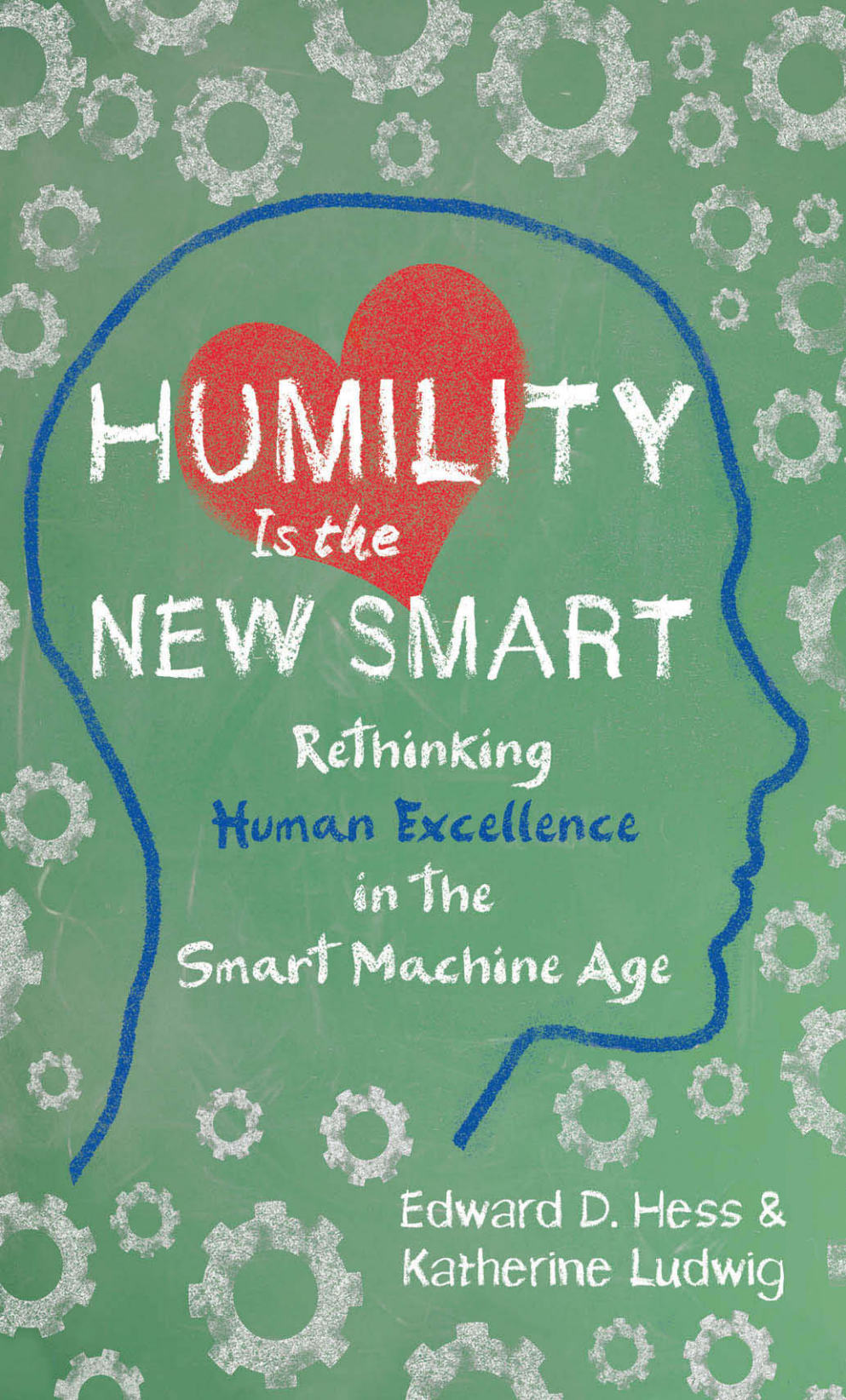
HUMILITY
Is the
NEW SMART
Rethinking
Human Excellence
in The
Smart Machine Age
Edward D. Hess &
Katherine Ludwig

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More Praise for *Humility Is the New Smart*

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—Frank H. Foster, Managing Director, Frontier Venture Capital

"This book was a revelation to me. Who knew that the secret to survival in this intimidating new world of machine intelligence was for us to become more human? In both our business and our private lives, we can choose fear and ego and retreat into ourselves in the face of these challenges, or we can embrace collaboration and positivity instead. Hess and Ludwig show us how to make the life-affirming choice."

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"An insightful, practical, enriching book for individuals and organizational leaders. NewSmart can be a key to unlocking immense organizational value, one human interaction at a time."

—Sean Ryan, Senior Vice President, McGraw-Hill Education

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"This compelling book is about how we can succeed in the age of AI—by excelling at what differentiates us as humans. Leaders will have to be good at 'not knowing,' quieting their ego and mastering their fears of looking bad and making mistakes. Instead of managing others, leaders will have to manage themselves to enable others."

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"Hess and Ludwig offer revolutionary approaches to self-management along with innovative and insightful leadership platforms for the Smart Machine Age. A powerful book!"

—Jeanette K. Winters, Senior Vice President and Chief Human Resource Officer, Igloo Products Corporation

"Outstanding book with rock-solid arguments about why doing a 'good job' will no longer be good enough in a smart machine world and how NewSmart beliefs and behaviors can help humankind master this challenge."

—Kurt D. Bettenhausen, Chair, Digital Transformation Group, VDI, Germany

"How must our notions about individual and organizational excellence adapt to the Smart Machine Age? Hess and Ludwig offer insights that are perceptive, provocative, and powerful! Their ideas can help your organization and you adapt to the coming transformations spurred by big data, deep learning, artificial intelligence, and automation."

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"*Humility Is the New Smart* is a must-read for business and political leaders, parents, teachers, and everyone interested in understanding the challenges and opportunities of the coming Smart Machine Age. The explanation of humility—its philosophical meaning and application to leadership—is the best I've ever read."

—Fernando Mercé, President, Latin America and Caribbean, Nestlé Purina

"Hess and Ludwig crush it in *Humility Is the New Smart*. They introduce the compelling concept of NewSmart, which will help learners successfully navigate the coming Smart Machine Age. They want our young people to be adaptive lifelong learners, and embracing NewSmart is a path to learning for the future, not our past."

—Dr. Pamela R. Moran, Superintendent, Albemarle County Public Schools, Virginia

"This fascinating examination of what it will take to thrive in the Smart Machine Age offers a compelling and profoundly humane manual on how to achieve our highest expressions of excellence, in business and in all our interactions."

—Ming-Jer Chen, former President, Academy of Management, and Professor, Darden School of Business, University of Virginia

"*Humility Is the New Smart* provides a provocative view of the kinds of individual skills necessary to succeed in the future. Through their exhaustive interdisciplinary research, the authors give us practical advice on how we can best prepare ourselves to excel in the Smart Machine Age."

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"As a father and the leader of a school responsible for preparing students for their future, I embraced the authors' premise that we need to change our mindsets, skills, and behaviors for a more dynamic technology-based world. They provide compelling research and very practical tools to help us on our journey. Listen well—our futures and our children's futures depend on it."

—G. Thomas Battle, Jr., Headmaster, Virginia Episcopal School

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To Lyle E. Bourne Jr., Kim Cameron, Arthur W. Combs,
Jane E. Dutton, Linda Elder, Barbara L. Fredrickson,
Sidney M. Jourard, Gary Klein, and Richard Paul,
whose work inspired me.
– EH

To my family, for their humbling support and encouragement.
– KL

Contents

Introduction

Why You Should Read This Book

Society is on the leading edge of a technology tsunami. Advances in artificial intelligence, the Internet of Things, virtual reality, robotics, nanotechnology, deep learning, mapping the human brain, and biomedical, genetic, and cyborg engineering will revolutionize how most of us live and work. Technology will be able to learn, as well as teach and program itself. We call this next big step the Smart Machine Age, or SMA.

The SMA has the potential to be as disruptive and transformative for us as the Agricultural Age and Industrial Revolution were for our ancestors. In the last few decades, the American worker has been outsourced, offshored, and automated on many factory floors and in many routine tasks. Up next is a broader and more encompassing automation that will likely affect many more workers, including many professionals. This new reality should cause many of us to ask:

Could a robot or smart machine replace me?
How can I thrive in this new era?
What can I do now to start preparing for the SMA?

What could this mean for my career plans? Will I have meaningful work?

What do my children need to do to begin preparing for this new age?

The Smart Machine Age Is Coming Soon

The impact of technology on our economy and our lives is nothing new.[1] Technology has driven vast improvements in productivity while allowing businesses to maintain or lower labor costs and has put GDP and national income mostly on an upward trajectory since World War II. However, the median income of most workers has increased little since 1979 and has been on the decrease since 1999.[2] Wages for average production and nonsupervisory workers as of 2013 were 13 percent less than in 1973 (adjusted for inflation), even though productivity grew 107 percent and the costs of housing, education, and health care rose dramatically.[3] As a result, income inequality is at levels not seen since 1929.[4] Many people are working as hard as ever for less pay, and advancing technologies are at least partly to blame.

Moreover, for the last few years, the percentage of "contingent workers," including part-time and temporary workers and independent contractors, has risen and now makes up a whopping 40 percent of the workforce, according to an April 2015 report of the US Government Accountability Office.[5] While automation has been happening for decades, up until now robots have been, well, robotic: good at doing what they're told in explicit terms by direct or indirect (that is, remote) human manipulation. What is and will be different soon is that machines are getting smarter by the day and even now are able to tackle both cognitive and nonroutine man-

ual tasks previously thought the exclusive purview of humans. Technology is even beginning to replace knowledge workers, people who have believed that their professions were immune to automation, including accountants, business managers, doctors, lawyers, journalists, researchers, architects, higher-education teachers, and consultants. **Smart technologies will become ubiquitous, invading and changing many aspects of our professional and personal lives and in many ways challenging our fundamental beliefs about success, opportunity, and the American Dream**.

What Is the Likely Impact?

The best research to date from Oxford University and the Bank of England indicates a high probability that technology will replace 47 percent of US jobs or displace as many as eighty million US workers within the next ten to twenty years.[6] The consensus view is that humans will be needed to perform those skills that either complement technology or constitute what machines can't yet do well, and that list includes **critical thinking, innovative thinking, creativity,** and the kind of **high emotional engagement with others** that fosters relationship building and collaboration. We call these SMA Skills.

Other experts—whom we call the "techno-optimists"—are predicting that technology will produce plenty of new jobs to replace those lost because that's what happened in the Industrial Revolution. In other words, they believe that history will repeat itself. We're skeptical of that view for two reasons. First, that prediction ignores the widespread human havoc created by the Industrial Revolution, which for example in England lasted more than sixty years before society adjusted. Second, a big question is whether technology will produce *tens of mil-*

lions of new jobs that technology itself won't be able to do.

Our prediction, based on the data, is that this upheaval in the number and types of available jobs and required skills will turn our lives and our children's lives upside down. The jobs available for humans will require high-level thinking, creativity, and high emotional intelligence. Those skills present a challenge for us, because while they're uniquely human, they run counter to human nature—which is generally reflexive both cognitively and emotionally—and the manner in which we've been trained, educated, and nurtured.

As we explain in more detail in chapter 1, we humans tend not to be good critical or innovative thinkers, and we tend to engage in fast thinking tainted by cognitive biases. Our emotions are inextricably intertwined with cognition, and depending on whether and how we manage them, these emotions can either enhance or undermine our behavior, thinking, and decision making.[7] We tend to "defend, deny, and deflect" when confronted with information that challenges our beliefs. Our nature can cause us to think and behave in ways that protect our egos, and we usually listen to confirm, not to learn. Our evolutionary fight-flee-or-freeze response is triggered by fears of failure and embarrassment that interfere with our abilities to engage in creativity, critical and innovative thinking, and emotional engagement with others.[8]

All the above cognitive and emotional challenges can diminish the quality of our thinking and our ability to collaborate with others. We know from the science that very few of us can think creatively, critically, or innovatively at the highest levels by ourselves. We need the help of others to do that. The SMA Skills are "team activities." In addition, from a nurture viewpoint, our US culture (this book is written from a US perspec-

tive) encourages self-centered individualism and thus inhibits the more outward-focused mindsets and behaviors needed to do the kind of high-order thinking and emotional engagement with others that will be the key employable skills in the SMA.

These are our challenges. We humans have to overcome our inhibiting cultural mindsets, our reflexive cognitive and emotional ways, and what the social psychologist Barbara Fredrickson calls our "cocoon of self-absorption"[9] in order to compete effectively and complement smart machines, which will have no biases (unless through human design), no egos, no emotional defensiveness, and no fears of making mistakes or looking stupid or not being liked. The purpose of this book is to propose how we can become much better thinkers, listeners, relators, and collaborators and overcome our culture of obsessive individualism in order to thrive in the SMA. Our book is a story of how to strive for human excellence—from individual, team, and organizational viewpoints.

What Can We Do?

We'll have to change the behaviors that inhibit our abilities to excel at SMA Skills. Based on our research into the science of critical thinking, innovative thinking, creativity, and emotional and social intelligence, and from Ed's fieldwork inside high-performance learning organizations, we believe that there are four fundamental behaviors that will help us overcome our nature and nurture limitations: **Quieting Ego, Managing Self** (one's thinking and emotions), **Reflective Listening,** and **Otherness** (emotionally connecting and relating to others).

For most of us, these behaviors require that we radically change how we negotiate the world. Research shows that people are more inclined to change their behavior if they first

change their personal beliefs—their "mental models"—in a manner that supports the desired behaviors. That requires us to fundamentally change our story about what it means to be smart in the SMA. **The first hero in our story is NewSmart. It's a new definition of what it means to be "smart" in our society and what it takes to succeed in a world in which technology will in many ways be smarter than we are.**

NewSmart

Today the dominant definition of "smart" is quantity based. It means that I'm smarter than you if I know more than you. To determine that, we typically see which one of us makes the fewest mistakes or gets the highest test scores. This definition is partly a legacy of the Industrial Revolution's need for mass education of workers who could perform the required repetitive manual tasks in factories without making mistakes. Today it's a consequence of a knowledge-based economy where "knowing more" is rewarded.

In the SMA, that definition of smart that we call Old Smart won't work. It'll be impossible for humans to know more content than a smart machine. Such machines will be able to process, remember, recall, pattern match, find variances, and synthesize more data faster and more accurately than any human. Humans will never outsmart smart machines if quantity of knowledge is the standard. Additionally, Old Smart breeds intolerance of mistakes and failure, which are required for the kind of iterative learning that underlies innovation, scientific discovery, entrepreneurship, and creativity. In the SMA, Old Smart will become the new "stupid."

NewSmart is a new definition of human smart that reflects the increasing cognitive capabilities of smart machines and is

measured not by *quantity*—how much you know—but by the *quality* of your thinking, learning, and emotionally engaging with others. NewSmart is not about always being right, being perfect, and knowing more than others.

To be NewSmart is to excel at the highest level of thinking, learning, and emotionally engaging with others that one is capable of doing.

In chapter 2, we discuss how we came to our definition of NewSmart and the underlying ideas about what quality thinking entails. We introduce the work of critical thinking experts and share what we've learned from Ray Dalio, the founder of Bridgewater Associates—the largest and one of the most successful hedge funds in the world—and from Ed Catmull, a founder of the highly creative and innovative Pixar Animation Studios. We explain how and why in the SMA we must think more like scientists, embrace the magnitude of our ignorance, collaborate with others, and learn from our mistakes and failures.

NewSmart leads us to our second hero: Humility. Why humility? Because we know from the scientific research that two big inhibitors of quality thinking, learning, and emotionally engaging with others are our *ego* and our *fears*. Studies of high-performance learning organizations confirmed these findings. To mitigate ego and fear and excel at the highest levels of human thinking and emotional engagement requires a new mindset that embraces humility.

Humility

What do we mean by Humility? We do *not* mean its common connotation in US culture: being meek or being subdued or thinking that you're not a worthy person. Our definition is

derived from psychological science, Western critical thinking philosophy, and Eastern philosophy. Our definition of humility, which we refer to throughout this book with a capital H, means **a mindset about oneself that is open-minded, self-accurate, and "not all about me," and that enables one to embrace the world as it "is" in the pursuit of human excellence.** We believe that our definition of Humility is the gateway to human excellence in the SMA because it enables the behaviors that underlie the high performance of SMA Skills. As we explain further in chapter 3, Humility is a mindset that results in not being so self-centered, ego defensive, self-enhancing, self-promotional, and closed-minded—all of which the science of learning and cognition shows inhibit excellence at higher-order thinking and emotionally engaging with others.

We recognize that Humility may be a hard concept for some successful people to buy into initially because they'll believe that it runs counter to their being perceived as strong, smart, and confident. That view is changing in our society: the exemplar organizations and leaders we discuss in this book already embrace Humility, including Google, Pixar, Bridgewater Associates, Intuit, and the US Navy SEALs.

Perhaps some of you are saying to yourself: I already am a good thinker. I am a good listener. I do relate well to other people. I'm not self-centered. We thought that, too, seven years ago (and we had achieved success to prove it). But we were wrong. We were good enough, but good enough won't cut it anymore. In the SMA, the highest levels of thinking, listening, relating, and collaborating with others will be the pathways to success for many of us and our children. And reaching that high level requires that we behave in ways that are more likely to drive those results. Our story about SMA success and

excellence has two heroes—NewSmart and Humility—and a desired ending: the ability to excel at the four SMA Skills. That leads us to the final part of our story: how "to do" the four fundamental behaviors that are required in order to excel at the SMA Skills. We call those four behaviors the NewSmart Behaviors.

The NewSmart Behaviors

In chapters 4 through 7, we explain why Quieting Ego, Managing Self (one's thinking and emotions), Reflective Listening, and Otherness (emotionally connecting and relating to others) are necessary for excelling at the SMA Skills, and we provide guidance on how to adopt those behaviors and how to improve them based on research, our work with senior managers and leaders, and our own experiences. Most people we have worked with reflexively respond to these behaviors by saying, "I am good at that." But after learning about the various sub-behaviors that underlie and define those main behaviors, nearly everyone comes to the same conclusions that we came to: we can take our thinking, listening, managing self, and emotionally engaging "games" to a much higher level. That's what we all must do.

This is a "how to" book, because knowing what to do is not enough—we need to actually do it and do it excellently and consistently. We must make the choice to deliberately practice the NewSmart Behaviors. Just like world-class athletes, dancers, and musicians train, most of us will have to train our cognitive, emotional, and self-management "muscles" to excel at the NewSmart Behaviors that underlie the thinking and emotionally engaging skills that can separate us from smart machines.

To help you do that, you'll have the opportunity in chapter 8 to use a NewSmart Behaviors Assessment Tool to evaluate the level at which you currently engage in the NewSmart Behaviors and where you have room for improvement. Ed developed this tool in his work with more than a thousand managers and leaders over the last few years. Every one of those senior managers and leaders came to the same conclusions we did after focusing on what sub-behaviors are necessary to excel at the four NewSmart Behaviors—we need to improve. After the assessment, you'll find guidance on how to create your own NewSmart Behaviors Personal Improvement Plan based on the leading science of how best to train, learn, and master new skills through deliberate practice. Our goal is to help you start on your SMA journey to personal excellence with an actionable and measurable behavioral improvement plan.

Leading a NewSmart Organization

In chapter 9 we switch our focus from the individual to the team and organization. Although technology will in many cases reduce the size of the human workforce, we believe that it will also humanize most business organizations. Why? Because in the SMA, humans will be needed to do the highest levels of thinking and emotional engagement, and organizations will have to create the right environment that enables and promotes those behaviors. That requires a positive, people-centric, humanistic work environment. Ironically, then, technology will likely both dehumanize and humanize organizations.

Leading an organization that can remain competitive in the SMA requires implementing a culture and processes designed

to embrace NewSmart, cultivate Humility, and encourage the NewSmart Behaviors in order to develop and excel at the human capabilities needed to achieve the organizational mission. **This environment must be designed to reduce the two biggest human learning inhibitors—ego and fear. Three psychological concepts form the foundation of such an environment: Positivity, Self-Determination Theory, and Psychological Safety.** The science of learning and examples from the studies of high-performance learning organizations offer a research-based roadmap to begin to lead a NewSmart organization.

Our Learning Journey

This book has been a work-in-progress for several years. Our research has taken us across many fields—philosophy, psychology, behavioral economics, education, the basic hard sciences, sociology, history, law, engineering, business, arts, evolutionary biology, and anthropology. We devoured over six hundred leading academic articles and over one hundred leading books and conducted field research with individuals and organizations on the cutting edge of human development of the SMA Skills. At the end of the book you'll find key references and a recommended reading list for additional information.

Our research has been motivated by imagination and concern—imagining what our world and our children's and grandchildren's worlds may look like in the SMA and concern about how they and our society will adapt to the coming technology revolution. And we have been motivated by our personal concern about how we, just like you, stay relevant in the SMA. From our research, we concluded that the magnitude of the upcoming changes requires a new story of what human suc-

cess looks like when we're working side by side with machines that are in many ways much smarter than us. And that new story needs to help us behave in ways that increase our chances of staying relevant and having meaningful work in the SMA.

None of us wants to be left behind or, as Jerry Kaplan, a computer scientist and Silicon Valley entrepreneur, warns in *Humans Need Not Apply*, the last human left to turn off the lights. (Actually, no worries, says Kaplan: "They can turn themselves off."[10])

This book is a call to action for anyone seventeen or older. The smart machines are coming, and we need to get ready! We invite you to read on and learn how to think, listen, relate, and collaborate better in order to reach your highest potential at work and in life. We invite you to join us in pursuing human excellence in the SMA.

Part 1

A New Mental Model for the Smart Machine Age

1

The Smart Machine Age: A New Game Requires New Rules

> We can be humble and live a good life with the aid of the machines or we can be arrogant and die.
>
> —*Norbert Wiener*

Norbert Wiener, an MIT mathematics professor and computer science pioneer, wrote those words in 1948 in a recently discovered unpublished essay for the *New York Times*. He literally meant them as an apocryphal warning about the dangers to humanity of uncontrolled advances in automation and artificial intelligence. For decades, such dire predictions remained on the fringe of societal concerns and relevant only to science fiction fans. The technologies that were only a gleam in Wiener's eye, however, have finally come to fruition.

Smart machines are becoming autonomous and able to tackle nonroutine cognitive tasks previously thought the exclusive purview of people. Machines are gaining natural language capabilities, voice and facial recognition, and the ability to draft sports columns and analyze due diligence documents better and faster than many human reporters or lawyers. Thanks to advances in automated perception, sensors,

and robotics, machines are now able to handle what had previously prevented them from tackling nonroutine manual jobs as well, such as driving cars, picking out products from warehouse shelves, and sorting mail. High-functioning humanoid robots can now be seen on hospital floors and in hotels, restaurants, museums, and shopping malls. They aren't just flipping burgers behind the scenes: they're interacting with patrons and patients—like "Connie," the robot concierge Hilton began rolling out in 2016 in lobbies across the country in partnership with IBM Watson.

With respect to nonroutine cognitive jobs, using automated tools and algorithms, machines can now handle data analytics, pattern recognition, and deductive reasoning. Machines are becoming better than a roomful of Wharton graduates at devising portfolio investment theory for hedge funds and better than a team of Sloan-Kettering doctors at diagnosing illnesses.[1] With investments from companies like Google, implantable biometric sensors will soon allow us to monitor our own health.[2] Facial expression analysis software will detect the emotions and engagement of others better than our own minds.[3] A group of researchers from MIT and the Masdar Institute, who conducted the first quantitative study of skill content changes in occupations between 2006 and 2014, concluded, "For any given skill one can think of, some computer scientist somewhere may already be trying to develop an algorithm to do it."[4]

Combining the development of artificial neural codes and networks that model the human brain with access to Big Data, programmers can give machines the ability to process information and learn on a level that rivals and may soon exceed that of the human race.

Machines quite literally are now beating us at our own games. In March 2016 in what many artificial intelligence (AI) experts touted as the match of the century, AlphaGo—a computer program developed by Google's DeepMind AI company—defeated South Korean Go master Lee Se-dol four matches to one in the ancient Chinese strategy game. Almost twenty years after IBM's supercomputer DeepBlue bested the chess champion Gary Kasparov, AlphaGo's victory still surprised many experts who predicted that it would take at least another decade to develop a computer program with the ability to outwit and out-strategize a Go master in arguably the most complicated human board game ever invented. The CEO of DeepMind, Demis Hassabis, said that algorithms used for AlphaGo "one day can be used in all sorts of problems, from health care to science."[5]

Plenty of today's technology experts, from Silicon Valley entrepreneurs to current MIT and University of Oxford academics, have sounded alarms about the potentially devastating impacts to our economy and society because of such recent and imminent technology advances.[6] We repeat Wiener's warning here, however, not because we believe that the robot apocalypse is around the corner but because we believe that it's crucial to our relevancy as human workers and the vitality of the organizations for which we work that we pause and acknowledge the drastic changes coming and prepare ourselves to not only survive but to thrive.

We believe that there's a path to successfully navigating these strange new highly automated waters, but many of us will have to fundamentally change our views of what it means for humans to be "smart" and what it takes for humans to succeed and reach their fullest potential. To do otherwise—to

ignore the impact and fail to prepare for what's to come—would indeed be a foolhardy exercise in human arrogance.

Smart Machines and a New Era

There's a growing consensus among most computer science experts, economists, and business leaders that smart machines—whether humanoid robots or invisible networked connections—that can learn, think, and perform both manual and cognitive tasks in most cases better than their human counterparts could be the biggest game changer both personally and organizationally since the Industrial Revolution. It's likely that the business, education, and leadership models created for the Industrial Revolution could become obsolete. Technological and scientific advances in artificial intelligence, the Internet of Things, virtual reality, robotics, nanotechnology, deep learning, mapping the human brain, and biomedical, genetic, and cyborg engineering could fundamentally change how all of us—from laborers to knowledge workers—live and find livelihood.

Technology that can learn and even program itself will become ubiquitous in homes, factories, and offices and soon displace even the highly educated people who have thought that their professions are immune to the risks of automation, including accountants, business managers, doctors, lawyers, journalists, researchers, architects, higher-education teachers, and consultants. Artificial intelligence—deep learning or machine learning—will be especially transformative in this regard. Speaking at a technology industry conference in May 2016, Jeff Bezos, the founder of Amazon, stated, "It's probably hard to overstate how big of an impact it's going to have on society over the next 20 years."[7]

Andrew Ng, an associate professor of computer science at Stanford University, a chief scientist at Baidu, and chairman and cofounder of Coursera, recently told the *Wall Street Journal*: "The age of intelligent machines will see huge numbers of individuals unable to work, unable to earn, unable to pay taxes. Those workers will need to be retrained—or risk being left out in the cold. We could face labor displacement of a magnitude we haven't seen since the 1930s."[8]

Similarly, Kevin Kelly, co-founder of *Wired* magazine, says in his new book *The Inevitable: Understanding the 12 Technological Forces That Will Shape Our Future*: "It is hard to imagine anything that would 'change everything' as much as cheap, powerful, ubiquitous artificial intelligence.… The advantages gained from cognifying inert things would be hundreds of times more disruptive to our lives than the transformations gained by industrialization."[9]

In the next two decades, technological advances could displace as many as eighty million US workers, according to the chief economist of the Bank of England,[10] or 47 percent of the US workforce, based on a 2013 study by leading researchers at Oxford University.[11] According to a study by McKinsey & Company, by adapting technologies already demonstrated as of 2015, as many as 45 percent of the job tasks US workers are currently paid to do could be automated. Not even the most highly skilled or highly paid are safe. McKinsey also estimated that current technology could be adapted to replace at least 20 percent of a CEO's work activities.

The result is that no longer will human scale be necessary for value creation in most fields. Without question, technology will transform how most businesses operate and are staffed in terms of both numbers and job requirements and skills.

Routine jobs in hierarchical organizations—both those requiring manual and those requiring cognitive skills—will rapidly disappear. Most businesses in the near future will be staffed by some combination of smart robots, smart machines, and humans, and the job and skill requirements for each will be in flux.

In addition, the kind of long-term employment at stable organizations that characterized previous generations will be rare. The percentage of "contingent workers," including part-time, temporary, and independent contractors, has been on the rise and recently made up a whopping 40 percent of the workforce, according to an April 2015 report of the US Government Accountability Office.[12] Another recent study predicted that by 2020, over half of the country's workforce will be consultants, freelancers, and independent contractors, cobbling together their own gigs.[13]

Martin Ford, a Silicon Valley entrepreneur and the author of *Rise of the Robots: Technology and the Threat of a Jobless Future*, recently argued that "emerging industries will rarely, if ever, be highly labor-intensive"; rather, they'll be more like YouTube and Instagram, "where we've come to expect tiny work forces and huge valuations and revenues."[14] Similarly, Tony Wagner argues: "While the Intels, IBMs, and Genentechs of the last century employed hundreds of thousands (the majority of whom were low- and middle-skilled workers), the Googles, Facebooks, and Twitters of the 21st century will employ an order of magnitude fewer employees. Almost all of them will be creative problem-solvers."[15] Howard Gardner made a similar statement: "The future belongs to those organizations, as well as those individuals that have made an active lifelong commitment to learning."[16]

In the age of these smart machines—what we're calling the Smart Machine Age or SMA—operational excellence may well become almost totally technology-driven, making human innovation the key to value creation. Organizations will need their people to be hyperlearners who can adapt to rapidly changing environments. These needs are unlike what was required in the command-and-control-style organizations of the Industrial Age or more recently with respect to the repetitive and routine nature of knowledge work. Agility, adaptability, and responsiveness also will be required for most, and thus organizational efficiency will be necessary but no longer sufficient. The type of human learning that will be required is continuous and iterative learning, where one's beliefs are constantly stress-tested against changing phenomena and adapted to better reflect reality. Those human processes are not efficient. In fact, they are hard and emotionally messy.

What's Left for Humans to Do?

Humans can no longer add value by merely accumulating or analyzing knowledge. The creation of new knowledge is increasing exponentially, and it's now believed that most knowledge has a less than three-year shelf life. What you think you "know" is so quickly out of date that you must continually update your learning. Moreover, it'll be impossible for humans to know more facts or concepts than a smart machine or be able to process, remember, recall, pattern match, and synthesize more data faster or more accurately than smart machines such as Google's AlphaGo and IBM's *Jeopardy!*-winning Watson.

Instead, to be marketable and stay relevant in the SMA, humans will need to excel at the kinds of jobs and skills that

either complement technology or are those that technology cannot do well—at least not yet. That list includes **critical thinking**, **innovative thinking, creativity,** and **high emotional engagement with others** that fosters relationship building and collaboration. Collectively we refer to these as the SMA Skills. (Note that by creativity we mean to refer to the original expression of ideas and thoughts, including through art and otherwise. By innovation, we mean to refer to the commercialization of new ideas, methods, or things.)

Other jobs that will remain in the near future are those manual jobs requiring customized tasks and physical dexterity, but here we're focusing on the cognitive skills remaining for the majority of us who consider ourselves knowledge workers. Regardless of job or position, most of us will have to think and behave more like scientists, entrepreneurs, and artists and better engage socially and emotionally with others. The SMA Skills amount to our summary of the conclusions drawn by leading business and education leaders, economists, and researchers at MIT, Oxford, McKinsey & Company, the World Economic Forum, and the National Educational Association, among many other experts on the most important human skills in the twenty-first century.[17]

The purpose of this book, however, is not to justify or debate the primacy of the four SMA Skills or to address, for example, when and if computers will ever achieve a human level of creativity. Much has already been written about the need to better incorporate twenty-first-century skills into primary and secondary education and job training programs and to close the skills gap to maintain US competitiveness in the global economy. Our purpose is to focus on how we humans can excel at those skills and thrive in the SMA. Unfortunately,

for reasons of both nature and nurture, most of us face challenges in that regard.

Why SMA Skills Are So Hard for Humans

While the SMA Skills are what humans increasingly will need to master to stay relevant, they're far from easy to execute well. We need to understand that many of today's business leaders and managers have not been trained to develop or cultivate critical and innovative thinking, creativity, and high emotional engagement with others. They were raised, educated, and trained instead in an era when higher-order thinking and emotional skills were not deemed essential for the majority of workers. Most of today's adults have had no formal training in how to think, how to listen, how to learn and experiment through inquiry, how to emotionally engage, how to manage emotions, how to collaborate, or how to embrace mistakes as learning opportunities. This is because US society (note that we're addressing these issues from the perspective of Western and particularly US culture) favors high grades over mastery, aggressiveness and competitiveness, and the avoidance of failure at all costs—all of which hinder thinking, creating, relating, and learning at our best.

Our humanness is a blessing and a curse

We can all probably agree that SMA Skills constitute what humans can do at their best and brightest. When we're functioning at our highest level, we're able to think critically and innovatively, be creative, and relate socially and emotionally to and collaborate with others. That's our human advantage over the "bots" and algorithms. The good news is that recent research in neuroscience and cognitive, social, and educational

psychology has begun to show us the environments, mindsets, and behaviors most conducive to enabling this kind of higher-order thinking, relating, and creating. The bad news is that most of us are really bad at creating those environments and embodying those underlying mindsets and behaviors because of both human nature and how we've been nurtured, which together generate two big inhibitors to learning and thinking: a preoccupation with protecting our own egos and a fear of failing and looking bad.

Let's take critical thinking, for instance. The *Oxford English Dictionary* defines it as "the objective analysis and evaluation of an issue in order to form a judgment." The key word is *objective*, and it's this objectivity that underlies the cognitive psychologist Daniel Willingham's more elaborate definition of critical thinking: "seeing both sides of an issue, being open to new evidence that disconfirms your ideas, reasoning dispassionately, demanding that claims be backed by evidence, deducing and inferring conclusions from available facts, solving problems, and so forth."[18]

Critical thinking is different from our usual way of thinking precisely because being "objective" is so difficult to do. You may believe that you're thinking critically much of the time, but chances are you aren't doing it as well as you think you are, as well as you could, or as well as increasingly you'll need to. Scientific research has revealed just how hard it can be for humans to think and behave at their best in our modern world because of basic human biology and evolution. Our strong inclination is to be confirmation-biased and emotionally defensive thinkers.

As Daniel Kahneman, a psychologist and Nobel Laureate, explains in his treatise *Thinking, Fast and Slow*, we've evolved to

have two systems of thinking. System 1 is fast, automatic, and subconscious—we can think of this as our intuition, which is not flying by the seat of our pants necessarily but relying on the internal beliefs, ideas, and perceptions that we consciously or unconsciously form from our experiences. Psychologists refer to this bundle of beliefs, ideas, and perceptions as our "mental models." They enable us to pattern match and make connections and associations that are quick and often subconscious. System 2 is our slow, deliberate, and effortful process of reasoning—it's closer to critical-type thinking, but not always quite there, as we'll explain further.

Our reactivity

System 1 was the first to develop in our evolutionary biology, and you can see why—there's no need to pause to deliberate about what to do when you hear the telltale signs of a predator approaching. Our minds developed several cognitive biases and heuristics as shortcuts to help us survive. In many cases our cognitive biases are wrong, however, and compromise our thinking and decisions. But when you're in actual survival mode—Is that woolly mammoth about to charge?—you're better safe than sorry. Not so in our modern world, where our cognitive biases have us often making faulty judgments based on, for example, stereotypes and groupthink.

As Kahneman explains, our minds are limited by "excessive confidence in what we believe we know, and our apparent inability to acknowledge the full extent of our ignorance."[19] "We can be blind to the obvious," he says, and also "blind to our blindness."[20] Also, "our memories are heavily influenced by ease of recall; our emotions (likes and dislikes); and our inherent comfort with coherence that leads to overconfidence."[21]

The other important point to note when considering these two systems is that even when we set out to be more deliberate and thoughtful in our decision making and use System 2, our thinking is still often "biased, distorted, partial, uninformed, or downright prejudiced," as Richard Paul and Linda Elder explain on their Critical Thinking Community website. Our thinking even when deliberate is also always influenced by our subconscious perceptions of reality that are colored not only by implicit biases but by our beliefs, assumptions, and experiences about the world that can inhibit us from seeing other sides of an issue or thinking outside the box.

Another problem is that we're bad at recognizing when our own thinking is faulty because, as Kahneman states, "laziness is built deep into our nature" and "it is much easier, as well as far more enjoyable, to identify and label the mistakes of others than to recognize our own."[22] We tend to brush off those who do recognize our biases and critique our thinking or beliefs, because, as another Nobel Laureate, Herbert Simon, once said, "People who agree with you are apt to seem a little more intelligent than those who don't."[23] Thus it's clear that to effectively think in ways that smart machines can't think, we need to acknowledge that we need the help of others to open our eyes to disconfirming data and different perspectives, which is why relationship building with other people will be even more important in the SMA.

Our irrationality

Another crucial point to understand about human thinking is that reason cannot be separated from emotional processes, and thus rationality is a myth. Psychologists and neuroscientists have made tremendous discoveries in the last two decades

that confirm that cognitive and emotional processes are inextricably intertwined in our minds and that learning, attention, memory, and decision making are profoundly affected by emotion and in fact subsumed within the processes of emotion. This is at odds with the Descartian belief in rationalism so preeminent in our Western learning traditions.[24]

Ignoring emotions can be as debilitating as allowing excessive emotions to take over. Emotions inform, mediate, and sometimes cloud our cognitive processing, learning, and social interactions. This isn't a flaw; it's just a fact. Research has shown that positive emotions and mood are associated with broader attention and more expansive and flexible thinking, while negative emotions such as stress, anger, anxiety, or defensiveness can impede decision making and problem solving.[25]

The reality of this situation—the two systems of thinking, the subconscious biases, the importance of other people in helping us recognize those biases, and the interconnection of cognition and emotional processes—is why to do our best, most high-level, critical thinking, we need to first acknowledge our limitations and then slow down, be mindful, and learn to manage our thinking processes, our emotions, and our thinking behaviors to understand and account for all the factors affecting our judgment. It also requires that we listen reflectively and with an open mind to the perspectives of others.

The same thing applies to thinking innovatively. The research is clear that most innovation occurs when diverse teams work together and use innovation ideation and experimentation processes. Diversity brings different perspectives to the table that make it more likely that someone can more easily see what you can't see. To be good at doing what smart machines can't do well, then, requires us to admit that we need

to work and collaborate with others and that we need to be the type of person whom others want to work and collaborate with. That means we must be good listeners, trustworthy, and socially sensitive. In the SMA, it doesn't matter whether you're a freelancer, entrepreneur, employee, manager, or leader, you'll need to engage with others in what we call "making meaning together" collaboration, which is very different than normal meeting talk.

Our fight-flee-or-freeze tendencies

Another way in which our evolutionary nature affects our ability to master SMA Skills is that we are also prehistoric when it comes to responding to stress and anxiety in ways that inhibit our ability to learn, create, or innovate for fear of failure. Our minds haven't caught up to modern life and still respond to any stress as if it threatens our very survival—triggering the older emotional center of our brains (the amygdala) to send out a cascade of hormones and physiological responses that bypass the later-evolved part of the brain where reasoning occurs (the prefrontal cortex) and causing an almost instantaneous fight-flee-or-freeze response. Such a response made sense when saber-toothed tigers were on the loose, but not so much when modern professional demands require that we slow down and think critically and creatively in response to the pressures of the global economy. In today's world, humans cannot fight, flee, or freeze in response to the necessary risks and failures involved in iterative learning.

We're not the first ones to evangelize about how learning, skill development, innovation, and creativity come directly from mistakes and failures. Everyone from Thomas Edison and his ten thousand failed inventions before the light bulb

to Michael Jordan and his nine thousand missed shots has made this point. The philosopher Daniel Dennett describes the importance of mistakes in *Intuition Pumps and Other Tools for Thinking*: "Mistakes are not just opportunities for learning; they are, in an important sense, the *only* opportunity for learning or making something truly new."[26]

Having the courage to try, experiment, and learn from the inevitable failures can make sense to most of us logically, but remember we're only human beings, not smart machines (or Michael Jordan, for that matter), and thus we rarely think and behave logically or in our best interests even when we think we are. Our subconscious emotions and behaviors influence our willingness and ability to fail in the process of creating or innovating. It's not just the failure itself—most of us don't even like dealing with the mere uncertainty involved in experimenting. Research has shown that we generally prefer certainty to uncertainty. One study found that we would all rather *definitely* get an electric shock now than *maybe* get shocked later, and we show greater nervous-system activation when we're waiting for an unpredictable shock than an expected one.[27] Our fear of uncertainty is increasingly a problem, because in the SMA, the advance of technology is increasing uncertainty as well as the need to adapt and experiment to stay afloat at work and in daily life.

We are inwardly focused

A profound problem for us in executing uniquely human SMA Skills is that we usually perceive and process the outside world in an inwardly focused, self-protective manner. This is a result of both nature and nurture. In general, **we're cognitively blind, confirmation-seeking, and emotionally defensive and**

reflexive thinkers. We operate more like a defensive closed system than a system open to disconfirming information, differing opinions, or new information that may challenge our stories about who we are and how the world works or to experimenting and opening ourselves up to learning from mistakes and failures.

Staying relevant and optimizing our thinking, listening, relating, and working with others in order to excel at the four SMA Skills will require us to become more of an open system—more open to what's going on in the world outside our heads and more open to others. Our inward focus will need to change to an outward focus with respect to others because it'll be very hard for most all of us to excel at the SMA Skills by ourselves. We'll need the help of others, and that requires that we emotionally relate and connect to them.

Connecting to and relating with other human beings is fundamental to human motivation. That's not anecdote; science has proved it over and over. This need to belong with and attach to others is something innate across cultures, ethnicities, and gender.[28] Many studies have shown that connecting emotionally and building relationships are not just about finding love and friendship and being happy in our personal lives; they're embedded within our drive to live, learn, and succeed. Research shows that students who emotionally connect with a teacher do better in school; employees who emotionally connect with coworkers are more productive; and emotional connection improves client and customer service. We know this intuitively without the data, yet we don't seem to understand or acknowledge the fact that our tendencies to be self-obsessed and our individualistic, hypercompetitive culture are often at odds with making these emotional con-

nections and building these meaningful relationships at work.

That's a real problem in the SMA because higher-level thinking requires us to connect with other people who can help us get past our biases. It's also crucial to engaging in the kind of teamwork and collaboration that leads to creativity and innovation. Most important, as of yet, smart machines, robots, and AI cannot fully replace the kind of empathetic emotional and social connections that humans have with other humans. Geoff Colvin, the author of *Humans Are Underrated,*[29] has gone so far as to suggest that soon jobs requiring deep human interaction may be the only ones left for the masses. In any case, being able to hone our emotional and social skills remains one of our few advantages. The bottom line is that in the SMA very few of us will succeed on our own. We'll need the help of others, which means we'll need to be the kind of people whom others will want to help. That requires much more than being "nice": it means being a trustworthy helper in return.

Our idea of "smart" no longer works

Another problem for us in developing SMA Skills is that today the dominant definition of "smart" is still quantity based. Today, we think, I'm smarter than you if I know more than you, and the way to determine that is by seeing who makes the fewest mistakes on "tests" of our knowledge and experience. That definition is a legacy of the Industrial Revolution's need for the mass education of workers who could do routine and repetitive manual and cognitive tasks error-free. It's also the consequence of a knowledge-based meritocratic economy, which rewards those who "know" more and "tell" more than those who listen and inquire.

Many of us who are college graduates or knowledge workers have probably defined ourselves in large part by being smarter in this way than others. We succeeded because we knew more, and we measured being smart by the grades and extrinsic rewards we received. Higher grades resulted from accuracy and efficiency—knowing facts fast and making few mistakes or at least knowing facts faster and making fewer mistakes than others. Most of our teachers, coaches, and parents instilled that mindset in us, and, later, managers and employers reinforced it. From our childhoods on we learned the importance of knowing more and making fewer mistakes, and we were led to believe that "smarter" people would get good jobs and succeed.

Another problem with the belief in a quantity-based definition of smart is that it encourages a constant need to prove ourselves by "looking" smart. That in turn motivates people to avoid experimenting and risking mistakes, which inhibits learning, improvement, discovery, innovation, and creativity. That's a huge roadblock because innovation, creativity, and entrepreneurship usually result from iterative learning, when things do not turn out as expected, that is, from surprises or failures.

A quantity-based definition of smart also incites ego protection and reinforces an individualistic culture in which our ultimate goal, even if subconscious, is to view every interaction as a way to compare ourselves or compete with others—a way to prove our intelligence or "win" the conversation or transaction. That kind of self-focus leads to ego defensiveness and fear that inhibits learning and impedes critical thinking, creativity, innovation, and emotional engagement with others. In sum, in the SMA our old quantity-based notion of smart,

what we call Old Smart, is the new "stupid." Knowledge workers, you've been warned.

We Need New Mindsets and New Behaviors

Cultivating SMA Skills in today's and future workforces goes far beyond institutional training or challenges—it goes to the very heart of our human nature, our social and organizational cultures, and our daily behaviors. We believe that to truly excel at the higher-level thinking and emotional engagement underlying the SMA Skills requires us to engage in four key behaviors: **Quieting Ego; Managing Self** (one's thinking and emotions); **Reflective Listening;** and **Otherness** (emotionally connecting and relating to others).

As we explain in more detail in Part 2, we determined these to be the most fundamental common behaviors underlying SMA Skills, based on researching hundreds of academic articles and over forty-five leading books about those four SMA Skills. Unfortunately, most of us don't regularly engage in those behaviors. In many ways they're in fact counterintuitive to us. To thrive and lead others in the SMA, then, requires many of us to work hard at behavioral improvements, and that's much easier if the new behaviors fit well with our mental models.

Mental models guide our thoughts and actions and predispose us to behave in certain ways. They can help us simplify the world and operate efficiently, but they can also be limiting and destructive when they're like concrete bunkers, blinding or repelling us from ideas, facts, or perspectives that challenge our views of the world. Many of our mental models are stuck in ideas and perceptions originating in the Industrial Revolution. The SMA is a new reality requiring new ideas and rules.

For most of us, our mental model is dominated by a quantitative definition of smart and an obsessively self-absorbed and individualistic, winner-take-all approach to life and livelihood that inhibits the more outwardly focused behaviors necessary to excel at SMA Skills. Developing the behaviors and ultimately the skills that will give us a chance for human excellence in the SMA, then, requires that we first change our mental model of what it means to be smart and what it takes to succeed.

Reflection Time

Periodically throughout the book we pause and invite you to reflect and "make meaning" of what you have read. What we're asking you to do is "try on" the ideas, consider how it would feel if you believed those ideas, or think deeply about how the specific points affect you. We suggest that you write down your answers and use them as a reflective journal to come back to on your journey to human excellence.

1. Think about your job. How much of what you do is the same every day? How much of what you do can be broken down into small repeatable steps? What does that mean?
2. How much of what you do requires rigorous, deliberate, and focused critical or innovative thinking?
3. How much of what you do requires high-level emotional engagement with other people?
4. Do you accept the science of how we're often cognitively and emotionally reflexive in our thinking? If not, why not? What is the basis of your belief? What scientific research are you relying on?
5. How do you define "smart"?

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