the people to the state,” and lament that “controlling the nation's money has allowed governments to control the apparatus of power.” Come again?

Disruptive technologies don't have to vanquish incumbents in order to be significant. Often, they provide the greatest service by pushing existing firms to adapt and improve. On August 17, I received an email from a company called TransferWise that offered to shift money abroad for a 0.5 percent fee. Among TransferWise's investors, it said, are Virgin America founder Richard Branson and venture capitalist Peter Thiel. In Kenya, millions of users of M-Pesa — the country's cheap and wildly popular mobile payments network — can already send money electronically on their cell phones. A revolution in which bitcoin replaces the dollar, euro, and yen as a unit of exchange seems improbable. It is likely, however, that we'll see credit card companies forced to lower their

3 percent transaction fees to a rate closer to 1 percent.

At the end of this engaging and vigorously reasoned book, the authors argue for a middle ground, in which bitcoin is part of the mix but neither the anarchists nor the traditional system wins. Ten years from now, when we go to get a checkup from our robot doctors, we may be able to pay in either dollars or digital currency. +

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Steve LeVine

stevlevine@gmail.com

is the Washington correspondent for Quartz. He is the author of *The Powerhouse: Inside the Invention of a Battery to Save the World* (Viking, 2015).

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