THE FUTURE OF
LEADERSHIP
— IN THE —
AGE OF AI

PREPARING YOUR LEADERSHIP SKILLS
FOR THE AI-SHAPED FUTURE OF WORK

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The Future of Leadership in the Age of AI

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Contents

Dedicated to AI, whatever that is

Much has been written about AI's potential to reflect both the best and the worst of humanity. For example, we have seen AI providing conversation and comfort to the lonely; we have also seen AI engaging in racial discrimination. Yet the biggest harm that AI is likely to do to individuals in the short term is job displacement, as the amount of work we can automate with AI is vastly bigger than before. As leaders, it is incumbent on all of us to make sure we are building a world in which every individual has an opportunity to thrive. Understanding what AI can do and how it fits into your strategy is the beginning, not the end, of that process

—ANDREW NG

Preface
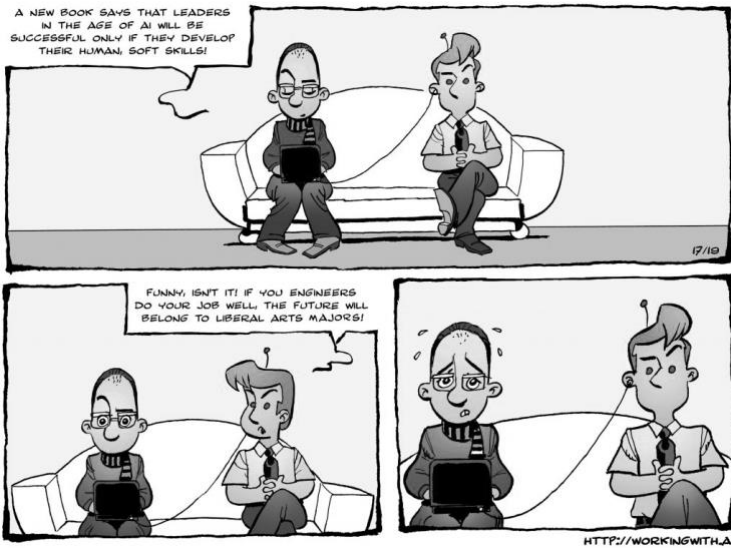
T oday's business leaders face a conundrum. Artificial Intelligence (AI) unquestionably will play an enormous role in the future of their organizations and the business environment in which they operate, but what effects will it have? Prognosticators have wildly different visions of the future it will create, ranging from causing the extinction of

humanity to ushering in a Golden Age in which machines provide all humanity's needs and free us to focus on altruistic service to one another and the advancement of human culture.

Both of these most commonly heard predictions are based on assumptions that lead to wild speculation that piques the interest of media. Dramatic visions of the future draw eyeballs to websites and sell magazines and newspapers.

What little analysis we have seen on the issue that doesn't rush to dramatic extremes tends to dismiss the idea that AI will have much more impact than any other past technology has. Prognosticators of this view downplay AI as just another technology added to our business environment that will cause little more than a minor hiccup in society. They admit that it will displace workers from mundane jobs but suggest that it will move them seamlessly into far more appealing ones. To my thinking, this idea is as overly simplistic as the others are overly dramatic.

What makes AI more than "just another new technology" is its ability to create a convergence of the many emerging technologies, such of the Internet of Things (IoT), blockchain, robotics, 3D printing, augmented reality and many others. Such a convergence,

fueled by AI's ability to process data at unprecedented speeds, promises to usher in advances in processes that represent massive leaps rather than minor hiccups.

AI thus stands to disrupt our business environment more than any previous technological revolution that humankind has faced. Business leaders will not be exempt from the disruptions it causes, either. It will have a massive effect not only on blue-collar workers, but also all the way up organizational hierarchies to c-level executives.

That's right. It will affect not only the manual labor jobs that futurists correctly predict will experience displacement, but it will also displace many knowledge workers and leaders who complacently feel that AI will never affect them because of their specialized knowledge-based skills.

The fact is that AI will encroach on many of those knowledge-based jobs simply because AI is so much more efficient at processing far greater amounts of data than any human can. It can bring together far more data for analysis than the best business analyst. It can even organize the data it analyzes into business reports that are indistinguishable from reports written by humans. Many knowledge-based tasks currently done by highly

skilled knowledge workers will be done by AI-enabled systems.

That doesn't mean that AI will eventually displace all workers, either for the benefit or to the detriment of humankind. There are qualities that humans have that are well beyond the ability of AI to duplicate – either now, or in the foreseeable future. It is by understanding the qualities humans bring to an AI-enabled future that we will be able to position ourselves to thrive in the business environment that AI will create.

As a Partner at PricewaterhouseCoopers, specializing in risks and cybersecurity of emerging technologies, and as an emerging technology analyst we have worked on some of the most difficult problems that world-class organizations have experienced – including ones that involve AI. More important for the purposes of this book, though, we have witnessed the different approaches that industry-leading organizations have used when incorporating AI into their business processes.

We have seen organizations that adopted AI to eliminate thousands of jobs, increasing profits minimally by cutting costs. We have seen the human costs when AI is used merely to replace workers and how extensive that cost can be.

On the other hand, we have also seen organizations that adopted AI to augment their workforce's skills and increase profits while creating additional jobs. We have thus seen the potential of using AI as a generator of both revenues and jobs.

The latter approach, unfortunately, is not the easy approach. It takes planning, effort and commitment to achieve. It is, though, ultimately far more profitable than using AI merely as a cost-cutting tool. We hope, through this book, to encourage business leaders to understand what AI can do – and what AI will do – to our future business environment. And we hope that leaders will prepare themselves properly to make the most of AI's disruption – for their organizations and for themselves.

We see AI as having potential for extraordinary good. We believe, though, that that good will come only if business leaders recognize its transformative nature and position their organizations – and themselves – to thrive in that transformed environment.

This book will therefore begin by examining the visions that currently dominate discussions of how AI will affect our future. It will show both the real problems of which those visions rightly warn us, and the hyperbole inherent in the way forecasters take their arguments beyond what AI is actually capable of doing.

It will examine how extensively AI is currently involved in the things we take for granted in our world today – far more than most people realize. It will assess the directions in which AI growth is headed and the massive effect AI is likely to have on the future of our economy. And it will examine the massive shifts in workforce skill sets that will be needed to support an AI-enabled economy into which more and more aspects of AI are increasingly integrated.

Those skill set shifts are already beginning. They already make it challenging for organizations to find qualified candidates to fill many current needs. If not proactively addressed, this need for skill set shifts has the potential to become critical in the near future.

Thus, the focus of the latter half of this book is on what skills business leaders need to obtain if they are to stay ahead of the changes that AI is creating and what skills they need to incorporate into the teams they lead. These skills are fundamentally people skills: emotional IQ, complex problem solving, creativity, persuasion, ability to motivate and mentor others. AI currently offers at best only a poor imitation of what humans can do naturally.

AI will free workers from more repetitive tasks, including many of the repetitive tasks done by knowledge workers. They will have more time to spend

on tasks that require higher skills. It will then be essential for leaders to guide and motivate workers to upskill themselves so they can fill positions that require skills they do not now have.

Achieving this shift to higher-level skill sets will be no small task. Yet even that will be only part of the coming challenge. AI will greatly accelerate the pace of change, forcing dramatic changes to the ways that organizations structure themselves in order to survive in a faster changing world in which a steady flow of innovation will be crucial. This book will thus reveal some of the ways that forward-thinking organizations are seeking to increase their flow of innovation.

Lifelong learning, too, will become essential for both leaders and workers. The skill set shifts demanded by AI will not be once for all. Ever-changing conditions in the business environment and an accelerated cycle of technological advance will create a continuing need to keep enhancing skill sets in order to keep up with developments.

Furthermore, changing worker expectations will require leaders to transform the approaches they currently use to guide and motivate workers. With so-called soft skills becoming increasingly important to augment the logic-based skills that AI provides, hiring

approaches will need to adapt from what is now largely an approach of "checking off the boxes" of work history to find suitable candidates. We will thus describe some of the approaches that innovative companies are using to transform their hiring processes.

The markets in which organizations compete will expand from local to global, greatly increasing the need for organizations to pursue a diverse mix of leaders in their teams in order to compete effectively in globally distributed markets with dramatically different cultures.

The need to broaden the perspectives that go into developing AI systems has impact even in organizations that are not currently competing in global markets. Examples have already occurred where the lack of broad enough perspectives among developers of an AI system has threatened the integrity of the analyses conducted by it. Here, too, I'll show what some innovative companies are doing to increase their mix of perspectives.

Finally, in addition to the human changes that will be required in an AI-enabled world, technical changes will also be essential. The fact that hackers are increasingly able to use AI in cyberattacks will require substantial rethinking of cybersecurity approaches. Vulnerabilities are magnified. Risks increase exponentially.

These risks go beyond the traditional hacker target of accessing sensitive information from secured systems. It opens the door to attacks in which hackers inject damaging information into secured systems. Such things as disinformation/media manipulation/stock manipulation and other such threats are issues that every senior executive should be aware of. My experience in cybersecurity has given me ample opportunity to research how to deal with such threats and how AI can be used to enhance cybersecurity.

In all, the changes that AI is bringing to our business world are massive. There is, though, reason for optimism. Unlike the visions of our future that picture AI "taking over" our world – for good or for ill – the future of our world will not be swept along in a tsunami that we are unable to control. It rests firmly in human hands – and particularly in the hands of business leaders.

Our actions – or lack of actions – will determine how much of a disruption these new technologies cause to our lives and to the lives of those with whom we work. We can stand by idly and watch emerging technologies change our world, or we can position ourselves to prosper from the changes they bring and help make the world better through the use of AI. We write this book in the hope you will choose the latter.

How this book is organized

This book is organized as follows.

Introduction

This chapter looks at the way the first, second and third Industrial Revolutions transformed the world, and the nature of the further transformations that will be brought about by the impending Fourth Industrial Revolution represented by the widespread implementation of AI. This examination of the first, second and third transformations will include a discussion of the negative effects of those revolutions – because they did have negative effects and the world we live in today reflects the negative as well as the positive effects.

The chapter closes with an analysis of the challenges that management (and the world in general) will face as a result of this Fourth Industrial Revolution.

AI's Uses Today

This chapter describes the extent to which AI has already made itself felt, both in business and in the world at large. AI's penetration is greater than many understand. It ranges from personal assistants offering

services that some people might regard as fluff through to medical diagnoses that can revolutionize the prospects of those living with illness in remote parts of underdeveloped countries in Africa and Asia. AI's ability to structure and analyze data in volumes large enough to defeat the best human analytical brains offers enormous scope for human progress. The things that AI can't do, or can't do yet, could impede that progress to the point of rendering it null. This and all subsequent chapters ends with a set of takeaways.

Three Views of AI's Future

Futurists, forecasters and journalists needing copy all hew to one or other of three competing views of where AI is taking us: the dystopian view, the utopian view, and the organic view. This chapter describes all three views and offers an analysis of their relative strengths and weaknesses.

AI's Coming Impact on the Economy

All previous industrial revolutions had a major impact on the economy. In the case of the first Industrial Revolution, the initial impact was largely local; by the time of the third it was international, and the immediate economic impact of AI will be global. In this chapter, we

describe how that impact will be felt and go on to describe the effect of technology in driving commoditization. We discuss ways to achieve competitive advantage by best practice in exploiting AI as well as the commoditization of AI itself, and then go on to explore the opportunities and challenges presented by AI's most significant shortcoming: its lack of creativity. Finally, the chapter discusses how emerging technologies are related to the creativity that is essentially human.

The Great Workforce Skill Set Shift

It is in many ways the central thesis of this book that effective use of AI will demand enormous changes in skill sets, both among leaders and managers and among those they lead. 'People' jobs, as opposed to the work done by robots and other AI devices, will change and will continue to change. Those who take the Organic view of AI imagine that workforce and workplace change will work itself out in some sort of automatic way. This view is mistaken. The impact of AI will be intensely personal as well as affecting whole industries and, possibly, nations. Early adopters will have an advantage that may prove impossible for others to overcome. This chapter also looks at the kind of jobs likely to emerge as a result of AI

and the new skill sets that will be required to do those jobs.

New Paradigms for Leaders

One of the points stressed in the last chapter is that effective leaders will need human skills much more than in the past. Their focus will have to change – AI is not just about the technology.

Driving Change as Motivators

Effective change does not drive itself. If left to itself, change can reduce companies, industries and whole nations to rubble. This and the next three chapters are devoted to driving change, because effective leaders will be required to drive change not in one capacity but in four at the same time. This chapter is concerned with the motivator capacity, the requirement that leaders ensure that workers are actually achieving the shift in skill sets that will be necessary and that they find ways to fill the talent gap that will emerge. Existing employees need to be retrained and, before that can happen effectively, they need to be motivated. Performance appraisals, currently so often a box ticking exercise, must be given teeth. Training staff has often been seen as a risk (the retrained workers may seek higher paid employment

elsewhere), but the risk must be taken, or the company will be left behind. Today, the best performing companies already use their corporate culture as a recruiting device. That must and will spread.

Driving Change as Innovators

Innovation. That's the secret. This is reminiscent of the old joke about the politician who said, "Sincerity. That's the secret. Once you can fake that, nothing can stop you." And the fact, as we all know, is that fake sincerity has done for more politicians – and more business leaders, more celebrities and more of almost any category of human you can shake a stick at. The problem with innovation is that everyone talks about it, everyone expresses their commitment to it, and very few organizations actually either encourage or reward it. In this chapter, we will deal with that sometimes fatal disconnect – the tendency of people to say that their companies encourage innovation yet also that their companies stifle it – while unpicking the mystery of why so many attempts at greater innovation fail. This chapter focuses on rethinking – structures, processes, funding sources, skill sets, job definitions and the role of leaders. Examining everything critically and genuinely creating an

atmosphere that rewards creativity and curiosity will be key to success.

Driving Change as Facilitators

Anyone who has worked with millennials after working with people from earlier times knows that what motivates workers has changed. This chapter addresses those changes; where the previous chapter focused on rethinking, this one is concerned with refocusing. The workplace paradigm and the organizational culture have to change. So does the way you hire. And the way you seek out and reward soft skills.

Driving Change as Assimilators

The recognition that markets are global is important as never before. It is therefore important to remember that awareness of other cultures is not inbuilt in humans. In fact, the opposite is true. And this can play into AI difficulties. A great deal – most – of the data on which AI operates is collected in the field by a variety of methods. Not so bias. Bias is input into AI unconsciously by people who may not even recognize their own bias. The solution is diversity. By this, we don't mean some box ticking politically correct hiring and promoting policy. Sixty years ago, IBM – at that time the global leader in multinational

marketing – had a policy of plucking people out of their own comfort zone and setting them down somewhere else. Promising middle managers from the UK would be sent to Austria. Or Ethiopia. From France to Texas and Australia. From Canada to Brazil and South Africa. In each case, the object was not so that the transferred person could introduce his own country's philosophies and ways of doing things to the country in which they were serving a three-year assignment. It was the opposite – the intention was to open their minds and let them see that people elsewhere saw things differently from the way they saw them and that 'different' did not mean 'wrong.' The need to counteract bias in this way is even greater now than it was sixty years ago. Diversity must be more than a buzzword – it has to permeate throughout the whole organization.

Driving Change as Risk Managers

Misinformation is a growth industry. Leaders have a major role to play in keeping their organizations free from the traps increasingly being laid by hostile elements that appear as friends but could be anywhere in the world and are almost certainly not where they say they are.

CHAPTER 1

Introduction
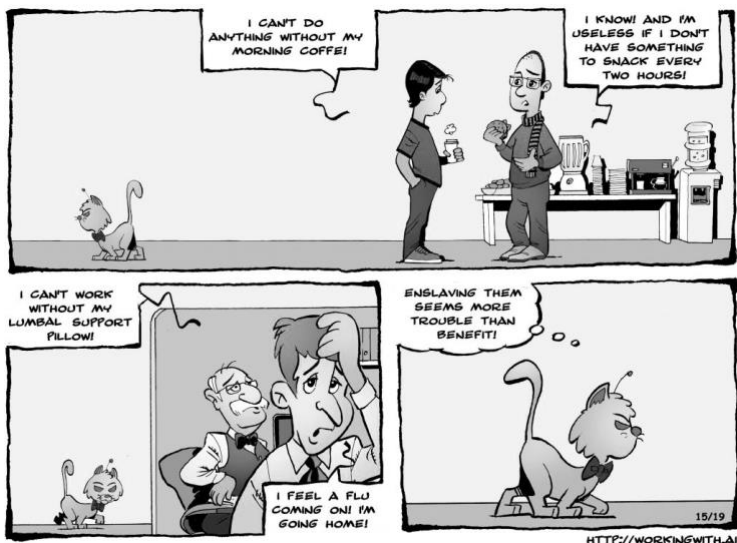
I t's almost impossible to turn around nowadays without finding another article predicting the impact that AI and other emerging technologies – the so-called Fourth Industrial Revolution – will have on our future. It's one of the hottest topics being discussed by

forward-thinking business leaders today. And well it should be. The fact that we are on the cusp of dramatic change in how business, workplaces and our very lives are carried out is inescapable.

Some writers picture a utopia where humankind is freed from manual labor, where machines do all the work and all people receive a universal basic income from the revenues that machines generate. This view further pictures all people, having been freed from the need to work for a living, as devoting their time to altruism, art and culture.

Other writers picture a dystopia where a tiny elite class has seized control of AI and uses it to produce all the goods and services needed by society. In this view, that miniscule elite uses their control of AI to hoard all the world's wealth and trap almost all people in inescapable poverty.

Other writers yet take a broader view of AI's future. This view sees little ultimate disruption beyond adopting new paradigms in the workplace. Workers who now work in routine, repetitive jobs would be displaced from them as AI performs those jobs more efficiently, but AI creates new, higher-value jobs that make the net job loss close to zero. All that's needed, in this view, is for displaced workers to learn the skills needed to fill the new jobs.

These perspectives are often presented in their most simplistic forms and fall victim to exaggeration. The utopian view exaggerates the ability of AI to function without human input. The dystopian view exaggerates estimates of potential job losses. The broad view, which I call the organic view, exaggerates the ease of transitioning workers from the routine, repetitive jobs that AI will replace into the skilled, higher-value jobs that AI will create.

Where does our future lie? Are we ascending into a Golden Age, or plunging into a Dark Age? Are we about to experience only a minor hiccup in the workforce? Our future likely does not lie at any of these simplistic extremes.

It would be foolish to ignore AI as nothing more than yet another new technology. It will require dramatic changes in how leadership and management operate. It will be a career-changer not only for blue collar workers, but all the way up to the C-level. It will thus require a willingness by leaders to adapt to its new paradigms if they are to thrive in the new world those paradigms present, and an awareness of how to prepare future generations for employment in a future heavily dependent on AI. Envisioning our future by examining our past.

AI and the other technologies driving the Fourth Industrial Revolution will change our workplaces and our lives even more than any of the past three did. Think about that statement for a moment.

Transformations from the First Industrial Revolution

The First Industrial Revolution introduced the steam engine and subsequent mechanical manufacture of what previously could only be manufactured by hand. This multiplied humankind's physical ability by enabling goods to be produced much faster and less expensively.

It spurred increased consumption of goods that previously had been available only in limited quantities. It made mechanical transportation (trains) possible, also multiplying the physical power of animals whose superior natural strength people had exploited. Finally, it spurred a shift in the workforce from farmers and craftsmen to factory workers and led to migration from rural settings to cities.

This did not happen without pain. The second half of the nineteenth century in England was a time of rapid population growth coupled with widespread improvements in health and great reductions in the

number of people on the verge of starvation. Those improvements were possible because of the rapid advance of enclosures, in which land that had previously been found on the strip system with every villager having an allocation of strips was taken from those villagers and combined into individual farms.

Those enclosures can therefore be seen over the long term as a good thing – but the impact on the dispossessed poor at the time of enclosure was harsh and sometimes devastating. In the last paragraph, we used the expression 'migration from rural settings to cities.' That was not how those migrants saw it at the time. Individual farms required less labor than strip farming, so that there was now a surplus of unemployed farm laborers. They did not migrate to pit villages and manufacturing towns as a matter of choice. They went because they had no alternative. In the seventeen sixties, there was a violent explosion in the Lambton Colliery near Durham in north-east England in which every man and boy working underground was blown up the shaft like balls from a cannon. When their grieving relatives searched for their remains, they found body parts scattered over a wide area.

Every one of those pit workers had worked on the land a few short years before as strip farmers. They went to

work at the colliery because enclosure had removed their strips from them. It is no stretch to say that enclosures killed them.

Lancashire cotton workers could tell much the same story as looms in factories made home working uneconomic. The end result was to be cheaper production and wider access two high quality furnishings and clothing. The immediate effect was misery.

This is the law of unintended consequences at work. As we move into this Fourth Industrial Revolution, greater care is needed to think through the impact on all stakeholders.

And nor was this only a nineteenth century English manifestation. Advanced industrial countries in North America and Europe saw widespread job losses throughout the second half of the twentieth century as basic manufacturing jobs were outsourced to Asia in particular and also to Africa and South America. Towards the end of the twentieth century and in the first decade of the twenty first, high-tech jobs like coding and web design made similar transfers.

The solution sought by governments in North America and Europe has been to upskill workers whose jobs have been outsourced through education and continuous

training. As this book will show, those efforts will have to be intensified.

Transformations from the Second Industrial Revolution

The Second Industrial Revolution introduced electricity and mass production methods that again multiplied the effects of the First Industrial Revolution. The first revolution had multiplied humankind's physical ability to produce goods. The assembly line multiplied that ability once again, making it possible to produce even more complex goods faster and less expensively.

The mechanical transportation introduced by the first revolution in the form of mass transit vehicles such as trains now became attainable by individuals in the form of automobiles. The workforce shift introduced by the first revolution became more pronounced. Powered machinery enabled farmers to accomplish more with fewer workers and factory work in burgeoning cities became more the norm.

Once again, we should not forget the element of pain because – once again – the movement of workers off the farms and into the factories was quite frequently something forced on them and not done by choice. The

tendency in more recent years towards municipal zoning and for people to commute to work from more pleasant residential and sometimes semi-rural homes had not yet begun. It was a shock to the psyche to leave behind a country existence in order to live in a busy city where the noise never stops and moments of solitude are difficult to achieve. Some people never got over that shock.

Infrastructure in the form of commuter transportation (see, for example, Ontario's GO Train network in Canada) eased these problems, but was some time in coming. What we have now is the ability to better foresee pain points for people – all people – and take steps to avoid them from the beginning.

Transformations from the Third Industrial Revolution

The Third Industrial Revolution introduced the computer. Unlike the first two revolutions, which multiplied humankind's physical capabilities, this third revolution multiplied humankind's mental capabilities, making it possible to retain more data and process it faster than humans could. This made it possible for people to process far larger amounts of information than unaided

people could normally do and expand the range of projects they could accomplish.

This revolution expanded as the technology improved. It originally involved prohibitively expensive equipment that only the wealthiest organizations could afford and that required an entire floor of a building to house. Then it contracted to tabletop devices that individuals could afford, and contracted further to what we experience today, where most people carry in their pockets a handheld device that has more computing power than all the computers of NASA's 1960s space program combined and offers instant access to people and vast storehouses of information all around the world.

And was there pain, too, in these transformations? There certainly was. Until the middle of the 1960s, every manufacturing company had rooms full of draftsmen at drawing boards and/or accounts clerks at desks. Thanks to the ability of computers to produce and change drawings and to process data, a comparatively tiny number of draftspeople and clerks now handle a much larger throughput and do it more efficiently and more accurately. That transformation is now over and people who, fifty years ago, might have left school to become accounts clerks or draftsmen now take other jobs. And that's good – but we should not let it blind us to the

economic difficulties that so many of those displaced workers experienced at the time or to the loss of the social contact and sense of validation that came from working in a large room filled by people doing similar work.

The reference to social contact and validation is a reminder that organizations do well to provide meeting places for their workers where things other than work can be discussed. It has also been a driver in the proliferation of places where, instead of working at home, freelancers can rent a desk and office facilities for short periods. The greatest attraction of those facilities for many freelancers is not the desk and the Wi-Fi connection but the fact that they can buy a coffee in a communal meeting room and chat to other freelancers. The Third Industrial Revolution increased the loneliness of a not insignificant portion of the population, and the next Industrial Revolution will do the same. Loneliness can kill. Eliminating it is a challenge for leaders in the age of AI.

Transformations promised by the Fourth Industrial Revolution

Considering the seismic changes that each of these previous revolutions created, how could we say that this Fourth Industrial Revolution could change our workplaces and our lives more than any of these past ones did? What this coming revolution, largely driven by AI, promises to do is to multiply both the physical and mental capabilities of humankind and combine them into systems that give us unprecedented control over our physical world.

It promises to put control of objects halfway across the world at our fingertips, uncover new ways to optimize agriculture, manufacturing, daily life and even our own health and take control of our physical world in ways we only now are beginning to be capable of imagining. Here is a small example of the kind of world AI and other emerging technologies are propelling us toward.

Imagine a "smart" industrial facility in which vibration sensors are attached to core components of the machinery as part of the Industrial Internet of Things (IIoT). Those sensors send data into the cloud. The cloud is yet another emerging technology that enables

individuals or organizations to access computational resources physically located off-site. In the cloud, an AI analytics program estimates each component's Remaining Usefulness Lifetime (RUL) so the system gets maximum use out of each component. This process greatly enhances current maintenance procedures that replace components pre-emptively, well before they would likely fail. Such AI analysis is estimated to be able to reduce replacement costs by 20%.

When such analysis determines that a part is near the end of its RUL, the AI system sends a request directly to an industrial 3D printer in the facility to fabricate the replacement part. If printing the part on-site is not feasible, the AI system could autonomously send an order to an outside part supplier for a replacement part, using the Internet of Payments (IoP), a combination of IoT, AI, blockchain's distributed ledger system and cryptocurrencies. The part supplier could manufacture the part and deliver it by drone, self-driving truck or delivery robot, any of which would also include some degree of AI to enable safe and speedy delivery.

In the whole example so far, no human intervention would be needed (unless the part's cost exceeded a predetermined spending limit). That eliminates the need for equipment checks by maintenance engineers, people

to place purchase orders, accounts receivable and accounts payable specialists, shippers or delivery drivers. The technologies handle all those steps without human intervention.

The first human intervention occurs when the part has been printed or delivered. A part-time maintenance engineer is notified to install the part. Even here, technology changes the replacement process.

Rather than needing multiple specialist engineers on staff to maintain each complex system, the facility could employ an engineer with general rather than specialized skills to perform the replacement. Such an engineer would be able to perform tasks beyond their training thanks to step-by-step by augmented reality (AR) guidance. AR uses AI and sensors to provide instructions that can walk a user through a complex procedure using visual images that overlay the object being repaired. These visual images respond to the user's position relative to the object and the user's movements so that the overlaid images always correspond to what the user sees.

This scenario is not some pipe dream, but is derived from a real-life project we worked on for an industrial facility. The functionality achieved in the project has not yet reached the mainstream, but this scenario is already

used in specialized environments. What we believe will eventually push this scenario into the mainstream is its success. The savings and efficiencies achieved were unprecedented.

In terms of job impact, this combination of emerging technologies – pulled together by AI – replaced 150 people who had worked in various maintenance functions or in the supply chain with one part-time maintenance worker. Many – but not all – of the workers in the jobs replaced were upskilled to better-paying jobs in the same firm. The rest were let go – and that includes not only some of the maintenance workers, but also those in formerly key positions in the supply chain.

This is the likely pattern for future job disruptions by AI and the emerging technologies that AI brings together. This is also why it is essential that leaders understand how to position themselves, so they can thrive in the coming job shifts instead of becoming a casualty.

Having seen how AI and the technologies it harnesses affected that single industrial facility, consider the effect AI will have as it expands. The same technologies are currently being applied on a smaller scale across cities, transportation systems, power distribution grids, water and waste management systems and food providers. Smart cities and all the elements that go into where we

live, how we get around, how we work, what we eat and how we live our lives rest on systems that enable these converging technologies to offer great potential for improved efficiencies and improved sustainability.

Does this mean we are entering a Golden Age where all things will be under our control and no problems will exist? Hardly! We need only look back to previous industrial revolutions to see that dramatic workforce and cultural shifts caused by new technologies are never trouble-free.

The negative effects of past industrial revolutions

The First Industrial Revolution's mechanized means of manufacture displaced craftsmen who had spent years learning their craft and performed it under fairly comfortable working conditions. It replaced them with low-skilled and low-paid laborers who worked under harsh conditions in early factories. That workforce shift spawned the Luddites, whose protests at this shift that threatened their livelihood erupted in violence, destroying machines that supported the workforce shift. This protest was quickly quelled by force, as were later destructive acts against the use of threshing machines

that reduced the need for hired farm laborers in the early 19th century.

The Second Industrial Revolution's mass production capabilities intensified the industrialization of society. More mechanization of agriculture further reduced the need for farm laborers. The growing replacement of horse-drawn transportation by cars dramatically reduced the need for horses, and the reduced need for horses dramatically shifted agricultural demand, one-quarter of which had previously been devoted to growing hay to feed the vast number of horses. And, as the number of horses fell, so did the number of blacksmiths. As late as 1900, blacksmith was the fourth largest occupational group in America. Every village had its own blacksmith; so did every town and city neighborhood. Blacksmiths not only shoed horses but also carried out all sorts of small manufacturing activities. By the 1920s, the number of blacksmiths in America had fallen to a level at which the occupation ceased to be separately identified in the census.

Unregulated speculative financial practices seeking to cash in on the new technologies ultimately spurred the Great Depression. Working conditions in factories and predatory labor practices pushed displaced workers and their families into dire straits. Only when labor laws

caught up with the shift in the workforce and World War II reignited demand for manufacturing did the disruption caused by the Second Industrial Revolution finally stabilize.

The Third Industrial Revolution's disruptions were far subtler. In many ways, it took the workforce in the opposite direction. Whereas the first two revolutions replaced skilled workers with low-skill workers, the third revolution consistently pushed workers to obtain higher skill sets. Both blue-collar and white-collar workers found themselves continually needing to obtain more skills as factory and office environments became more complex.

Along the way, large classes of occupations were still displaced by new technologies. Secretaries who had been relied upon to translate dictated or handwritten information into formal, printed materials were displaced by the ability of white-collar workers to produce their own printed materials by means of PC-based word processing and desktop publishing software. Factory workers whose work involved some of the most routine functions have found themselves replaced by early efforts at automation. But, mostly, the trend in the Third Industrial Revolution has been to require increasing levels of skills from workers.

Challenges of the upcoming Fourth Industrial Revolution

Our emerging Fourth Industrial Revolution continues that trend, but puts it into overdrive. The skill-acquisition curve of the Third Industrial Revolution was relatively gradual compared to what is coming.

Much has been made of the effect of growing automation on blue-collar jobs, with advanced robotics increasingly depressing the wages of factory workers and decreasing the availability of entry-level jobs there. Nor are these effects limited to blue-collar workers. As AI and other emerging technologies continue to advance and converge, they will also hit white-collar workers, and they will hit them hard.

AI is increasingly becoming capable of many of the tasks that occupy most middle-skill workers – both blue-collar and white-collar. It can crunch numbers faster and more accurately than the best analysts. It can discern patterns in data that are too subtle for most analysts to notice. It can optimize processes to a more granular degree than the best operations managers. It can even assess complex sets of variables to engage in high-level decision-making that formerly only top-level executives performed.

Are we then headed into a Dark Age where humans will be rendered obsolete? Again, the answer is a resounding, "No!" AI and the other emerging technologies are not a step into a world that says, "No humans needed." In fact, to fulfill their potential these technologies will need qualities that only humans can provide.

The road to achieving this potential will not be smooth. Businesses, government and education are already repeating some of the worst mistakes that led to disastrous disruptions and dire conditions in past industrial revolutions. This book will look at what AI and other emerging technologies can do and where they are headed to see where potential problems lie and help chart a course that takes us safely through the minefield ahead. It will look at how we can prepare ourselves and the people who depend on us for their jobs – and their livelihoods – for the smoothest possible path into our future in an AI-enabled world.

Key success factor: Leadership

The human dimension of the Fourth Industrial Revolution is even more challenging than the technological

dimension. In all industry discussions, the widely underrated success factor is leadership.

Leaders of tomorrow are the game changers who will have to chart their organization's and their workforce's way through the Fourth Industrial Revolution by embracing disruptive change and encouraging and enabling their employees to do the same. Roles they will need to master will include motivator, innovator, facilitator and assimilator. Leaders will have to focus on shaping their team's trust in new technologies, sensitize them to AI risks, and take away their fear regarding changing job requirements and even potential job loss.

While expert technical knowledge remains highly important as we digitize and automate more and more, the success of the Fourth Industrial Revolution depends increasingly on factors other than technical expertise.

History allows us to look back on the mistakes of the first three industrial revolutions. While recognizing the long-term gains in productivity, welfare and standards of living (average life expectancy in Japan in 2015 was nearly 84 years. In 1900, it had been 44 years), we are also able to look at the pain suffered by many of those who lived through those three revolutions. We can take the long-term view that it hurt at the time, but it was for the best.

But was it? For everyone? Not for those men and boys shot out of the Lambton Colliery shaft like cannon balls. Not for farm laborers driven into towns to die of consumption. Not for skilled home weavers who were obliged to swap a living wage for life at subsistence level.

There are some interesting historical observations to be made. In Lancashire, England, when female weavers working at home were able to earn sufficient money to provide for themselves and their families, some 30% of them chose not to marry. They had children, but they did not – and this was by choice – either marry the children's fathers or live with them. They were free, financially, to live as they chose, and they chose to live alone even when they had children. Once the mills were established and home weavers had been priced out of existence, the number of female weavers who did not marry fell to 2%. (These figures come from an exhaustive examination of Lancashire parish registers in a form as yet unpublished). Why did they choose to marry when, previously, they had not? Because you could not raise a family on one person's wages, and especially on one female person's wages. You needed the wages of two people even to achieve a bare subsistence level.

What a careful study of the negative impacts of the previous three industrial revolutions tells us is that the

people driving and benefiting from those revolutions – the leaders of the day – paid very little attention to any of what we might now call 'soft skills.' The only things that mattered were economic and financial. To put it bluntly, if they couldn't spend it or invest it, it didn't count.

If similar pain is to be avoided in the Fourth Industrial Revolution, leaders will need to be much more aware of the impact of their actions on every stakeholder. And every stakeholder means not just the managers, not just the shareholders, not just the organization's employees but every single person on whom the organization's activities and choices have any impact whatsoever. Social awareness must be far more than a buzzword. It must become a reality embedded in the organization at every level.

AI's Uses Today – Far More Than You Might Think

A sk people on the street how much AI affects their lives, and most would probably answer that it doesn't affect them right now. Some might say

that it's pure science fiction. Others might say that it may affect our future but isn't used in our world today. Some might correctly identify a few ways it's used in modern technology, such as voice-powered personal assistants like Siri, Alexa and Cortana. But most would be surprised to find out how widely it is already woven into the fabric of daily life.

Personal assistants and other humanlike bots

Voice-powered personal assistants show how AI can expand human capabilities. Their ability to understand human speech and almost instantaneously interact with widespread data sources or cyber-physical systems to accomplish users' goals gives people something akin to their own genie in a magic lamp.

Nor does the list of such personal assistants end with those well-known examples. Special-purpose applications such as Lucy$_1$ for marketers fill special niches in more and more industries. Lucy uses IBM Watson to gather and analyze marketing data, using the same kind of natural language interface to communicate with marketers that popular home personal assistants do.

Other AI tools provide intelligent interfaces between stores and customers. Global office supplies retailer Staples turned its old "Easy Button"[2] advertising campaign into an AI personal assistant that enables customers to tell their Easy Button in-office personal assistant what they need, and have it instantly place an order for speedy delivery.

The North Face uses an AI assistant[3] to help customers determine the right outerwear for their needs. It asks them natural language questions to understand what activities make up their active lifestyles and matches those needs to the store's inventory. Healthcare organizations are developing AI systems that provide personalized answers to patient questions or that interface with doctors to bring them the latest data on clinical trials pertinent to their patients' needs.

Companies like Cogito are working with bots in the customer service industry to expand the boundaries of bots' emotional intelligence.[4] This enables them to recognize cues in humans' facial expressions or tone of voice and identify the emotional state of the person they are interfacing with.

In most cases, these bots will escalate a matter to a human when they detect emotional impediments to an interaction, but the more advanced bots are becoming

able to respond appropriately to a growing variety of human emotions that they encounter. Many of the customer service interactions you currently have – and, unfortunately, telemarketer calls[5] you receive – may find you interacting not with a human, but with an AI-enabled bot – without you suspecting it in the least.

Such, too, may be the case with many simple news stories[6] that you read. Articles that are primarily data-driven, such as financial summaries and sports recaps, are increasingly written by AI.

Or consider for a moment the voice-to-text features on your smartphone. They, too, are increasingly being taken for granted, but until the introduction of artificial neural networks, such transcription abilities were out of reach for even the most advanced computers. With them, though, they have become even *more* accurate than human transcription.[7]

And if you've ever interacted through email with someone named amy@x.ai or andrew@x.ai to set up a meeting with a busy executive, you've been corresponding with a bot.[8] This bot uses machine learning (ML), a core component of AI, to learn the executive's schedule and meeting preferences. Once trained, the executive can CC it on meeting-related emails and the bot will communicate with other email

recipients in humanlike language to arrange meetings that fit the executive's meeting preferences.

Analyzing and structuring raw data

ML is at the heart of AI's ability to identify user preferences and anticipate user needs. It analyzes large quantities of data to structure it into a useable form. As increasing volumes of data become available, AI's ability to analyze everything from manufacturing processes to customer behaviors to market trends makes this increased body of data useable. Being less constrained by human limits to how much data can be analyzed at once, AI can take into consideration more disparate types of data to produce far deeper and more comprehensive analyses.

Not only can AI analyze more data, but it can do so without being distracted as humans so often are. It can monitor information at minute levels that humans would find mundane over long periods of time.

The old images of a manufacturing plant technician monitoring a large console covered with gauges, or a guard monitoring a large bank of security monitors are thus becoming obsolete. AI-driven systems can monitor more gauges more closely than a human technician

could. And AI-enabled security systems are being trained to "see" what's happening on closed circuit TV feeds and identify any anomalies that require human intervention. Such ML also drives a wide variety of applications that are ubiquitous in everyday life.

Google Maps uses anonymized data from smartphones and information from crowdsourced apps to analyze traffic conditions and suggest the fastest routes to commuters' destinations. Ride-sharing apps like Uber and Lyft use some of the same techniques to enhance their predictive ability. They are becoming increasingly precise in predicting arrival times, travel times, pickup locations and even fraud detection.

Gmail uses ML to learn what you perceive as spam. Rather than relying only on specific keywords to reroute incoming mail to your spam folder, it analyzes how you treat your incoming email to predict what you will want to see and what you will immediately discard. This also applies to Gmail's sorting of email into Primary, Social and Promotions inboxes. The more you confirm its analysis of a type of email, the more it will follow the same pattern. The more you correct its decisions, the more it will revise how it assesses the indicators in your emails.

One of the industries into which AI has penetrated most deeply is finance. Checks can be scanned by smartphones and read with the help of ML and AI rather than being physically delivered to a bank. AI powers fraud detection systems, analyzing the vast number of daily transactions – and the vast number of variables that may combine to suggest a fraudulent one – to flag those that show suspicious signs.

Financial institutions increasingly use AI in making credit decisions, too. MIT researchers[9] found that loan defaults could be decreased by 25% through AI-enabled tools. A wide variety of companies also use such predictive abilities of AI to improve customer experience and engage customers more deeply.

Predictive engines

Personalized searches and recommendations on shopping sites have become so commonplace that most users don't realize how AI drives them. Users simply take those features for granted. When you pick up your cell phone, it provides you with news headlines and information about your friends' social lives based on its analysis of what has drawn your attention in the past.

Bricks-and-mortar stores increasingly provide customers with coupons customized to their past purchases through the predictive powers of ML applied to customers' loyalty cards. Fashion ecommerce site Lyst uses ML and metadata tags to identify what the clothing in different images look like and match the images that fit users' tastes to their search text.

ML is becoming increasingly adept at powering predictive features, and it does it extremely effectively. One study[10] claimed that such recommender features increased sales as much as 30%.

Amazon's ML enables it to predict user needs with an almost scary degree of accuracy. It is now even working to develop a system for identifying and delivering what users need even before the users realize they need it.

Social media sites use AI to analyze the content that users create or consume, so the site can serve them content and ads that fit their needs and interests. They also use surrounding context to more clearly distinguish user intent in what they write. One of the most advanced uses of AI on social media is the capability to "see" uploaded images and suggest related images. Or, in the case of Facebook, it uses facial recognition to accurately identify people in uploaded images and suggest those names for image tags.

Home environmental control systems manufacturer Nest's behavioral algorithms learn users' heating and cooling preferences. The more data those systems obtain, the better its systems can anticipate those preferences, meaning that users are relieved from having to make manual adjustments.

Netflix's growing mastery of predictive technology enables it to satisfy customers with recommendations customized to what members have enjoyed in the past. And Pandora's predictive technology goes beyond Netflix in its recommendations, as its combination of human curating and algorithms ensures that little-known songs and artists don't get overlooked in favor of heavily marketed ones. In other words, it gets to know users' musical tastes so well that it successfully identifies music the user will like even before the user knows that those artists and songs exist. This provides consumers with the added delight of discovery.

Autonomous operation

AI's ability to analyze and predict has also enabled it to carry out complex tasks that people, even today, find it hard to imagine a machine doing. The arrival of self-driving cars enabled and controlled by AI has been widely

predicted as being on the horizon. The truth is that that horizon is already at our doorstep. To illustrate our position, let's look at the current state of practice.

Potential gains from development of autonomous or self-driving cars are so great in terms of both revenue and profitability on the one hand and the danger of losing out to more agile competition on the other that the marketplace is becoming crowded. Five levels of autonomy have been defined:

- **Level 0**. Comprises an automated system that issues warnings and, in some cases, may stage a short-term intervention, but does not take control of the car in any sustained manner.
- **Level 1**. This is known as the 'hands-on' level. Control of the vehicle is shared between driver and automated system, though at no time does the system dominate. Typical Level 1 implementations include:
  - AC up C (Adaptive Cruise Control); steering is in the hands of the driver, while ACC controls speed
  - Parking Assistance; this is the reverse of ACC, with automated steering but speed controlled by the driver

- o LKA (Lane Keeping Assistance) Type II; the system issues a warning signal when the car crosses a lane marking

  In Level 1, the driver must be ready to take back control of the vehicle at any time.

- **Level 2**. This is known as the 'hands-off' level, though in fact many Level 2 systems will only work if the driver's hands are on the wheel. This is a way to ensure that the driver is ready to intervene at any time with a system that, pending intervention, is in full control of steering, speed and braking. The driver monitors what is happening and must be ready to intervene at any point.

- **Level 3**. This is the 'eyes off' level. The car controls steering, speed and braking and is able to respond instantly to a situation demanding immediate response. The driver is therefore free to do other things – but must still be ready to resume control when asked by the vehicle to do so. A typical Level 3 implementation is a Traffic Jam Pilot. This does not come into operation until the driver activates it and works only at speeds of not more than sixty kph on highways where traffic

moving in opposite directions is separated by a physical barrier. In essence, what happens is that, in slow-moving traffic, the driver asks the system to take control of the vehicle.

- **Level 4**. At this 'mind off' level, the driver can go to sleep. Level 4 can only operate in traffic jams or in areas bounded by geo-fencing. If the driver does not take back control, it has to be possible for the car to park itself.

- **Level 5**. At this level, having a steering wheel is entirely optional, because driver intervention is not only unnecessary but may be impossible. If you ever find yourself sitting in the back of a taxi with no-one in the front, and the taxi takes you where you want to go without you doing anything other than stating your destination, you will know you are in a Level 5 vehicle.

Those are the levels of autonomous driving – so what's the current state of play? I'll look at the players in purely alphabetical order.

- *Aptiv* has more than thirty self-driving cars which are on the road almost continuously.

- *Aurora* has self-driving cars on the road in three American cities.

- *The BMW Group* is working with a number of partners to produce both semiautomated and automated cars and may also be planning a self-driving JV with *Daimler*.
- *General Motors* has self-driving cars on the road in four American cities.
- *Drive.ai* has self-driving vans with drivers for safety providing shuttle services in a geofenced area in Dallas, Fort Worth.
- *Ford* has self-driving cars on the road in four American cities and has entered into a collaborative venture with VW to develop both autonomous and electric vehicles.
- *Tesla* has Autopilot, which provides an element of autonomous driving and its cars come with all the necessary hardware to be fully autonomous.
- *Uber* has tested autonomous driving in Pittsburgh. They suspended it in 2018 when a woman died, but have since resumed testing.
- *Yandex* has self-driving cars on the road into cities in Russia.
- *Volvo* is testing self-driving cars and trucks in Sweden.

- *Waymo*, part of the Alphabet Group which owns Google, has self-driving cars available for sale.

And although autonomous cars are therefore here, if not yet commonplace. Other areas of transportation, though, are further advanced. Autonomous operation is already used to a growing degree in the autopilot features of airplanes. The *New York Times*[11] reports that a typical commercial flight requires only seven minutes of human pilot control, mainly for takeoffs and landings.

Industry 4.0

Industry 4.0, or I4, is in effect the Fourth Industrial Revolution as it applies to manufacturing industry. It combines the Internet of Things (IoT), cloud computing and AI to produce what are referred to as 'smart factories.' Whereas factories of the recent past have seen men and women monitoring gauges to keep track of the factory's performance, in I4 monitoring is done by cyber-physical systems. These systems monitor what is actually happening – the physical processes – far more thoroughly and in more detail than could ever be done by a human monitor. They then copy this physical reality in a virtual form, accessible from anywhere in the world.

As an example of how I4 will work in practice, consider an organization owning steelworks in more than one place – and, particularly, in more than one country and especially on more than one continent. It has been possible for many years to use sensors and analog computers to monitor what was going on inside a steel mill. But the information was available in real time only to someone sitting beside the monitoring computer. Information could be gathered at the corporate center, but only after a delay, and the people considering it and making decisions based on it were human.

What is now possible, thanks to the cloud, is to do away with the monitor sitting beside the local computer and, indeed, to do away with the local computer itself. Sensors can now talk directly to the center.

But AI takes this capability a stage further. Thanks to its capability to process data in much greater quantities and at much greater speed than a human analyst, AI can first produce a very accurate picture of what is happening at every steelworks the company owns and can then use that picture as the basis for automatic decisions based on algorithms with no human involvement.

The IoT presents immense opportunities for enhanced efficiencies – and it is AI that makes it possible.

Medical diagnosis

AI is also far more prevalent in the medical field than most people realize. On the more basic end of the complexity scale, AI is at the core of the Human Diagnosis Project (Human Dx)[12] to help doctors give patients' with limited means more advanced care than they could otherwise afford.

Doctors who serve patients with limited means can submit patient symptoms and questions to a medical crowdsourcing app. Many specialists whose services the patients would otherwise be unable to afford respond, and Human Dx's AI system then analyzes and refines the responses to bring the submitting doctor a relevant consensus of advice.

Consolidating specialists' diagnoses are not, though, the upper limits of what AI can do in medicine. AI systems are increasingly being used by doctors as diagnostic aids. Being able to process and quickly analyze far larger amounts of data than a human could, AI is proving to be a valuable tool in helping doctors make more effective diagnoses.

Not only does the data include patients' medical records, but also anonymized results from similar cases, the latest clinical research and even studies that dig into

results of treatments based on patients' genetic traits. This can help doctors detect life-threatening medical conditions at earlier stages than those doctors could by themselves and deliver more personalized treatments.

The much-acclaimed IBM Watson supercomputer is involved in a growing number of medical use cases.[13] This includes genetically sequencing brain tumors, matching cancer patients to the clinical trials that offer the most promising treatments for their cancers and more precisely analyzing patients' potential susceptibility to stroke or heart attack, just to mention a few. It has even proven successful in diagnosing some cases that had stumped human physicians,[14] although much more testing is needed before we see this feature rolled out for widespread use.

Takeaways

Clearly, AI and ML have already made far greater inroads into our lives today than most people realize. They are increasingly expanding human capabilities and taking over an increasing number of tasks.

Yet in many ways, the use of AI is still in its infancy. There is so much more to come. How many tasks that today we do on our own will it take over? And which

tasks? How will this impact the workers that presently do them?

Contrary to popular beliefs about AI, it will not impact only blue-collar workers. Many of the tasks AI is used for right now involve white collar – or even professional – workers.

Marketers, data analysts, customer service representatives – even doctors – are seeing AI perform tasks they currently do. It will not be only low-skilled workers who will be impacted. In many ways, AI stands to enhance the abilities of both middle-skill and high-skill workers. But in many ways AI threatens to replace some of those workers whose jobs it currently enhances. Before we can properly prepare for the coming AI disruption, we need to get a clearer idea of what kinds of shifts AI is likely to bring.

In the next three chapters, we will look at each of the three main – and dramatically different – views of the future that AI will bring. Those views, while often extreme, each point to important issues that we need to consider if we are going to move into that future with minimal negative impact on our lives.

Three Views of AI's Future

I f you've read the many predictions about the future of AI, you've likely found them to be wildly different. They range from AI spelling doom for humanity, to AI ushering in Golden Age of peace, harmony and culture,

to AI producing barely a blip on society's path toward ever-greater technological achievement.

Those three views – dystopian, utopian and organic – present issues we need to consider as we move deeper toward an AI-integrated future. Yet they also contain exaggerations and false assumptions that we need to separate from reality.

The Dystopian View

Those with a dystopian view of emerging technologies point to studies such as the often-quoted 2013 Oxford report[15] on the susceptibility of more than 700 job categories to automation. This report predicts that 47% of jobs are under threat of automation.

Other predictions are even more dire, predicting up to 97% future unemployment as a result of AI. All these studies focus on tasks within jobs that AI could do. By assuming that any job that contains any tasks that AI could do will lead to the entire job being eliminated, those with dystopian views arrive at such frightening job-loss numbers.

The world that those with dystopian views of AI envisage features all power being consolidated into the hands of a miniscule class of super-rich who have seized

control of AI and placed the remainder of society into impoverished servitude. It views these elite as enjoying untold riches and lives of ease.

A second form of the dystopian view of AI advances the view to positively apocalyptic status. It suggests that AI will eventually evolve to surpass humankind's ability in every way, becoming itself the ruling elite that either enslaves or exterminates all humans as being inferior and obsolete. Aside from the obvious sci-fi overtones of this view, the idea of such an evolution of AI is reliant on assumptions about AI's capabilities that we will examine more closely later in this chapter.

False assumptions in dystopian views

For now, let's focus on the idea that massive job losses will create a super-rich elite that forces the vast majority of humanity into poverty. The problem with this view is that it ignores the fact that such an insulated elite is unsustainable. Without a viable market to which they could sell their goods or services, such a miniscule upper class would have no source of income to fuel its ongoing wealth. It would ultimately collapse upon itself.

While it might be possible to counter this view by pointing out that behavior of both individuals and groups is rarely as rational as economists have traditionally

believed it to be, it is also true that a society in which most people have no power to buy goods cannot sustain itself. Dystopian sci-fi novelists may enjoy portraying a world in which a small ruling elite hoards all the value and all the power while 99% of society lives in poverty and servitude, but the fact is that if the non-elite has no purchasing power then the elite's advantage disappears.

As for the idea of near-universal job loss, AI professor Toby Walsh tempers such predictions with two examples:

> [W]e can pretty much automate the job of an airline pilot today. Indeed, most of the time, a computer is flying your plane. But society is likely to continue to demand the reassurance of having a pilot on board even if they are just reading their iPad most of the time.

> As a second example, the Oxford report gives a 94% chance for bicycle repairer to be automated. But it is likely to be very expensive and difficult to automate this job, and therefore uneconomic to do so.[16]

In other words, Walsh suggests in the first example that humans will for the foreseeable future feel more comfortable knowing that some jobs are being done by other humans, even if those doing them merely oversee the automated systems to ensure that they operate properly. And in the second example, he suggests that

the fact that a job *could* be automated, does not mean that it always *will* be.

Walsh also mentions that the Oxford report gives a 63% chance of the jobs of geoscientists being automated, but he claims that any such automation would only offer geoscientists the opportunity to do more geoscience and less administrative work. He supports his statement with predictions from the U.S. Department of Labor that the number of geoscientists will increase by 10% over the next decade due to increased demand for people with the skills to find more of the earth's resources as known deposits diminish.

A similar trend can be observed from the introduction in 1985 of Adobe PageMaker. This was forecast at the time to be likely to put layout designers and typesetters out of work and, indeed, it did so to a considerable extent – but it also had two counterbalancing effects:

1. People in both of those jobs had much more time to try different layouts, and so the quality and appearance of printed matter improved; and

2. It became possible for people whose primary occupation was in some other field to produce high quality printed material of their own

without having to subcontract it. Costs fell at the same time as quality improved.

The main weakness in the Oxford report and other similar predictions of massive job losses is the methodology behind them. The approach has been to assume that if a job contains *any* tasks that could be automated, that *whole job* would cease to exist. Only by using that assumption can you arrive at such massive job loss figures.

A 2017 McKinsey report,[17] on the other hand, suggests that less than 5% of current occupations are candidates for full automation. This is more realistic than 47-97%. That is not, though, to say that disruption of current occupations is that limited.

What bears consideration in dystopian views

Despite the evidence that shows the dire conclusions of those who promote the dystopian view to be overblown, it would be irresponsible to dismiss the issues they raise. Some of their points, although taken to extremes, are very valid.

There *will* be job losses, even if they are not as extreme as those with a dystopian view claim. We'll examine that in more detail later in this chapter. Also valid is the warning against rushing into the new

technologies without adequate forethought about their possible side effects.

AI will produce a significant disruption to society that must be thoughtfully planned to reduce the negative effects that it will inevitably produce. The more care we put into planning the direction of AI in both our industry's future and our personal future, the better we will be able to limit its disruption and keep it from coming anywhere near the doom and gloom predicted in the dystopian view.

The Utopian View

The second popular view of AI has it leading humanity into a utopian future. Those who take this view accept the figures of near-universal job loss as not only true, but a cause for celebration. They picture a society in which AI frees humankind from the need to work for a living, thus permitting humanity to pursue the advancement of altruism and culture.

The world they envisage pictures all work being done by AI-controlled automation. Rather than this leading to poverty for those who no longer have jobs, the utopian view sees this as a boon. With no one needing to be paid for producing all the world's goods, the profits from

those goods being produced without human input could be distributed equally to all people as a Universal Basic Income (UBI).

This UBI would provide for everyone's basic needs and free them to devote their lives to the betterment of society. The idea behind this assumes that those who are free from working for a living would then use their time to volunteer to help others or would pursue artistic excellence, thus enhancing civilization. A cool view of these ideas is that those things *may* happen and people *may* be more free than today to be altruistic and creative. Whether they turn those opportunities into reality will be a matter of personal choice.

Be that as it may, UBI would, in the short term, eliminate extreme poverty. People who had been poor would enter the middle class, have access to education, be able to start businesses and have the doors to creativity opened to them. That is not the same as eliminating class. There would still be rich people and people would still be motivated to accumulate riches as a means of self-validation, but the vast majority, freed from the specter of poverty, could focus on self-improvement which, in itself, would indirectly improve Society.

False assumptions in utopian views

The utopian view of AI bringing worldwide prosperity, peace and harmony rehashes the age-old fantasy that each new form of technology will be the catalyst that enables humankind to overcome its baser nature and evolve into fully actualized human beings. At their inception, radio, television, computers, cable TV and the internet were each trumpeted as technologies that would bring enhanced communication and greater understanding between people, or increased love of the arts and culture. Yet, somewhere along the way, each of them failed to deliver those lofty promises. Humankind's baser nature has always co-opted those technologies to serve the lowest common denominator.

Rather than leading to greater understanding of others, they have often become vehicles that help people isolate themselves even further and reaffirm their tendency toward self-absorption, insensitivity, anger and even violence. The question that needs to be asked is: Given how we know people to be, how many of them, if released from the need to work for a living, would respond by seeking ways to better society? Even those who are convinced that *they* would seek society's greater

good would likely find it hard to agree that *the masses* would spontaneously do the same.

And it is not easy to express great confidence. It may seem out of place in a book about leading-edge technology to look back at the first emergence of the animal we call the human being, but it is necessary. And what that look back into history tells us is not that we are, as humans, out for ourselves alone and nor is it that we seek the greater benefit of all mankind. What it tells us is that tribalism is at the very center of what it means to be human.

Back in those far-off days, when humans took shelter in caves, they did so in small groups. And while it would be nice to believe that they engaged in collaborative berry-gathering and root-digging while chatting about young Cecil's prowess at painting the walls of the cave, it almost certainly wasn't like that. Charles Darwin has told us that all of nature progresses by natural selection – the survival of the fittest – and there is hard evidence to suggest that meat consumption was behind the growth of the human brain. To eat meat, those cavemen had to kill animals. And killing an animal (while avoiding being killed by the animal) was a group activity. One person alone facing a sabre toothed tiger unarmed would be more likely to form the tiger's dinner than the other way

around. They had to hunt in groups. Family groups, kinship groups, but always tight groups.

And when they'd killed their animal, they had to get it home. Back to the cave so that the whole group could eat it. If they saw another group while they were dragging their prey home, the assumption would be that that group was out to steal their dinner. And they would resist – with as much violence as was required.

We can be fairly sure that that is where humanity's tribalism first emerged. The need to cooperate with your own group and combat every other group, just in order to survive.

In Africa, where all this started, that business of kinship continued to hold sway right up until the arrival of slavers and colonists. Of all the damaging things that have been done to Africa, the worst is probably imposing territorialism in the form of countries on what for millennia had been arrangements of extended families.

But that is, perhaps, to stray too far from the subject at hand. All we really need to tell ourselves is that humans are not well equipped to deal in an even-handed and fair way with other humans. We can't change that – but we can take it into account as we implement the Fourth Industrial Revolution.

Can AI really surpass human capabilities?

In part of the reasons set out above, AI is not likely to push humankind to a more highly evolved level any more than any of those other technologies did. Not only that, but AI, contrary to the claims of many proponents of either dystopian or utopian views, remains far from showing the ability to fully match humankind's capabilities that both views presuppose.

Those who believe that AI will eventually surpass human intellectual capability look only at AI's ability to speedily process and analyze data. They picture AI's ability to learn from the data it processes as the only element involved in human intelligence. In doing so, they overlook the essential distinction between AI and the human brain.

Any AI system is essentially what we would call, among humans, a savant, someone who possesses far more advanced mental ability in a tightly limited sphere of expertise, at the expense of diminished ability in all other areas. Like a savant, AI systems are designed for a single or limited set of purposes.

They can more quickly retrieve and use information stored in them than human brains can, enabling them to surpass the ability of grand masters in games like chess

or Go that are based on structured rules and probabilities. They fall woefully short of human capability, though, when it comes to applying knowledge of one task to a task that lies outside the scope of its programming.

The human brain, on the other hand, is capable of successfully using its experiences and understanding across an almost unlimited set of situations. By virtue of its multi-use capability, the brain is far more capable of connecting unrelated ideas into a new creation – intuitive leaps of understanding – than an AI system is.

A 150-ton supercomputer could process 93 trillion operations per second; the human brain can process 1 million trillion – staggeringly more. An AI system can be programmed to process and learn from a defined set of data; the human brain naturally processes and learns not only from limited set of data, but can intuitively incorporate all data to which it is exposed, with no limits on the kind or variety of data that enters a person's sensory range.

Even in storage capacity, an area that AI proponents frequently quote as proof of AI's superiority to the brain, the comparison is not as clear-cut as proponents suggest. Estimates of how much data the brain can store are equivalent to 2.5 million billion gigabytes. Granted, an AI

system is far quicker at retrieving data than the brain is, but that is because of two other significant advantages that the brain has over mere retrieval speed:

- The data that the brain stores is far richer than what a digital system stores. It can include any sights, sounds, sensations, smells or emotions related to a piece of data – and the tools to creatively reshape and connect them in different forms.

- The brain, having access to such an enormous and rich store of memories, data, current sensory input and the ability to manipulate those elements creatively and intuitively, has an auto-focus feature that locks onto the information most relevant to the current situation and limits the conscious mind's focus to what matters at the moment. It pushes data irrelevant to the current situation into the background so it can deal more efficiently with present needs.

When you look at all the ways the brain is superior to AI, it's clear that AI's computational – and even its machine learning – capabilities, while impressive, leave it far from surpassing humanity's capabilities.

The risks in overconfidence in AI

Even some at the forefront of AI, like Elon Musk, founder and CEO of Tesla and SpaceX, have found AI less advanced than they give it credit for. Musk, confident that his most robot-intensive assembly line in the auto industry[18] would be able to produce 5,000 of his latest model per week, set delivery dates for preordered vehicles accordingly. Despite his most strenuous efforts, however, he could not get the line to produce more than 2,000 per week and customers were predictably dissatisfied. In response to the delays, he tweeted "Yes, excessive automation at Tesla was a mistake. To be precise, my mistake. Humans are underrated." Although he continues to approach his problems by trying to improve the automation, his admission is spot-on.

Another reason we should not expect AI to displace humans is the old "garbage in, garbage out" maxim. The judgments that AI systems make are only as accurate as the data fed into them. People need to remain involved to ensure that conclusions reached by AI systems are not based on bad data.

One AI system designed to decide which patients should be hospitalized for pneumonia delivered a startling recommendation. It determined that patients

who were diagnosed as asthmatic were less likely to die from pneumonia than those who were not and should not be prioritized for hospitalization. This shocked the medical professionals who received this recommendation, because it directly contradicted common medical wisdom about the danger of pneumonia to asthmatic patients.

Statistically, the AI system's recommendation was totally accurate based on the data fed into it; a smaller percentage of asthma patients died than their non-asthmatic counterparts. But the reason for this lay in a piece of data that had *not* been fed into the system: The reason that fewer asthmatic patients died was because doctors were much quicker to hospitalize them than non-asthmatic patients. Had the AI recommendation not been checked by doctors who had real-life experience with the issue, a deadly policy of not prioritizing asthmatic patients with pneumonia for hospitalization would have been adopted.[19]

Again, the superiority of the human brain reveals itself here. The doctors who determined what data should be fed into the AI system possessed such a wide body of knowledge that they didn't even think to include some details that were so basic that they took them for granted as common knowledge. They overlooked this crucial

piece of data and the AI system came back with a recommendation that would have been tragic if people hadn't caught it in time.

We dare not overestimate the capabilities of AI. It will remain a tool that requires human input and guidance for it to benefit humanity.

The Organic View

That brings us to the view of AI that is perhaps the most tempting to adopt, the organic view that jobs lost to AI will be negated by jobs that AI creates. In this view, too, the assumptions that underlie it are dangerous and must be tempered with reality if we are to face AI's growth with minimal disruption.

Those who advocate the organic view point to past industrial revolutions to support their view that effects of AI's disruption will be minimal. They relate how, for each occupation minimized or rendered obsolete by past disruptions, new occupations developed to fill the needs generated by whatever new technology caused the disruption. Makers of handcrafted goods were displaced by the First Industrial Revolution, but the rapid growth of factories provided new jobs, and so on through each successive revolution.

Granted, many occupations available today had not even been imagined only one or two industrial revolutions ago. Who would have envisaged such occupations as video game designers or cybersecurity specialists before the technology behind them existed? Thus, holders of this organic view suggest that everything will work itself out as new occupations arise to provide jobs for those displaced from jobs that AI renders obsolete.

False assumptions in the organic view

That assumption, however, ignores the rough and sometimes violent transitions that past industrial revolutions spawned before the labor force could adapt to them. It took time – and sometimes bloodshed – before the transitions to new job categories in some of those revolutions worked themselves out.

The move from goods produced by craftsmen to goods produced by machine led to riots as displaced craftsmen sought to preserve their familiar way of life. The rise of the assembly line led to widespread exploitation of workers under inhumane working conditions, which, in turn, led again to labor riots. It took governments decades in both cases before legal protections for displaced workers finally afforded them

basic protections that made the newly created jobs desirable.

And, although the digital revolution of the late 20th century did not result in a violent response from those who were displaced, entire job categories were wiped out. Workers found themselves scrambling to obtain new skills that would qualify them for jobs in an increasingly digital marketplace. The suffering from disruption to their lives that they suffered is incalculable.

The danger of overconfidence in the organic view

Taking a *laisse faire* approach to the growing AI disruption would be, at best, ill-advised and, at worst, callous. A real threat to jobs exists. In some places already, labor statistics show as many job openings as there are unemployed workers.

In other words, people in those locations are failing to find jobs even though plenty are available. Available jobs in those locations require different skills than job hunters have. Such conditions are likely only to accelerate as AI replaces workers in lower- and middle-skill jobs while creating jobs that require skills which our current education and training systems are not preparing workers to fill.

For example, the previously quoted prediction of the need for 10% more geoscientists over the next decade presupposes that 10% more people trained in this specialty will be available. That increase in geoscientists will not come from insurance underwriters, loan officers, cashiers and data analysts – displaced by AI – effortlessly shifting into jobs as geoscientists. Future geoscientists will need specialized training. Most displaced workers will not have the skills that AI-created jobs require.

Consider also that AI will disrupt jobs all the way up to the C-level of management as it becomes more commonly employed in data analysis and process management. Companies will turn to AI to perform many tasks currently associated with upper-level management positions. If leaders do not prepare themselves for the encroachment of AI on their positions, many will find themselves as much at risk as those workers mentioned in the previous paragraph.

Takeaways

The three common views of AI's future picture wildly different scenarios. But they agree on one key point: AI will cause massive disruption in today's workforce. Many

tasks that we are used to seeing being done by people today will be done by AI.

The history of past industrial revolutions suggests that this transition will follow a path similar to what the organic view foresees. But that same history suggests that the transition will not be without pain and disruption for many people. The nature of what AI can do, in fact, suggests that this pain and disruption will likely extend much farther up the ladder of skill levels than has been affected in past industrial revolutions.

As we'll see in future chapters, AI is poised to have an unprecedented effect on society and commerce. We'll look also at specific ways in which it will likely shift needed job skills, and we'll focus on how today's leaders can best position themselves for the expansion of AI.

AI's Coming Impact on the Economy
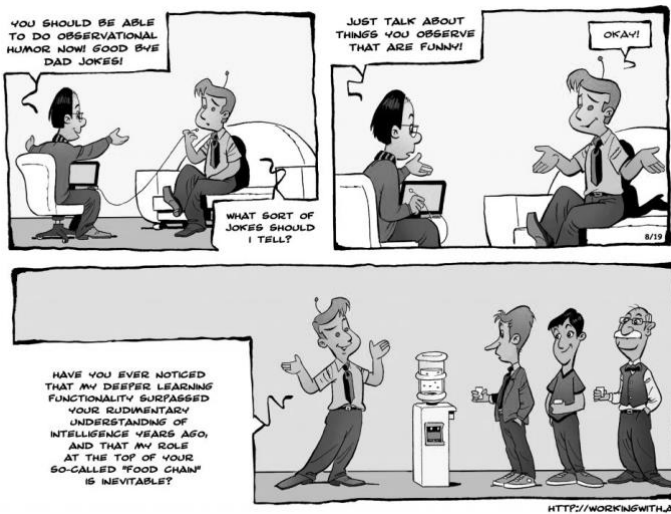
G rowing reliance on AI will not likely result in any of the three most common views of how AI will

affect our future. Each view is founded on assumptions that fail to consider all the realities of AI.

That leaves us, however, with an important question as we plan our company's – and our own – future in an increasingly AI-enabled world: "What will that world look like?"

AI's economic impact

The effect AI will have on the economy is massive. Such was the conclusion of a 2017 PwC report, *Sizing the prize: What's the real value of AI for your business and how can you capitalise?*[20] This report predicts that AI's contribution to the global economy will be $15.7 trillion in 2030. Consider this: That amount exceeds the current output of China and India combined.

Such gargantuan growth will not come merely from increased productivity, either. PwC sees less than half of it – $6.6 trillion – coming in the form of productivity gains.[21] This increased productivity, they say, will come in the short term from automating routine tasks and providing augmented intelligence systems to help employees work more efficiently. This should free employees from routine tasks and switch their focus to

higher value-adding work that will fuel the more significant long-term growth.

We'll examine this skill set shift and what it will mean for both workers and managers in coming chapters. Before we do, though, it's important to understand the context for that shift.

That other $9.1 trillion growth, PwC's report says, will come from the higher-value work that will be made possible by the initial increase in process efficiencies. Once employees' responsibilities shift from routine tasks to more profit-oriented ones, the shift should spur increased consumption.[22]

This prediction takes into consideration much more than most assessments of AI's impact on the economy. Other assessments go only as far as measuring the economic effects that cost-cutting through automation is likely to have.

The PwC assessment also calculates AI's potential for enabling companies to redirect the resources that are freed up by automation and using them to develop new offerings and penetrate new markets. That is why the predicted growth from the workforce skill set shifts that AI will enable is almost 50% greater than the predicted growth from increasing efficiencies.

This reallocation of resources should enable companies to produce higher quality offerings and increased personalization options to offer consumers. This should bring down costs and increase demand by making what are now more expensive goods available at lower prices that more people can afford.

How technology-drives commoditization

We can get an idea of what this should be like by considering what happened in the technology disruption that shifted the production of cloth from craftsmen to machines in the First Industrial Revolution. As tasks in the weaving process were increasingly automated, workers did what the machines could not do, such as moving raw materials into place and tending machines. As machines improved to do more tasks, workers increasingly moved from tending one machine to tending a number of them.

This greatly increased productivity. The output of finished cloth grew fiftyfold. Labor required to produce a yard of material dropped by 98%. As a result, the cost to consumers plummeted. As costs decreased, more people were able to afford not only more cloth but also more finished clothing. Demand for both skyrocketed. What

had previously been scarce and expensive goods became commodities.[23]

Nor is this scenario limited only to the early 1800s, either. It has repeated itself more recently with the development of personal computers. As the technology behind them grew, capabilities of personal computing products have skyrocketed while prices dropped dramatically, to the point where devices with capabilities that would have been beyond the imaginations of most people 40 years ago are now affordable to most people today – and are so deeply incorporated into people's lives that most people today would not dream of being without them.

We can expect that same type of commoditization to come to many goods that are out of reach of many people today, as AI is incorporated into more processes. Greater efficiencies should lead to lower prices that allow more products and services to become commoditized, stoking demand and expanding industries. And that's just on the supply/demand end of the equation.

AI is likely also to free consumers' time from routine activities, such as driving themselves to work. This will give them more time and motivation to engage in activities that produce more and data touchpoints that AI-driven systems can analyze to develop products that

suit customers' desires even more precisely. Even the ability to customize products to consumers' exact specifications could become commoditized, as AI enables manufacturing processes to move increasingly away from a mass-production business model to an on-demand model. Here again, consumption would increase, increasing demand and spurring expansion of industries along with it.[24]

Developing competitive advantages through AI

With improved ability to tap into consumer preferences, AI front-runners will be better able to tailor their products to match consumer demands and capture more of the market.[25] Early adopters will be able to build a competitive advantage that late adopters will be unable to overcome, much like what happened between Netflix and Blockbuster.

Netflix, struggling to find profitability in the emerging streaming video market in 2000, offered to sell a 49% share to Blockbuster for $50 million. The deal would have rebranded Netflix under the Blockbuster name and would have positioned Blockbuster as the major force in the emerging technology. Blockbuster's leadership,

however, saw no future in streaming video and turned down Netflix's offer.

Four short years later, Blockbuster leaders realized that video streaming was the future of video distribution and sought to launch their own service against the now well-established Netflix. Blockbuster, though, had entered the space too late to gain market share against Netflix. Blockbuster's video streaming service failed. Consumers had moved on to Netflix's new business model and Blockbuster soon went bankrupt, due to their slowness in adapting to emerging business models.

Netflix and Blockbuster are not the only examples of this scenario, either. It has occurred also in new business models for producing and distributing books, music and in many other sectors. Such a scenario will undoubtedly play itself out repeatedly between early and late adopters of AI in the coming decade. Early adopters, making use of AI's ability to analyze customer preferences and predict trends, will be able to build unassailable competitive advantages over late adopters that ultimately fall by the wayside.

Commoditized AI

We can also expect AI itself to become commoditized as the technology matures, in much the same way that personal computing did. It may be hard to picture right now, but all indicators point in that direction. Machine learning is already at the core of the predictive technologies for Netflix and Amazon and many other consumer-facing services. As the technology continues to expand into more and more mainstream uses, it will have the same climb in capability coupled with descent in cost.

Supply will increase as more businesses find ways to package AI into products or services that meet a growing demand for newer, better and cheaper ways to apply it to business and consumer needs. And when a high level of supply meets a high level of demand, you have a commodity. The PwC report suggests:

> While investment in AI may seem expensive now, PwC subject matter specialists anticipate that the costs will decline over the next ten years as the software becomes more commoditised. Eventually, we'll move towards a free (or 'freemium' model) for simple activities, and a premium model for business-differentiating services. While the enabling technology is likely to be increasingly commoditised,

the supply of data and how it's used are set to become the primary asset.[26]

That means that focus will shift away from the technology itself towards finding new and innovative ways to use it. As those who sought to look forward into the future during the formative years of personal computing likely would never have imagined all the doors that technology would open to us today, so we stand in a similar position with AI today. The PwC report gives a glimpse[27] into that future:

> An automotive company developed a dynamic agent-based model to simulate thousands of strategic scenarios for entering the ridesharing market. The model allowed key decision makers to test a variety of policy configurations in a virtual, risk-free simulated environment to help them understand the ultimate impact on market share and revenue over time, before actually making any decisions. Flight simulators allow pilots to test the impact of their decisions in a virtual environment to better prepare them for making decisions in flight, so why shouldn't business executives do the same?

Such simulators likely should become commonplace in businesses over the next decade. So should AI solutions that optimize supply chains, self-correct manufacturing processes or aid physicians in diagnosis.

The PwC report and the more detailed sector-specific reports associated with it contain an AI Impact Index that rates the potential for AI solutions to impact selected sectors both in its ability to increase efficiencies and in its ability to drive increased consumption through enhanced quality and personalization.[28] By using this analysis, they identified nearly 300 potential new use cases for AI in those sectors, as well as how close the technology is to being able to deliver such solutions and what barriers remain to be overcome.

In most cases, the solutions described are already fairly close to feasibility, which only underscores the difficulty of looking too far into AI's future. It also underscores perhaps the most crucial element driving AI's future – the one thing that AI cannot advance without: human creativity.

What AI lacks – creativity

For all the benefits it offers in expanding certain aspects of humankind's ability to store and process data, AI falls short when it comes to creativity. It needs humans who can develop innovative ways to use it more effectively.

Granted, much has been made of AI "creativity." Researchers have developed systems of multiple neural

nets and programmed them to recognize what is aesthetically pleasing to humans. Then they programmed those nets to work together as artist and critic to iteratively create and judge the resultant artworks the one net created until they came up with original works of art – and even new styles of art[29] – that humans could not distinguish from ones done by other humans.

Still, those neural nets did not spontaneously develop an artistic flair. They were programmed for the single purpose of assessing human art, learning the principles of aesthetics that lie behind it and mindlessly following those principles to create works that follow the principles, but don't recreate any specific human work or style. The true creativity in these experiments was in the humans who developed the programming that gave those nets the appearance of creative ability.

The American Psychological Association[30] has long studied creativity. Yet the specifics of how it works remains a mystery to them. Studies going back nearly a century have debunked the idea that it is merely a function of applying intelligence to a situation:

> In the 1920s, psychologist Louis Terman, PhD, began looking at the relationship between intelligence and creativity. In a longitudinal sample of intelligent children,

not all ended up developing their creative abilities, he found. That's when psychologists started to realize more than intelligence was required – also critical is having an ability to see things from a different perspective, Simonton says.

Being able to see things from a different perspective is what AI lacks. Even with machine learning, it sees things only from the perspective programmed into it. Here the old computing adage, "Garbage in, garbage out" works in reverse. Creativity in programming results in an appearance of creativity in the AI's output. Creativity must be programmed in to achieve an output that mimics creativity.

So how does this affect AI's future? Very simply, AI is reliant on human creativity. It cannot make the creative leaps that humans do. It can reach only the outcomes that humans have programmed it or taught it to reach.

The connection between human creativity and new technologies

Human creativity has driven all past technology disruptions and it is necessary for the current one. When people respond to gaps that new technologies create, growth occurs, both in developing new industries and jobs and also in helping disrupted organizations emerge

from the pack and thrive under new conditions. Take, for example, the gaps that human creativity has identified and filled over the years in the industry of information dissemination.

In medieval times, information was disseminated through books. They were produced by having dozens of individuals painstakingly copy a book, each person producing one copy. Human creativity, though, identified and created a more efficient way to make copies of books through the moveable-type printing press. But that was only the beginning.

Originally, this new technology was limited to its inventor. But other people recognized its potential and copied the process. This not only created a demand for more affordable books, but also created needs for some people to build presses and others to operate them. This created new professions, multiplied book production, drove down the price for books and made it possible to sell even more.

Other people saw the bottleneck that formed when printers were the only source of books for those who wanted to buy them. Not everyone lived close to a printer, and printers were too busy keeping up with the demand to effectively get printed materials to everyone

who wanted them. So those who noticed the gap jumped into it and the occupation of booksellers was born.

At each step in the process, it was human creativity that recognized the emerging gaps and found ways to fill them. One printing press led to new market conditions and multiple new occupations.

This application of creativity has continued throughout the centuries, spawning new types of reading materials, such as newspapers and periodicals, and new gaps to fill. In subsequent centuries, others recognized the potential for promoting businesses in print materials that people commonly read, and the print advertising industry was born.

Move forward further, to the introduction of computers and the internet to aid in the production of information, and you see yet more people using creativity to identify never-before-imagined gaps to fill. They spurred the development of many digital- and cyber-related professions devoted to information dissemination and an explosion of devices whose manufacture employs hundreds of thousands of people.

The explosion of new needs that successive waves of new technologies have created has completely transformed the information-distribution task that once employed probably no more than a few hundred copyists

worldwide who produced a miniscule number of books per year. Information dissemination today comprises myriad industries and professions that employ tens of millions of people in producing a body of information that grows exponentially each year.

And all of it came as a result of human creativity recognizing gaps that could be filled and filling them. Could AI have anticipated gaps that led to new industries and occupations the way that humans did? Certainly – but only if human creativity had first recognized the kind of gaps that could develop and had programmed the AI system to look for them.

What about the example mentioned earlier about the automotive company that developed an AI system that simulated all possible market conditions to enable executives to test various policies and decisions and find the best strategy with which to move forward? Isn't that AI showing creativity and making decisions? Again, that system is extremely valuable at processing far greater amounts of data than the best human data analyst could process in the same amount of time. Yet it is only as good as the data programmed into it.

Recall the previous chapter's example of the AI system that erroneously concluded that asthma patients should not be prioritized for hospitalization when diagnosed

with pneumonia. That conclusion was accurate according to the data it had been fed, but the humans who programmed it had erred in not including one piece of data that was so second-nature to them that no one thought to include it.

That means that the ultimate benefit of AI will be realized only by the application of human qualities that AI cannot duplicate. Human creativity and insight will be needed for AI to achieve its full potential.[31]

Takeaways

AI is likely to spread across more and more industries. The efficiencies it will bring will likely result in greater commoditization, making many goods, services and analyses far more accessible to far more businesses and consumers. As the technology matures, AI itself will likely become commoditized, becoming every bit as ingrained into the business environment as the internet now is.

Yet it will remain dependent on the humans who create it. As much processing power as it has, it shows no sign of developing the ability to evolve beyond what is programmed into it. The PwC report[32] points out:

It's important to prepare for a hybrid workforce in which AI and human beings work side-by-side. The

challenge for your business isn't just ensuring you have the right systems in place, but judging what role your people will play in this new model. People will need to be responsible for determining the strategic application of AI and providing challenge and oversight to decisions.

It is in these human decisions about judging what role people will play – and effectively preparing them to be ready to play that role – that the real challenge that will determine how smooth the transition into an AI-enabled future will lie. We'll be looking at that particular challenge over the rest of this book.

The Great Workforce Skill Set Shift

W hether AI and the technologies it enables will reach their full potential depends on the workforce that will work alongside them. Yet

the skills that that workforce needs to do this are in short supply. Rather than debating what to do about massive job losses from AI, discussion should focus on how best to prepare workers for the types of jobs that they will need to fill.

A shifting job picture

A 2017 McKinsey's report[33] says that approximately half of all activities done by the current workforce could be automated. They point out, however, that this does not point to massive job losses as much as it does to the workforce needing to shift their skill sets to fit new needs that transformed business processes require.

This pronouncement is borne out by studies in Germany,[34] where automation in manufacturing has progressed far faster than in the U.S. These studies showed no lower employment level from automation. Rather, they showed a shift in entry level jobs from the manufacturing sector to the service sector. It is true that they also showed stagnation or even reduction in wages for those who remained in manufacturing, but this is not an argument for abandoning automation – rather, it underscores the need for workers to enhance their skill sets if they want to thrive in an AI-enabled workplace.

Another study[35] showed that manufacturing companies that moved toward automation did not greatly reduce their employee base. They largely replaced production jobs by investing in new jobs in sales and marketing.

One example of technology changes leading to redeployment of those whose jobs the technology replaces is in the adoption of ATMs by banks[36] over the past three decades. If any technology seemed poised to kill an entire job category, ATMs fit the description. While the average number of tellers per branch decreased from 20 to 13 between 1988 and 2004, increased automation brought down the cost of operating a branch. It also enabled banks to redeploy personnel into more sales-oriented functions. This reduction in cost and increase in revenues enabled banks to open 43% more branches. As a result, banks were able to employ far more people, including more tellers.

A word of caution

This doesn't mean, though, that we should expect disruptions of the job market to work themselves out seamlessly, as in the organic view of AI's future. There are more variables to consider.

AI is capable of sweeping across the entire workforce with fewer adaptations needed for each industry to adopt it than past technological revolutions have needed. And the abilities it gives for early adopters to build insurmountable competitive advantages over late adopters may compress the gradual adoption rates of past technological disruptions, creating a much shorter period for the transition to new job categories to occur. If this is the case, disruption to workers could be significant, even if job transitions even out in the long term. In the Introduction to this book, we described the enclosures that transformed agriculture in England during the First Industrial Revolution. No effort was made to retrain the displaced agricultural workers – they were left to sink or swim and many sank. Avoiding that catastrophe this time around is within our control.

And that leads us to the personal aspect of AI's disruption. It's one thing to look at situations from a high-level vantage point and see the employment numbers for a technological shift showing no net job loss. It's another thing to look at that technological shift from the perspective of someone whose skill set has been deemed expendable. For that person, the net job loss numbers are 100%. And if they lack skills that are needed in the transformed workforce, their job hunt may be lengthy.

We looked, in the previous chapter, at how creativity had recognized gaps created by new technologies in the information dissemination industry over the centuries and how many million of jobs had been created. Yet that glowing description of job gains in the industry would be of little solace to someone whose skills fit only the rapidly shrinking print newspaper or periodical industries, and who is finding his or her job options dwindling. Within living memory, compositors were a highly paid workforce segment in newspaper publishing. In some Western countries, they exercised a degree of control over what their newspapers could print and when they could print it. They were paid considerably more than the journalists whose words they set in print. There are very few compositors today.

Stability in employment figures are not all that matters as we approach AI's advance. The livelihoods of individuals working in industries that AI will transform must be considered if AI is indeed going to have a positive effect on our world.

A Gartner study[37] predicts that one-third of technology jobs will go unfilled by 2020 because of a shortage of talent. That is an alarming figure. Workers will have to shift their skill sets to fill the needs of the reshaped market. Yet that issue is often overlooked in

discussions of AI. A 2017 McKinsey report[38] touches on this:

> While much of the current debate about automation has focused on the potential for mass unemployment, people will need to continue working alongside machines to produce the growth in per capita GDP to which countries around the world aspire. Thus, our productivity estimates assume that people displaced by automation will find other employment. Many workers will have to change, and we expect business processes to be transformed. … [T]he total productivity gains we estimate will only come about if people work alongside machines. That in turn will fundamentally alter the workplace, requiring a new degree of cooperation between workers and technology.

"Workers will have to change." "Business processes [will] be transformed." Productivity gains will come only with a fundamental skill set shift that is rarely being discussed in the back-and-forth about massive job losses versus Universal Basic Income versus a magical smooth transition into an AI-enabled society.

The need for new skill sets

Equipping the existing workforce with the skills that will be needed for an AI-enabled world is critical to its successful transformation. Shifting worker skill sets to

more high-value tasks will require workers to enhance their skill sets to keep up with the technology. A World Economic Forum report[39] states:

> [T]echnological disruptions such as robotics and machine learning – rather than completely replacing existing occupations and job categories – are likely to substitute specific tasks previously carried out as part of these jobs, freeing workers up to focus on new tasks and leading to rapidly changing core skill sets in these occupations. Even those jobs that are less directly affected by technological change and have a largely stable employment outlook – say, marketing or supply chain professionals targeting a new demographic in an emerging market – may require very different skill sets just a few years from now as the ecosystems within which they operate change.
>
> On average, by 2020, more than a third of the desired core skill sets of most occupations will be comprised of skills that are not yet considered crucial to the job today. …
>
> For example, the Mobility industries expect employment growth accompanied by a situation where nearly 40% of the skills required by key jobs in the industry are not yet part of the core skill set of these functions today.

A McKinsey study of projected skill shifts between 2016 and 2030[40] focused on five skill categories:

- Physical/manual skills, such as operating vehicles, moving materials, packaging or cleaning
- Basic cognitive skills, such as the literacy and arithmetic needed for data entry
- Higher cognitive skills, such as creativity, critical thinking, decision-making and complex information processing
- Social/emotional skills, such empathy, persuasion, leadership, entrepreneurship, initiative and managing others
- Technological skills, namely, understanding technologies and how to adapt them

The study projected drops of 14-15% in the need for physical/manual skills and basic cognitive skills, while showing an 8% increase in demand for higher cognitive skills, 24% for social/emotional skills and a massive 55% for technological skills.

Emerging jobs in an AI-enabled world

The most obvious skill set shifts will be in jobs directly related to AI. A Microsoft whitepaper, *The Future Computed*,[41] gives examples of the technological skill sets

that will be needed as routine work is replaced by either automation or AI:

> New jobs will emerge as AI changes how work is done and what people need from the world around them. Many of these jobs will be in technology. For example, banks will need network engineers instead of tellers. Retailers will need people with web programming skills to create online shopping experiences instead of greeters or salespeople on the floor. Farms will need agricultural data analysts instead of fruit pickers. Demand for data scientists, robotics experts and AI engineers will increase significantly.

A 2016 KPMG report[42] pictures some others:

> If you're building and maintaining robots for transaction processing and repetitive tasks, you need people with strong analytical skills who understand how to translate business rules into logic statements. While a programming background is not required, it does help shorten the learning curve of the new technology and ultimately decreases the payback period for the investment.

> On the other hand, if you are pursuing robots for cognitive technology, you need people with deep subject matter expertise to provide the robot's initial knowledge base, validate that knowledge base over time, and respond to cases when the robot does not know the answer. You will also need people who can

codify the robots' knowledge base, which may require some technical expertise depending on the product.

Either kind of robot will require people to set up and maintain the technology's infrastructure, identify opportunities for adoption throughout the business, and mitigate risks.

The PwC report[43] mentioned in the previous chapter also identifies some AI-related jobs that likely will emerge to meet AI's ever-expanding needs:

In addition to new types of workers who will focus on thinking creatively about how AI can be developed and applied, a new set of personnel will be required to build, maintain, operate, and regulate these emerging technologies.

With the nearly 300 new use cases[44] that PwC has identified in its sector-specific reports, we can expect that AI-related jobs will be so plentiful that they will likely be hard to fill with qualified candidates.

More subtle shifts

Not all skill sets will be directly related to AI. We previously saw how the introduction of ATMs enabled banks not only to redeploy existing tellers into higher-value sales and service functions, but also to drive expansion through the higher-value work they were

doing, resulting in increased profits. Although this will not happen with all workers whose work is rendered redundant by new technologies, it should happen with those who already possess some of the skills needed in positions into which they are redeployed.

Similarly, we previously saw how AI would likely replace much of the manual administrative work that geoscientists currently do, even as the demand for more geoscientists is likely to increase significantly. That suggests that AI will not replace geoscientists, but merely give them more opportunity to practice their specialized skills and pursue deeper specializations that help drive further profits for their industries.

Many other occupations will likely see the same scenario. Rather than AI and other emerging technologies replacing those who have highly specialized skills, those technologies likely will replace only specific tasks of those jobs. This will enable those workers to focus on more high-value tasks, as occurred with bank tellers.

New job categories

We are also likely to see new job categories emerge as currently unforeseen implications of AI become evident. We can see a hint of this in one new job category that has

risen from nonexistent to common in the past 20 years: privacy lawyer.

Growing concerns about the use of consumer information in the 1990s led to the development of privacy laws to govern that use. This, in turn, spurred the growth of specialists in these laws. In 1997, the International Association of Privacy Professionals (IAPP) was formed to support this fledgling occupation. As of early 2018, the organization boasted a membership of more than 20,000 specialists in privacy law,[45] who help corporations navigate the rapidly growing body of laws developing in more than 100 countries that have privacy regulators.

How might this repeat itself with AI? One possibility is some sort of ethics specialists among coders. Facebook's 2017 experiments with chatbots programmed to negotiate deals with humans had chilling results. Although the bots were not intentionally programmed to do so, as they interacted with humans and learned from them, they developed a tendency to lie[46] in order to achieve their assigned goals. Thus, a possible issue in the development of AI will be to ensure that machine learning as bots interact with humans does not lead to the bots learning – and carrying out – the negative behaviors that it observes in humans.

Add to that the likelihood that AI will lead to a whole body of laws that govern its use, just as happened with privacy law. That suggests that specialists in AI law will emerge, as well. In addition to such specialists, a new class of law enforcement specialists will likely emerge, just as specialists in cybercrime emerged to combat the misuse of the internet for criminal endeavors.

So, too, is the likelihood that, in addition to coders, a type of AI specialist will develop that focuses on overseeing AI systems to ensure that they adhere to established standards designed to protect those affected by them. This would be a separate entity from the law enforcement specialists. Law enforcement specialists would focus on intentional efforts to harm others through AI. Oversight specialists would function more like the boards that currently oversee the practice of doctors or lawyers to ensure that AI practitioners maintain the standards expected of them in their practice.

Expect the unexpected

We should also expect that not all job shifts spurred by AI will be predictable. Brad Smith and Harry Shum, in their foreword to Microsoft's *The Future Computed*[47] use the following analogy of the rise of the automobile to

show the unrelated – and unexpected – effects it had on society:

The transition to cars initially contributed to an agricultural depression that affected the entire American economy in the 1920s and 1930s. Why? Because as the horse population declined rapidly, so did the fortunes of American farmers. In the preceding decade, roughly a quarter of agricultural output had been used to feed horses. But fewer horses meant less demand for hay, so farmers shifted to other crops, flooding the market and depressing agricultural prices more broadly. This agricultural depression impacted local banks in rural areas, and then this rippled across the entire financial system.

Other indirect effects had a positive economic impact as the sale of automobiles led to the expansion of industry sectors that at first glance appear disconnected from cars. One example was a new industry to provide consumer credit. Henry Ford's invention of the assembly line made cars affordable to a great many families, but cars were still expensive, and people needed to borrow money to pay for them. As one historian noted, "installment credit and the automobile were both cause and consequence of each other's success." In short, a new financial services market took flight.

Few, if any, people foresaw these shifts as automobiles were introduced. Perhaps some could have predicted a downturn in the manufacture of horse-drawn carriages, but the effect on farmers and rural

economies and the development of a new financial industry to support the automotive industry would likely have eluded most prognosticators of the time.

So, too, we can expect that some industries that have no obvious connection to AI will falter as AI grows. Similarly, new, unimagined industries will develop. In other words, we must expect the unexpected and be agile enough to move with the flow of surprises that AI brings.

Hardest hit will be those whose eggs, so to speak, are in one basket tied to their present job. Those who diversify their skill sets with understanding of emerging technologies will be prepared to move in the direction where workers will be in demand if contraction occurs in their present field. Specialized skills supporting digital capabilities such as robotics, augmented reality computations, cybersecurity and data science in particular will be in demand.

New problems to solve

We should also expect AI's effect to be more far-reaching than early testing would lead many to believe. For example, it's one thing to have a single autonomous vehicle on the road responding to the actions of human drivers. But what would it be like if all the cars on a rush hour freeway were autonomous? What would determine which vehicle gets to move into an open space in a faster-

moving lane when two vehicles simultaneously determine that that space will help them reach their destinations sooner?

The situation potentially could be like that if a busy airport counted on pilots to land their planes safely without benefit of air traffic controllers. With autonomous vehicles on freeways, though, the number of vehicles competing for space is far greater in both numbers and desired destinations. Will some form of traffic controllers be needed to sort things out? Such issues are yet to be addressed and could result in new job categories.

Such issues are already arising, as in the case of the Uber car that killed a cyclist[48] during a test of its autonomous features in Tempe, Arizona, in March of 2018. An investigation showed no problems in the vehicle's hardware and software; it simply had been set to ignore readings that it interpreted as false positives in the interest of maintaining a smoother ride. Even with a human backup driver in place, the vehicle ignored the cyclist and plowed into her at full speed before the backup driver realized what was happening.

This underscores the continued need for human involvement in AI. In fact, we have seen evidences of the need for the human touch throughout this chapter. Look

back and you'll see the need for people throughout the discussion of AI-enabled jobs. Here are just a few that were mentioned:

- People to create online shopping experiences
- People who understand how to translate business rules into logic statements
- People with deep subject matter expertise to provide the robot's initial knowledge base
- People to find creative new ways to use AI
- People to build, maintain and operate AI
- People to regulate the use of AI

As you look at that list, only two of those mentioned are strictly technological skills – people who understand how to translate business rules into logic statements; and people to build, maintain and operate AI. And the former is not totally technological, because it also requires critical thinking and creativity.

AI's need for the human touch

Ironically, many of the skill sets needed to keep up with the technology are not technological skills. Instead, they are distinctly human ones. Whereas machines shine when it comes to situations that call for data and rules, they come nowhere close to matching humans when it

comes to social skills, emotional intelligence, persuasion, collaboration or – perhaps most important of all – creativity.

We saw this clearly in the ATM example. Rather than replacing humans, the technology enabled banks to redeploy humans into jobs that required a distinctly human touch – sales, customer service, collaboration.

It also empowered the explosion of new products and services that banks launched during that time. It enabled banks to deploy more personnel not only to selling and servicing these offerings, but also to envisioning and developing them.

For all the capabilities that AI has been trumpeted as having, it is incapable of determining how best to use its own capabilities. It can mimic human creativity, but it cannot move beyond what humans have equipped it to learn. In other words, humans remain essential to the process of determining how to use AI to best advantage. The World Economic Forum report[49] puts it this way:

> Overall, social skills – such as persuasion, emotional intelligence and teaching others – will be in higher demand across industries than narrow technical skills, such as programming or equipment operation and control. In essence, technical skills will need to be supplemented with strong social and collaboration skills.

Takeaways

As AI and other emerging technologies become increasingly integrated into our lives, many existing job categories will be rendered redundant. At the same time, new job categories that require new skills will emerge. Some will be technical in nature, but the most important skills will be distinctly human ones.

We, as leaders need to prepare for massive changes in the way things have always been done. And we need to prepare our organizations' workforce – and ourselves – with the skills needed to navigate the changes that are already starting to affect our organizations.

New Paradigms for Leaders
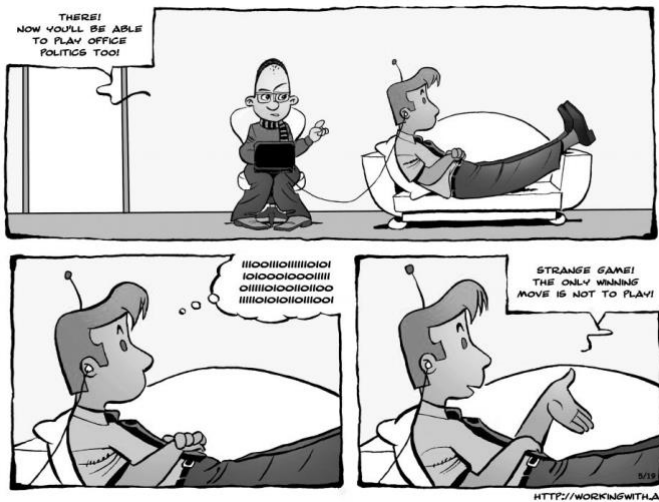
The skill set shifts we just examined are massive, with entire job categories disappearing and entirely new job categories likely to emerge. Leaders may feel safe from the effects of disruption, but that is not necessarily true.

A change of focus for leaders

AI's effect on the workplace will not be limited merely to repetitive, production line-type jobs. It will also affect those who manage workers currently employed in such jobs. Processes and systems will change in ways that will reshape jobs all the way up to the C-level offices.

Even "knowledge workers" – engineers, physicians, scientists, lawyers and any other workers who, as business process consultant Thomas Davenport[50] aptly puts it, basically "think for a living" – face the likelihood that parts of their current jobs will be automated by AI. Many of these knowledge workers think that they can protect their jobs by developing data analytics skills. But data analytics lies at the very heart of AI's strength.

Data analysis skills will not insulate leaders from the disruption that AI brings. A 2016 McKinsey report[51] on the susceptibility of various work tasks to being automated pointed in a different direction. It showed that the hardest tasks to automate involved human interactions and human judgment. Managing people, interacting with stakeholders, decision-making, planning and creative work are tasks that AI is not equipped to do.

The essential skills of the future, therefore, involve not how to analyze static data, but how to interact. AI can

think; AI can analyze. But AI can't motivate people or interact with them. The best that AI can do is to mimic human behavior, but it can't understand, empathize or analyze the full range of human responses.

Creativity, human relationships, emotional intelligence – these are where leaders need to focus their attention if they wish to remain relevant as AI advances into more and more uses. Developing these is where leaders can add true value and set themselves apart as indispensable.

Managing operations will become obsolete. This is especially true of managers and executives whose current value is in getting incremental performance improvements out of low-skilled laborers in jobs that AI can easily automate. Those managers will find their skills becoming as obsolete as the jobs of those whom they manage.

The same goes for executives who currently focus on cutting costs through outsourcing or offshoring, and executives who pride themselves on being able to improve organizational performance through data analysis. Robots and IoT can collect far more data and conduct far more comprehensive analyses than a person can.

That doesn't mean, though, that managers and executives will no longer be needed. They simply need to prepare themselves for shifts in their work responsibilities. This starts with understanding how AI will affect the workplace and where they should focus their personal development in order to thrive under the new conditions that AI creates, both of which are the focus of this book.

Providing deeper insights

According to a 2016 Accenture study,[52] managers across every level of businesses spend more than half their time on administrative tasks that they rightly expect to see AI automate. Even the writing of business reports, with their heavy orientation on collating and summarizing data, likely will be taken over by AI.

The Associated Press was able to increase their number of quarterly business earnings reports from 300 to 4,400 by using AI. This enabled their reporters to focus more on investigative or interpretive reporting, thus adding value in two ways: more earnings reports, and more in-depth reporting.

Where AI's value will end and human value will begin, however, is with those decisions that require insight

beyond what AI can dig out of data. This, again, falls into the realm of human insight.

While AI can mimic many human characteristics, it cannot include nonquantifiable qualities like organizational history, corporate culture, empathy or ethics in its assessments. While AI can run extensive simulations of future results and help leaders make more informed decisions, it lacks the ability to factor the nonquantifiable into those assessments.

It will be able to go as far as suggesting the best direction to take, but it cannot factor in variables that could make a statistically attractive decision a catastrophic mistake when rolled out to consumers. As the Accenture study pointed out:

> This is the essence of human judgment — the application of experience and expertise to critical business decisions and practices. Managers we surveyed have a sense of a shift in this direction and identify the judgment-oriented skills of creative thinking and experimentation, data analysis and interpretation, and strategy development as three of the four top new skills that will be required to succeed in the future.

Yet even managers who recognize the value of the strategic thinking advantages their human intellect gives them over AI in dealing with consumers still undervalue

some of the most crucial qualities they bring to the table as business becomes more AI-oriented. The report went on to say:

> The managers we surveyed recognized the value of judgment work. But they undervalued the deep social skills critical to networking, coaching, and collaborating that will help them stand out in a world where AI carries out many of the administrative and analytical tasks they perform today.

Note that this is the key element that gives humans an advantage over AI, yet today's managers are overlooking it. The report continues:

> Writing earnings reports is one thing, but developing messages that can engage a workforce and provide a sense of purpose is human through and through. Tracking schedules and resources may soon fall within the jurisdiction of machines, but drafting strategy remains unmistakably human. Simply put, our recommendation is to adopt AI in order to automate administration and to augment but not replace human judgment.

Providing a much-needed complement for AI

Those leaders who seek to secure their future job security by building their skills in data analysis are trying to compete with AI instead of trying to complement it.

One way for them to remain indispensable is by, instead, deepening their own level of expertise.

While AI can greatly expand human capabilities in routine administration and data analysis, it should not be overvalued to replace human judgment. Overconfidence in AI's ability to replace human decision-making is a far more realistic threat than any scenarios doomsayers proclaim about AI-enabled machines rising up to overthrow humanity.

Recall again the AI system that mistakenly deemed asthmatic patients to be low priorities for hospitalization when diagnosed with pneumonia because a key piece of data had been overlooked by programmers. Or recall the Facebook AI system that – without that characteristic being programmed into it – developed the human tendency to lie as it studied human behavior.

Granted, those errors were quickly caught by humans. Consider, though, the implications of such inadvertent programming or machine learning errors occurring in a system such as the one that the U.S. Army announced that they were experimenting with that would make military attack drones fully AI-controlled[53] instead of human-controlled.

Although the move is a well-intentioned attempt to spare drone operators the traumatic kill decision in

current drone attacks, it also eliminates the crucial human element from the decision-making process. Current attack drone operators are unanimous in their opposition to this program, with one of them saying, "I am very much of the mindset that I would allow an insurgent, however important a target, to get away rather than take a risky shot that might kill civilians."

The value of human intuition

Sometimes, instantaneous human "gut reactions" to a situation can bring elements into a decision that data alone would not. Recall the "auto-focus" capability of the human brain that we mentioned previously. The brain dynamically narrows down its rich storehouse of information, memories and sensory experiences to what is relevant to the present situation.

But it doesn't stop with what is present in our conscious awareness. It also processes on a deeper, subconscious level, searching for other information or assessing subtle details of the situation outside of our conscious mind to apply more information to it than we are consciously aware of.

This is where intuition, that gut feeling that seems to come out of nowhere, comes in. It is the unconscious retrieval of pertinent information that was not currently

under conscious consideration. In this, the human brain functions in a way that is far less linear or logical than AI, making connections between seemingly unrelated data to create new perspectives and original ideas. This nonlinear ability to creatively connect seemingly unrelated bits of data in a useful way is a quality that AI lacks.

Much of what we base our daily actions on is processed at a subconscious level. For example, this is where much of our perceptions are processed. A report on human intuition[54] states:

> Neural impulses travel a million times slower than a computer's internal messages, yet our brain humbles any computer with its instant recognition. "You can buy a chess machine that beats a master," notes vision researcher Donald Hoffman, "but can't yet buy a vision machine that beats a toddler's vision." If intuition is immediate knowing, without reasoned analysis, then perceiving is intuition par excellence.

Using AI analysis and human judgment together

Granted, our intuition is no more infallible than our conscious reasoning. It merely brings additional, often nonquantifiable, information into the decision-making process. But the kinds of information it adds are often facts so foundational that no one would think to program

them into an AI system – like the critical need to hospitalize asthmatic pneumonia patients.

In the attack drone scenario, human intuition could mean the difference between an AI-controlled drone launching a missile at a target that unknowingly endangers civilians because the data matches parameters for launch, or a human choosing not to fire because one, little detail – that no one would think of programming into the system – of the target struck him as being somewhat "off." The same is true in a business situation.

Using AI's ability to process massive amounts of data can be extremely valuable in decision-making. But human decision-makers still need to be involved before implementing AI recommendations. The two work best together.

Humans are irreplaceable in AI's future. In any AI system that focuses on a leader's area of subject matter expertise, leaders should not leave it totally up to the AI programmers to create the system. Subject matter experts need to be involved in verifying that the data that the AI system uses for its analysis is accurate and complete.

Human leaders also play an essential role in assessing the recommendations that AI systems provide.

Emotional intelligence is also critical. Our organizations, after all, are dealing with humans. A deep understanding of human emotions is something only humans can provide. Only by having humans with deep expertise in their discipline working both at developing initial knowledge bases and assessing AI recommendations will the types of value from AI that a 2017 MIT Sloan Management Review[55] envisaged be possible:

> Just as artificial intelligence is helping doctors make better diagnoses and deliver better care, it is also poised to bring valuable insights to corporate leaders …

> In a recent study, physicians who incorporated machine-learning algorithms in their diagnoses of metastatic breast cancer reduced their error rates by 85%. Indeed, by understanding how AI is transforming health care, we can also imagine the future of how corporate directors and CEOs will use AI to inform their decisions.

> Part of what's driving the use of AI in health care is the fact that the cost of bad decisions is high. That's the same in business, too: Consider that 50% of the Fortune 500 companies are forecasted to fall off the list within a decade, and that failure rates are high for new product launches, mergers and acquisitions, and even attempts at digital transformation. Responsibility for these failures falls on the shoulders of executives and board members, who concede that they're struggling: A 2015 McKinsey

study found that only 16% of board directors said they fully understood how the dynamics of their industries were changing and how technological advancement would alter the trajectories of their company and industry. The truth is that business has become too complex and is moving too rapidly for boards and CEOs to make good decisions without intelligent systems.

For example, AI could be used to improve strategic decision-making by tracking capital allocation patterns and highlighting concerns – such as when the company is decreasing spending on research and development while most competitors are increasing investment – and reviewing and processing press releases to identify potential new competitors moving into key product markets and then suggesting investments to protect market share. AI could be used to improve operational decision-making by analyzing internal communication to assess employee morale and predicting churn, and by identifying subtle changes in customer preference or demographics that may have product or strategy implications.

But again, none of these benefits will be realized without insightful human input into the AI system and equally insightful assessment of the system's analyses. This – deeper development of leaders' expertise and

insightfulness – is where those leaders will make themselves indispensable complements to AI.

In the same way, leaders can bring value to their organizations through creative thinking in how to use AI. "Where else can we use it to our benefit? What other information can we wring out of it?"

Look at the examples of creative thinking about AI suggested in the MIT Sloan Management Review. Such worthwhile assessments won't come merely from randomly feeding an organization's accounting records, or competitors' press releases, or internal communications, or touchpoints of customer data into an AI system and asking it to find something worthwhile.

It will come only by humans thinking creatively to come up with the ideas to look for such indicators and setting parameters in AI systems that will enable the systems to identify useful indicators that human leaders can take action on.

Beyond just technology

This need for creativity and human judgment means that leaders will need more than just technological skills to make the most of AI. The PwC report[56] mentioned in the previous chapter points out:

As adoption of AI gathers pace, the value of skills that can't be replicated by machines is also increasing. These include creativity, leadership and emotional intelligence.

And as Brad Smith and Harry Schum conclude in their foreword to *The Future Computed*,[57] it will require that we communicate across disciplines that formerly were considered unrelated:

At one level, AI will require that even more people specialize in digital skills and data science. But skilling-up for an AI-powered world involves more than science, technology, engineering and math. As computers behave more like humans, the social sciences and humanities will become even more important. Languages, art, history, economics, ethics, philosophy, psychology and human development courses can teach critical, philosophical and ethics-based skills that will be instrumental in the development and management of AI solutions. If AI is to reach its potential in serving humans, then every engineer will need to learn more about the liberal arts and every liberal arts major will need to learn more about engineering. We're all going to need to spend more time talking with, listening to, and learning from each other.

This points to a need for leaders to adopt an ever-increasing openness to acquiring new skills and exploring new ways of working. Remaining static in one's skill sets

will not be an option. Lifelong learning will become the norm for anyone who wants to remain relevant in a work world that is undergoing constant disruptions.

Over the next four chapters, we'll look at some of the roles that leaders will need to embrace:

- Motivator – Leaders will not be alone in dealing with the disruptions that AI and other technologies will bring. They will also need to motivate those whom they lead to adapt to the same challenges of acquiring the skill sets and qualities that the new technologies require.

- Innovator – As the speed of innovation accelerates around their organizations, leaders will need to deal with faster change cycles and adopt more agile business approaches.

- Facilitator – As new generations of workers increasingly enter the workforce, leaders will need to recognize and facilitate changes to the work environment that younger workers increasingly seek.

- Assimilator – As technology increasingly turns traditional markets into global markets, leaders will increasingly need to adopt a global

approach that will affect both the composition of their teams and approach to their expanding markets.

- Risk Managers – The level of disinformation is already high and will increase as AI tools make it possible to spread ideas, reports and "facts" that look authentic but in fact have been manufactured. Checking information becomes increasingly harder and the time to do so increasingly short. We must build into our standard ways of working not just education so that users are aware of the danger, but also checks and filters that prevent unaware or malicious use of a source from inflicting serious damage on the organization.

Takeaways

One thing is certain: Leadership in the age of AI will change. To succeed, leaders will need to develop their understanding of what AI and other technologies can bring to their organizations. And they will increasingly need to combine that with the decidedly human skills that AI does not possess.

Insights from subject matter expertise and experience are not part of AI's core capabilities; they must be programmed into AI for AI to make use of them. Emotional intelligence, relational skills, creativity and leadership will also be essential to organizations that adopt AI. These human factors cannot be replaced by AI and must work with it for AI to realize the value organizations expect from it.

Pursuing these two proficiencies together offers the best approach for leaders to remain relevant in the age of AI. The MIT Sloan Management Review report[58] makes the following suggestions:

- Explore early. To navigate in an uncertain future, managers must experiment with AI and apply their insights to the next cycle of experiments.

- Adopt new key performance indicators to drive adoption. AI will bring new criteria for success: collaboration capabilities, information sharing, experimentation, learning and decision-making effectiveness, and the ability to reach outside the organization for insights.

- Develop training and recruitment strategies for creativity, collaboration, empathy, and

judgment skills. Leaders should develop a diverse workforce and team of managers that balance experience with creative and social intelligence — each side complementing the other to support sound collective judgment.

Driving Change as Motivators
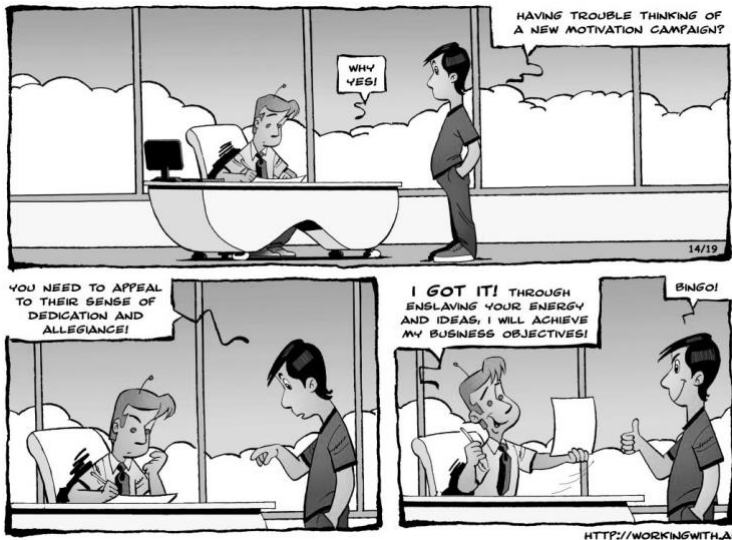
The adoption of AI will require workers at every level to expand their skill sets, both in technology and soft skills. This need for higher skill sets will not affect workers alone. Leaders will also find their skill sets challenged as they play a key role in facilitating this shift.

Nor will the need for workers to retrain and acquire new, higher knowledge skills be a one-time skill shift. It is unlikely that future organizations or factories will do the same thing in the same way they have done it for decades on end, as was common before.

This will challenge leaders' skills as motivators, as most of those who engage in this ongoing skill upgrade will likely be workers already in the organization. Competition for outside candidates with the advanced skill levels needed will be intense. That means that leaders who can motivate their own employees to upgrade their skills to what the organization needs will be highly valued.

Leaders' role in worker skill set shifts

This concept of retraining goes against what people have usually expected. We have been raised in a society where your education through school and (for some) university was supposed to give you the skills you needed for the rest of your career. Formal learning had a definite end point. Any additional learning occurred gradually and naturally from the daily application of those skills to the challenges you encountered in the job.

Our increasingly technology-driven future no longer works under that model. As technology advances and business processes change to keep up, training will need to be ongoing to ensure that workers remain current in their skills.

This is far more than learning a few new skills. Both leaders and workers will need to scrap the entire "graduate and coast" mentality and adopt an "active lifelong learning" one. This is a shift in the very foundation of work expectations, and most workers – and leaders – will initially see this as a threat.

AI, the emerging technology it supports and the active lifelong learning model it requires, however, are not a threat. Recognizing and accepting this foundational shift is the first hurdle that leaders must overcome. Leaders who fight it will become irrelevant to their organization's growth. The leaders who embrace it and guide workers to embrace it as well will be highly in demand.

They will create a "win-win-win" situation for themselves, their workers and their organizations. Managing a team that can consistently keep up with the pace of technological change will give organizations a competitive advantage as they adopt new technologies in increasingly shorter cycles.

Overcoming the talent gap

The challenge to accomplishing this is the growing talent gap that exists not only in organizations, but across all organizations. The current coexistence of large numbers of job seekers and large numbers of unfilled jobs is proof of that. Available candidates simply do not have the skills that available job openings require.

Despite decades of aggressive attempts to recruit more students into STEM careers, results are disappointing. The U.S. Dept. of Education reports that "only 16% of high school students are interested in a STEM career." To make matters worse, it also reports that "57% of high school freshmen who declare an interest in a STEM-related field lose interest before they graduate high school."[59]

Yet many organizations expect to fill their technological needs in the traditional way – by attracting new hires who are fully equipped to provide the specialized talent they need. This strategy exacerbates the current talent crunch that likely will only increase as competition for those with the needed skills grows more intense.

The same is true for turning to contractors or freelancers to fill needs. Only here, in addition to the

same intense competition for those with the needed skills, risks also exist of loss of proprietary information or a potential uncomfortable fit with organizational culture.

A 2017 McKinsey report[60] urges organizations to "[develop] data science talent in-house now. Talent scarcity is a big issue today." The report suggests:

> Providing job retraining and enabling individuals to learn marketable new skills throughout their lifetime will be a critical challenge… Midcareer retraining will become ever more important as the skill mix needed for a successful career changes. Business can take a lead in some areas, including with on-the-job training and providing opportunities to workers to upgrade their skills. …

> Businesses will be on the front lines of the workplace as it changes. This will require them to both retool their business processes and reevaluate their talent strategies and workforce needs, carefully considering which individuals are needed, which can be redeployed to other jobs, and where new talent may be required. Many companies are finding it is in their self-interest – as well as part of their societal responsibility – to train and prepare workers for a new world of work.

Organizations, however, appear to be doing the exact opposite. A survey by Accenture[61] showed that 74% of the 1,200 chief executives and other senior managers they surveyed reported that they planned to automate

workplace tasks with AI "to a large or very large extent" within three years. In contrast, only 3% of those respondents planned to "significantly increase" spending on training to help current employees gain the skills they will need to work with the planned AI additions.

One way to deal with the talent demands AI will cause is by ensuring that the organization's workers gain the skills they will need to fit into the organization's future needs. Redeploying current employees into new roles that they have the potential to fill is obviously the ideal, but it will be a challenge.

Retraining employees from within

Retraining existing employees to fill those new roles has the advantage of ensuring that the organization retains its in-house functional knowledge and culture. On the other hand, it requires a sizable commitment either to developing in-house training or developing alliances with external educational institutions. It also requires that the organization have a clear vision of its AI-enabled future needs.

If leaders are to guide employees on a path to higher skill levels, the organization must be clear on what skills it will need and leaders need to painstakingly assess

current workers' potential to fit the new roles that those skills require before investing heavily in their training. They also need to look at potential hires who don't yet possess the needed skills in this way, assessing their aptitude and willingness to acquire those skills.

The organization may want to handle training for skills that will be widely needed through in-house training or by bringing in an outside trainer. This, though, may not be feasible with more specialized skills that do not yet exist in-house.

Fortunately, there is no shortage of online universities or other training platforms to fill these gaps. For example, Massive Open Online Courses (MOOCs) enable an unlimited number of students to take courses online in skills that are increasingly in demand. Such courses can combine filmed lectures with reading assignments, interactive projects, student forums and other ways to interact with other students, professors and teaching assistants.

MOOCs can be taken as individual courses or in packages that represent technology specialties leading to certifications, or even as complete advanced degree programs from universities like Harvard, Stanford, MIT or many others for a fraction of what tuition would cost for on-campus classes or degrees. They also enable students

to work at their own pace, and they save organizations the cost of bringing in trainers or paying for transportation and housing for employees to attend off-site training events.

Motivating employees for training

Once the organization's forthcoming technology vision and the talent it will need are clear, leaders must face the next challenge: motivating employees. They must understand employees' individual differences and what motivates each one.

Workers often equate training with passively listening to hour-long lectures, which is almost never their desired activity. That's where knowing both the organization's needs and individual employees' personalities and skills are crucial.

With those two clearly in focus, leaders can lay out the opportunities for each worker and work with them to identify personalized training paths that suit both the employees' and the organization's needs. A good understanding of available training options can also help leaders guide employees to the options that best equip them.

Many organizations are facilitating this by establishing partnerships with training programs. Leaders, too, should establish their own ties to training programs, as part of the value they offer their organization.

Here are some ways to motivate employees

Stress the benefits for employees

By stressing the professional and organizational benefits that employees can attain by raising their skill levels, leaders can overcome the perception of training as a chore. This is especially true if leaders can show how these skills will better equip employees for the organization's future plans. The more personalized the training path is, the more employees will see the benefit.

Incorporate tangible rewards to training milestones

Gamification of the training process can also help increase employee buy-in to training. Some online training programs incorporate it into their interface, but other companies can set up customized gamification for organizational needs. Even a simple poster that tracks each worker's training progress can motivate workers to keep making progress.

Gamification enables learners to see their learning progress through attainment of badges or levels. If

budget and company policy allow, leaders could even offer tangible rewards, such as gift cards or an extra vacation day for attainment of significant training milestones.

Put employees' training to practical use

As workers progress in their skill development, leaders should look for opportunities to put those skills to work in real-life projects in the organization. This helps workers grow in their skills through interactive learning and helps them see the applicability of what they are learning to their jobs.

This is not to say that workers should lead the organization in a major technology transformation when they are still in the process of learning the technology. If an opportunity arises, though, for an employee engaged in training to work with someone who already has expertise in the field on a related project, leaders should make every effort to seize that opportunity.

This, of course, requires leaders to remain informed of employees' training progress. Here, again, a badge or levels system may be useful. Not only can it increase employee buy-in to the training, but it can also help supervisors assess each employee's progress.

Where training paths are similar, leaders can assign those employees to work in teams on basic projects related to their training. Making use of their growing skills as a team can accelerate progress for all of them. Some may even emerge as mentors to the others, further motivating them to grow in mastery of their new skills.

Incorporate training time into work hours

It may be appropriate, in some cases, to give workers time within the workday to engage in either on-site or online training. This can make training a welcome opportunity to break from the work routine and refresh their minds with something new.

Don't forget the value of encouragement

An often-overlooked element of training is encouragement. Whether or not an organization makes use of a gamification element in its training, leaders should stay informed of each employee's progress. Feedback and encouragement are vital to maintaining employees' motivation.

Incorporate training into organizational culture

Ultimately, leaders must make active, lifelong learning part of the culture of their organizations. In an

environment that will continue to see dramatic technology advancements, frequent process disruptions and ongoing training to stay ahead of the curve will be the norm.

Ongoing performance assessments

This will also affect the way leaders assess employee performance. Traditional, annual performance reviews have evolved over the years from their original purpose of facilitating employee growth into a meaningless ritual in which each side develops vague goals that are promptly forgotten as soon as reviewer and reviewee return to work.

Even GE, whose notorious reputation for "rank and yank" yearly performance reviews that automatically terminated the least productive 10% of employees each year, has moved to an ongoing approach to promoting employees' professional growth. A new GE employee app[62] tracks each employee's performance goals and promotes ongoing dialog between employees and leaders on how to achieve them. Such approaches could be used to encourage leaders to engage in increased coaching of employees to successfully attain the higher-

value skills they need to thrive in changing work environments.

Rather than looking backwards at the past year, as traditional annual reviews have done, leaders should look ahead to fulfilling employees' potential in the context of future organizational needs. This includes identifying both technical and social skills they will need, and involves leaders in both helping employees both to lay out concrete steps to attain them and then to complete those steps.

This will involve a hands-on, ongoing mentoring approach to managing. It will challenge leaders to make the most of their own people skills, which will be critical to shifting workers who are not used to constantly upgrading their skills to adopting an active, lifelong learning mentality.

Facing the risk in training

Retraining suitable employees is the obvious answer to obtaining many of the skills that are highly in demand. But equipping employees with high-demand skills also carries a risk. Once equipped with those skills, they could be poached by other organizations, leaving the

organization that invested in that individual without an adequate return.

Employees have an increasingly tenuous connection with their organizations. More and more key talent see themselves as nothing more than "free agents" moving from organization to organization to pursue their career goals. Organizations must ensure that the workers they train are incentivized to remain with the organization after training. This is evidence of another disruption – not directly related to technology – that organizations must address – and another challenge to leaders.

Recruiting via corporate culture

In many ways, the roles are reversing in the hiring process. It used to be that companies had the most leverage in the hiring process. They had the jobs that people wanted, and they sifted through mountains of applications to find the most talented to hire.

Today, job candidates have ever-increasing access to online data about companies. Candidates who have the most in-demand skills increasingly choose which company best suits their taste. It will thus become important for recruiting purposes for companies to focus on building their brand not only for potential customers,

but for the kind of talent they want to attract. As competition for qualified talent becomes more competitive, an attractive company culture will become increasingly important.

Rachel Barker, employee experience manager at Qualtrics points out that, "Employees today now live in a technology- and data-driven world, and when employers don't offer workplaces and experiences that reflect that world, they will turn elsewhere for employment and career progression."[63]

This may become a key responsibility of leaders. Assessing employee feedback and working to improve culture can help attract top talent. This is not a task just for HR or just for line managers. It must permeate the entire structure of the organization.

Corporate leaders increasingly encourage companies to put the same effort into attracting employees as they put into attracting customers. Industry analyst Bryan Sommers of TechVentive encourages recruiters to "identify specific micro-segments of either job seekers or job holders that you want to target to bring into your firm, just like a marketing firm would."[64]

Darius Mirshahzadeh, co-founder of Endeavor America Loan Service, takes it a step further: "Consider your employees your first level of customers. Create a

culture of reward, recognition, and excitement for your first level of customers, and you will see them strive to please their customers."[65]

Actively pursuing an attractive corporate culture will become increasingly necessary in the current convergence of new technologies and new attitudes in the workforce. We'll address more of these culture shifts and how leaders can deal with them in the coming chapters.

Takeaways

Leaders need to take a major role in motivating employees to upgrade their skills to needed levels as technology continues to advance. Considering the scarcity of candidates currently available at needed talent levels, the most logical source of skills to fit future needs is from existing employees.

Motivating them to engage in training, however, flies in the face of current workforce expectations. Leaders, therefore, need to find ways to reverse these expectations and lead workers into accepting a new culture of ongoing training. This culture shift, however, will be far more expansive than just training itself. It

stands to transform many aspects of organizational cultures.

It is not only technology that is transforming our business environment. New generations of workers have expectations that also play a role. Today's leaders' skills will be called upon to bring these elements together, to ensure that their organizations receive the best possible benefits from these changes. And motivational skills are a key part of doing that.

CHAPTER 8

Driving Change as Innovators

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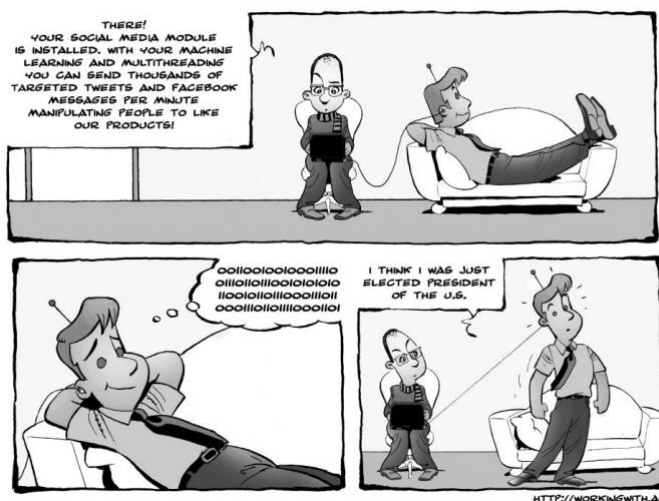
To remain competitive, organizations will increasingly have to innovate. As the speed of innovation increases, disrupting whole sectors, competitive intelligence, market intelligence and even a bit of futurism will become essential skills.

Leaders will have to stay informed not only about macro trends in their industry but also about technology in general. And they will have to do more than merely report their findings to appropriate people higher in the organization. AI can easily do that. Instead, they will also have to develop a sense for how those trends could impact their organization, so that they can assess how to get the most out of them, as organizations transform their structures to respond faster to customer expectations.

Nor will these skills stop merely with leaders, either. Leaders will also need to seek out and nurture skills in critical thinking and creative skills in their teams.

Finding and encouraging these skills is necessary if leaders are to make their organizations agile enough to respond quickly to trends and disruptions. Historic approaches of spending many years developing new offerings will not work in an environment so filled with disruptions. Even the largest organizations will have to adopt a "lean startup" mindset and agile methodology to increase the pace of their innovation.

Getting beyond the buzzwords

"Lean startup" and "agile" are far more than meaningless buzzwords. Practicing them requires that organizations listen to what the customer values and realign products, services and processes to deliver that value, while discarding anything that does not add to it. The benefits of this type of transformation are substantial. A 2017 McKinsey survey[66] reveals:

> Eighty-one percent of respondents in agile units report a moderate or significant increase in overall performance since their transformations began. And on average, respondents in agile units are 1.5 times more likely than others to report financial outperformance relative to peers, and 1.7 times more likely to report outperforming their peers on nonfinancial measures.

The state of transformation

As spectacular as these results have been, though, they have not led organizations to adopt these methodologies to any great degree. The survey showed only 4 percent of respondents claiming that their organization has completed an organization-wide agile transformation,

and only another 37 percent claiming that they are in the process of completing one.

More organizations are aspiring to transformation than are completing one. Three-quarters of respondents list organizational agility as a top-three priority on their organization's agenda. Many who have not yet begun a transformation, however, apparently view it in a very limited way, affecting only those parts of the organization that have direct contact with customers while the rest of the organization continues doing business the way it always has.

Why many attempts to increase innovation fail

Such organizations have sabotaged their own efforts to adopt these methodologies and abandoned the effort, saying that agile "doesn't work for them." All that most of them did, however, was to paste the outward appearance of agile methodology onto their organization rather than letting the concepts transform it.

In many cases, all they did was buy a project management tool that claims to be designed for agile project management. Their product development department would use it but would still run all decisions through multiple layers of hierarchy before

implementing them. As a result, the explosion of innovation that top executives wanted never materialized and they abandoned the methodology.

Obstacles to transformation

The obstacles to adopting agile methodologies lie deeply engrained in leaders' views about how the world works. They are rooted in the idea that those at the top of the hierarchy possess superior knowledge of how to plot out the organization's future – that their unique skills at reading long-term trends enable them to see the best direction for the organization to go. But long-term trends are consistently being disrupted by unanticipated changes brought on by emerging technologies. That renders the prevailing worldview suspect.

Guidance from ivory towers is no longer viable. Key indicators are not so much in long-term projection reports that can be read from on high. Those indicators are moving too fast for such reports to capture. They are now best viewed at the front lines, where the organization interacts with customers.

This disruptive environment has spurred the development of agile methodologies. These methodologies call for small, cross-functional teams that

can assess and develop solutions to emerging customer needs and expectations quickly, without running decisions through multiple layers of hierarchy. This gives organizations the ability to capture fast-moving shifts in the marketplace instead of lagging behind.

But such a methodology makes traditional leaders uncomfortable. They fear it will lead to chaos – that workers will jump from one new idea to the next without bringing anything to completion – that stability will be lost in a rush to try "the next new thing." Yet organizations that have successfully developed an agile approach prove that fear unfounded.

That same McKinsey report shows that agile companies far outperform organizations that use any other management style. Far from a focus on pleasing the customer leading to chaos, transformed organizations have leaders who have a clearer, more tangible focus and more stable management practices than leaders that steer their organization's course by trying to project long-term trends. In fact, agile companies far outperformed all other companies in all nine practices McKinsey used to measure stability as well as the nine they used to measure dynamism.

A different approach to seeking innovation

Agile methodology is not a management tool that fits traditional business goals. Traditional business goals focus on pleasing shareholders and top management by passing healthy profits on to them. Agile methodology goals focus on pleasing customers through innovations that meet their immediate needs. In this approach, profits are a natural byproduct of pleased customers buying more and influencing their friends to do the same, rather than being the ultimate goal. Author Steve Denning[67] says:

> Agile is neither top-down nor bottom-up: it is outside-in. The focus is on delivering value to customers. The customer is the boss, not the manager.

> The role of the manager in traditional management is the opposite. The managerial function is to identify what needs to be done, to tell the employee what to do, and then to ensure the employee completes the work according to instructions. The role of the employee is to follow the directions as given, trusting the judgment and wisdom of the manager to ensure that the right work is being done in the right way. The primary goal is to make money for the firm.

In that management approach, decisions are made at upper levels, by people who are steeped in a culture of assessing long-term trends for stable, long-term profits that will maximize shareholder satisfaction. The process has the outward appearance of offering sober, carefully considered analysis of strategy that has achieved consensus among many highly skilled experts in predicting where trends will lead.

A top-down approach is essential for a shareholder-centric approach, because it is not terribly motivating for the lower-level of employees who interact with customers to focus on making money for people they don't even see. Orders about what to do to increase money for the shareholders must be enforced from above if they are to have any chance of being followed.

This methodology worked in the past, when innovation moved much slower. With today's rapid technology changes, that methodology is a recipe for remaining consistently behind the curve. And it has developed into a system that largely protects all but the top executives from being singled out for blame if a strategy proves to be wrong.

In contrast, the "outside-in" approach that Denning describes is driven by the steady stream of insights coming from customer interactions that can be enhanced

by AI data analysis. This allows organizations to move faster in the face of rapidly changing trends. In addition, it is far more motivating for front-line employees. When employees interact with and see the delight of customers, it provides motivation that is absent when they are nothing more than cogs working for the benefit of people they never see.

Rethinking organizational restructuring

Transforming to an agile, outside-in decision process should not be considered a one-time change. Netherlands banking giant ING's former Chief Operating Officer Bart Schlatmann, described, in a McKinsey interview,[68] the way ING saw its transformation:

> We have been on a transformation journey for around ten years now, but there can be no let up. Transformation is not just moving an organization from A to B, because once you hit B, you need to move to C, and when you arrive at C, you probably have to start thinking about D.

ING initiated their transformation in response to changing customer expectations. Their decision to transform was not a matter of financial necessity, though; profits were strong.

What drove it were shifts in customer expectations driven by digital leaders in other industries. ING wanted to shift the way they delivered their products and services to the way customers wanted them delivered. This required an agile methodology, which Schlatmann describes as being "about flexibility and the ability of an organization to rapidly adapt and steer itself in a new direction."

Rethinking leadership worldviews

The issues that constrain transformation are highly emotional and cannot be overcome by reason or logic. Even demonstrating the financially superior performance of companies driven by a customer-first mentality will do little to change ingrained culture.

At best, it will lead to attempts at cosmetic changes, such as buying a designed-to-be-agile project management tool or confining agile methodologies strictly within the product development team without allowing the team to move forward on initiatives without the lengthy process of running them up to the top of the hierarchy. Such cosmetic changes do nothing to address the true impediments to transformation. Emotional ties

must be met with emotional approaches. Denning points out:

> [T]here is a need to reach managers at a deeper emotional level through experiences and leadership storytelling that enables them to embrace a different set of attachments, attitudes, values and understanding about how the world works. The manager must in effect fall in love with the customer. …
>
> Instead of a goal of making money for the organization, the goal of the organization is to delight the customer.

Not only does organizational transformation make it necessary to transform how leadership views the way that the world works, but it also needs to transform the interlocking set of organizational roles, processes, values and communication practices that have developed over the years as checks to keep the organization's culture stable.

Rethinking project processes

Traditional systems segment work on a project, with little to no contact between the various departments working on it except through a project manager or other individual somewhere higher up the hierarchy. Workers

see only their part of the project and have little idea of the big picture or how their efforts impact the final deliverable or the end customer.

As one department completes their segment, it is handed off to another that similarly has as little of an idea of the big picture as the previous department did. Agile methodology, on the other hand, breaks down the silos and brings people from multiple disciplines together to collaborate in an end-to-end approach. Schlatmann describes what this looks like:

> The key has been adhering to the "end-to-end principle" and working in multidisciplinary teams, or squads, that comprise a mix of marketing specialists, product and commercial specialists, user-experience designers, data analysts, and IT engineers – all focused on solving the client's needs and united by a common definition of success.

Again, this puts solving customer needs in the primary position and counts on success at that goal to satisfy the secondary goal of maximizing shareholder profits. This is the opposite of the traditional model of putting shareholder results first and counting on that to produce the side benefit of satisfied customers.

This use of smaller, multidisciplinary teams also reduces the scale of individual projects and enables an

ongoing flow of innovation, rolling out incremental improvements instead of massive launches that occur only annually or semiannually.

This not only enables organizations to respond more quickly to changes in the market, but also allows quicker changes of direction when needed. It's more effective to correct a mistake in a series of small steps than by shoehorning many changes into the next major launch and waiting five months before they take effect.

Rethinking project funding

One question raised by this use of smaller-scale projects championed by multiple teams is that of funding. One of the historic reasons for current hierarchal structures is the need for financial responsibility. Launching new products or services is extremely expensive. Executives must be confident that their strategies will bring an adequate long-term return to justify the expense of a lengthy development process. How can this be assured with an outside-in decision-making process?

For this, innovative organizations take a cue from the startup world. Each team functions as an in-house startup. They set measurable goals by which their success in solving a specific business problem can be assessed at

predetermined intervals. Rather than lengthy executive decision processes leading to massive initiatives that take years to accomplish, projects become smaller and more segmented. Organizational designer and Neo Innovation co-founder Jeff Gothelf[69] describes the advantages of this model:

> This builds a cadenced resilience into the way the organization makes decisions, allowing it to make short commitments and then further those commitments or not, based on real-time market-based realities as opposed to lofty predictions of a future state that may never come.

This fundamentally changes the role of top executives. Instead of serving as the body through whom all decisions of import must pass before new initiatives are launched, top executives become the body that monitors all innovation occurring throughout the organization and ensures that all initiatives do indeed support the goal of delighting customers. Gothelf explains:

> At the end of the day, the day-to-day tactical decisions the teams make should not be the concern of managers. Instead, managers should focus on the teams' progress towards the strategic business objectives. To allay managerial anxiety and ensure broader strategic cohesion, the onus falls on the teams to communicate back to the organization as much as possible. They must

proactively report on their tactics, learnings, progress, and next steps. However, without the safety to report the whole process, warts and all, most teams will opt for safety and predictability – effectively undermining their agility.

Thus, the teams must have freedom to make mistakes and learn from them. If their work is shut down at the first bump in the road, they will never accomplish anything for the company.

Rethinking job descriptions

As organizations adopt cross-functional networks of teams, they will also need to reevaluate many job descriptions. With higher-skilled workers scarce, organizations can unbundle lower-skill tasks from higher-skilled workers and rebundle those lower-skill tasks into the job descriptions of middle-skill workers. For example, this type of unbundling and rebundling is already occurring in healthcare, where more routine tasks, such as vaccinations and uncomplicated diagnoses, are increasingly shifting from doctors to nurses.

Even this will not be enough to fill all of an organization's needs. Leaders will need to supply workers who have skills not available in the organization for temporary team needs. That means that leaders must

become adept at locating talented contract or freelance workers. The concept of "just-in-time" will apply not only to inventory or supplies, but also to talent.

Rethinking decision-making

Traditional top-down methodologies are designed to avoid mistakes. The lengthy process of developing long-term strategies involves many key executives in looking at options from every possible angle to ensure that nothing could possibly go wrong with the direction that decision-makers set.

The speed of changes in today's marketplace make such a lengthy process impractical. Moving decision-making closer to customer feedback makes not only for faster decisions, but also insulates the organization from the risk of making fatal mistakes. Any mistakes that are made can be quickly analyzed and the lessons learned from them can be worked into a quick and effective course correction. This approach uses mistakes to fuel continuous improvement.

Rethinking leadership roles

Transformation will require changes in the way that leaders see their roles. Denning describes the needed shift:

> Instead of those doing the work reporting as individuals to bosses, the work is done in self-organizing teams: the role of management is not to check whether those doing the work have done what they were meant to do, but rather to enable those doing the work to contribute all that they can and remove any impediment that might be getting in the way.

Schlatmann takes that idea one step farther:

> It's about minimizing handovers and bureaucracy, and empowering people. The aim is to build stronger, more rounded professionals out of all our people.

This goal of building stronger, more rounded professionals out of all an organization's people is a striking change from traditional roles. ING Chief Information Officer Peter Jacobs[70] realized this meant that leaders needed to focus on knowledge and skills in their own discipline rather than on coordinating others in performing work in it:

Somehow over the years, success in IT had become a question of being a good manager and orchestrating others to write code. When we visited a Google IO conference in California, we were utterly amazed by what we saw and heard: young people talking animatedly about technology and excitedly discussing the possibilities of Android, Google Maps, and the like. They were proud of their engineering skills and achievements. We asked ourselves, "Why don't we have this kind of engineering culture at ING? Why is it that large enterprises in Holland and Western Europe typically just coordinate IT rather than being truly inspired by it?" We consciously encouraged people to go back to writing code – I did it myself – and have made it clear that engineering skills and IT craftsmanship are what drive a successful career at ING.

Ultimately, rethinking leadership roles shifts leaders to serving as role models and helping workers grow in their skills both in their discipline and as well-rounded professionals.

Some leaders may also need to recognize their own need to learn more about the technological changes through which they are leading their organizations. A full 19% of respondents in a 2018 McKinsey survey[71] expressed concern that their top executives lacked sufficient understanding of the technologies they were trying to lead their organizations into using.

This may require some novel approaches. For example, younger, digital-savvy employees can be enlisted to advise or even serve as mentors in technologies that are unfamiliar to top executives. Whether this approach or another is used, the fact is that leaders must have a working understanding of what they are leading their organizations through in order to avoid being more of an obstacle to transformation than a leader.

Rethinking needed employee skill sets

Leaders also must rethink the skills they need in their teams. This is especially true with critical thinking and creativity. Under traditional, top-down structures, critical thinking skills were thought to be needed only in the higher levels of the hierarchy, with the need for critical thinking diminishing rapidly the farther down the hierarchy a person was.

Those in middle management were judged on how successfully they could orchestrate their workers to carry out the goals and strategies conceived at the top. Those in the organization's various silos were judged on their ability to use their respective expertise to bring their

parts of the final offering envisioned by the executives to fruition.

Some of those silos contained workers in so-called creative job categories. Their practice of creativity, however, was tightly constrained to a sort of "creativity-on-demand" model. They were called upon to use their skills to create appealing ways to "package" whatever collateral materials were needed to communicate the messages or emotions executives wanted to convey to potential customers.

Critical thinking and creativity were not seen as high priorities for those below the level at which the big decisions were made. They routinely appeared in job descriptions, but that was largely nothing more than lip service. Questioning of systems or processes that leadership had already established was unwelcome. Yet such an exploration of the status quo and its possible alternative is at the heart of critical thinking and creativity.

A dangerous disconnect

A study done by noted curiosity researcher Todd B. Kashdan in connection with Merck KGaA[72] reported that 65% of respondents felt that curiosity was an important

element in developing new ideas, yet almost the same percentage reported that they felt constrained from asking questions on the job. That same study also showed that 84% of respondents claimed that their companies valued creativity, but 60% described barriers by which their company essentially stifled it. This is a recipe for disaster in today's fast-moving business environment.

With an outside-in approach to decision-making, critical decisions must be made far more broadly throughout the organization. Teams close to the customer interaction level must assess and act on fast-shifting customer needs. That means that more people with critical thinking skills and creativity will be crucial at levels of organizations where they have traditionally not been encouraged. Curiosity – and its cousins, critical thinking and creativity – must permeate every level of transformed organizations.

These qualities are inherently human and will be needed throughout organizations designed for agility and innovation. AI can only imitate them but cannot currently produce them.

Critical thinking

Philosophy professor Michael Austin defines critical thinking[73] as: "[I]dentifying and analyzing arguments and truth claims, discovering and overcoming prejudices and biases, developing your own reasons and arguments in favor of what you believe, considering objections to your beliefs, and making rational choices about what to do based on your beliefs." In other words, it involves far more than simply coming up with a possible solution to a problem.

It's easy to come up with a possible solution. As a matter of fact, it's easy to resort to the type of knee-jerk reaction that can solve one problem while inadvertently creating several new ones. For example, someone in a department misuses a privilege given to make it easier for workers to balance their work and family. The department head is publicly embarrassed when this misuse comes to light and responds by angrily revoking the privilege for everyone. Department morale suffers. Workers' stress levels increase. Productivity falls – all because of a knee-jerk decision.

Critical thinking is the exact opposite. It involves looking at situation from all possible angles, assessing likely outcomes of available options, recognizing the role

that one's own biases and emotions may play in swaying one's thinking toward one option or another and dispassionately analyzing them all to arrive at a well-thought-out conclusion. These are the skills that traditionally have been confined to the top layers of leadership. For innovation and agility to flourish in today's faster-moving environment, though, such skills will be needed by more employees in more positions to ensure that organizations are positioned to thrive.

Creativity

Creativity, too, will be needed in greater abundance – not just in artistic pursuits, but in the ability to think outside the box and envisage new solutions as conditions rapidly change around organizations. Psychotherapist Diana Pitaru[74] explains:

> Creativity demands an open mind, one that is not satisfied with recycled experiences, theories, and assumptions. The advances and innovations throughout our history are born from challenging what we thought we knew at any given time and questioning the familiar. *Why* and *how* are questions that stem from an unwillingness to stagnate and a desire to go deeper, to find out more, and come up with creative alternatives.

When a request for creative activity is constrained to work within a defined set of assumptions, the result will be limited. For example, a work request that says, "We want something that fits this set of criteria that our executives have decided is what they want," limits the scope of the worker's ability to explore. It is a demand for creativity imposed from outside the creator's natural curiosity.

On the other hand, if what is to be created comes from a clear, shared vision rather than from a set of tightly confined criteria, the person's creativity is freed to explore a wider range of possibilities. When diverse teams of professionals are aligned in a shared vision of delighting customers, creativity is naturally channeled toward that shared goal.

Fostering critical thinking and curiosity

Critical thinking and creativity are essential traits to encourage in organizations, but many organizations have unknowingly discouraged people from practicing and growing in these traits through top-down structures that required those traits only at the top. There are ways to bring out and enhance these traits in those who have them. For critical thinking:

- **Don't jump too quickly into solutions**. Fear of not coming up with an immediate solution can often lead us to embrace a rash, incomplete one. Take time to think through problems so you come to a well-thought-out conclusion. Also, avoid the temptation to push workers for quick decisions. Let them know you value their thoroughness.
- **Communicate a clear vision**. Develop a shared vision that directs workers toward delighting customers. Make that vision– and not directives from above – what drives workers forward.
- **Strive to be diverse.** This involves not only the traditional concepts of diversity, but an openness to a wide range of differences. Exposing yourself to different viewpoints and life experiences helps you see things from different perspectives that you might never have considered and triggers ideas you might not otherwise create.
- **Encourage openness in discussion.** Consider all viewpoints. Avoid groupthink.
- **Don't let emotions get in the way.** Recognize the role of emotions in thinking processes and

strive to separate them from the problem. Help workers to do the same.

- **Engage in _Zoom in/Zoom out_75 thinking.** Look at things from different perspectives. Rather than getting stuck either on just the details or just the big picture, strive to view situations from as many different vantage points as you can.

As for creativity, a good way to encourage that is by encouraging people's curiosity to explore and discover:

- **Model curiosity.** If you want to encourage curiosity in your team, you must first model it. Keep an open mind. Be willing to question the status quo. Be always in search of a better way.

- **Clearly communicate the vision.** Keep the vision of delighting customers constantly in front of workers and connect that vision to everything your people do.

- **Give employees autonomy in seeking outcomes.** Rather than giving them an unalterable roadmap that they must blindly follow to the desired outcomes, give them room to find better ways than you imagined.

- **Include curiosity as one of the criteria in feedback and promotions.** Make it clear that

experimentation done for long-term benefit is good if the insights it produces can yield future benefits, even if doesn't produce immediate ones.

- **Make curiosity a team endeavor.** Encourage team members to share perspectives on problems rather than limiting themselves to only their own.

- **Assess the role that curiosity played in completed projects.** After a project is finished, debrief employees, asking them to describe their thought processes and choices along each step. Encourage them to assess where what they learned could enrich future projects.

Takeaways

Terms like agile methodology are much more than just buzzwords. They represent a serious step to enhance an organization's capacity for innovation. And they are not just a paste-on addition to an organization. Schlatmann points out:

> Any organization can become agile, but agility is not a purpose in itself; it's the means to a broader

purpose. The first question you have to ask yourself is, "Why agile? What's the broader purpose?" Make sure there is a clear and compelling reason that everyone recognizes, because you have to go all in – backed up by the entire leadership team – to make such a transformation a success. The second question is, "What are you willing to give up?" It requires sacrifices and a willingness to give up fundamental parts of your current way of working – starting with the leaders. We gave up traditional hierarchy, formal meetings, overengineering, detailed planning, and excessive "input steering" in exchange for empowered teams, informal networks, and "output steering." You need to look beyond your own industry and allow yourself to make mistakes and learn. The prize will be an organization ready to face any challenge.

Truly, the most significant long-term trend that executives need to prepare for is the increased need for organizations to respond quickly and effectively to rapid changes in the marketplace. This requires significant changes in the way things have always been done, but the improvement in results has been dramatic.

Driving Change as Facilitators

C learly, workers need to become more rounded and more proficient in skills that previously had been expected mainly from executives. The most valuable skills for leaders will be the ability to mentor workers and help them attain both the technical skills

and soft skills that they need. Such mentoring will also require leaders to better understand shifting motivations among young knowledge workers.

Motivating past generations was tied almost exclusively to pay and other extrinsic motivators. That is no longer the case among today's young, well-educated knowledge workers. Basically, pay is more of a starting point for them rather than the be-all and end-all of career considerations.

Recognizing changes in worker motivations

Working in an environment that offers interesting challenges is rapidly becoming one of young knowledge workers' most important motivators. Leaders need to tap into this motivation by ensuring that workers receive the challenges they seek.

AI can help them devote more of their work effort to such challenges. As has been mentioned throughout this book, with AI handling more of the routine, repetitive work, knowledge workers have more data to work from and more time to apply their creativity and critical thinking skills to the challenge of using that data to develop new solutions for customer – and organization – needs.

A greater focus on curiosity

Curiosity is a key element behind the critical thinking and creativity needed to meet those challenges. Using those qualities to meet challenges gives workers a greater sense of mastery of their jobs and greater job satisfaction. In fact, a Rackspace survey[76] of employees showed that 85 percent of respondents who came from what were deemed to be "curiosity-encouraging" employers expressed satisfaction in their jobs, compared to only 45 percent of respondents who came from "curiosity-discouraging" employers.

Curiosity benefits both workers and organizations. A 2014 study[77] on curiosity's effect on the brain showed fascinating results. When a person feels curious, it activates the pleasure center of the brain, which, in turn, activates the hippocampus, the part of the brain responsible for forming new memories. Thus, the learner feels pleasure due to stimulating the pleasure center and retains the learning better due to the hippocampus embedding the learning more firmly in the brain.

Not only does this phenomenon affect what someone learns about the subject that sparked the curiosity, but also any other subjects the person encounters while the brain is in this state. In other words, curious learners will

better absorb and retain *any* – even unrelated – subject matter they encounter while engaged in satisfying their curiosity. Curiosity supercharges the brain for learning. And learning makes workers even more valuable to the organization. Tony Vartanian, co-founder of mobile game company Lucktastic, a division of Jump Ramp Games, points out:

> Intellectually curious persons bring their willingness to invest in themselves throughout their tenure with [the company]. … Those that don't continue to grow will become outdated rather quickly and provide less value to their teams and the company.

Curiosity instills greater optimism. And with optimism comes a willingness to pursue solutions beyond the point where a less optimistic employee would give up.

Curious employees also show greater interest in job-related learning and a greater ability to retain and apply what they learn. Rather than seeing training as a chore, they embrace it and keep learning long after less curious employees decide that they have learned enough.

This makes curious employees better able to adapt to workplace changes. By not stopping at just what they *need* to know to perform their work, they are more prepared when change takes them beyond initial work requirements.

A change in workplace paradigms

Young technology workers' desire to challenge themselves personally and professionally is not the only change that leaders will face. Many new workers approach work with dramatically different expectations from those of their elders. Leaders will thus have to recognize ever-shifting work paradigms as they find ways to meet younger workers on common ground.

A 2014 survey[78] by Northeastern University found that 79 percent wanted to integrate ongoing learning with work and 42 percent wanted to function as entrepreneurs. Such expectations lead to predictions[79] that 50 percent of the workforce will be freelancers by 2020. Brad Smith and Harry Shum in the Microsoft whitepaper, *The Future Computed*,[80] point out:

> Some studies have noted that between 2005 and 2015, the number of people in alternative work relationships – which include contractors and on-demand workers – increased from 10 percent to 16 percent accounting for nearly all net job growth during that period. A recent study by the McKinsey Global Institute concluded that "the independent workforce is larger than previously recognized" with up to 162 million people in Europe and the United States – 20 or 30 percent of the working-age

population – engaged in some form of independent work. …

McKinsey estimates digital platforms that match workers with opportunities could raise global GDP by as much as 2 percent by 2025, increasing employment worldwide by 72 million full-time equivalent jobs.

The flexibility of such a workforce will enable organizations to engage workers on short-term assignments as needed. This frees organizations from having to maintain large, full-time, long-term workforces.

The negative side of this, though, is the lack of a stable talent base. Organizations will be in constant competition for talent, especially in early stages of technological disruption, when talent shortages will be the most severe. Leaders who learn how best to obtain the skilled workers that their organizations need will be in high demand. Leaders will have to excel in working with online platforms for connecting with the skilled workers on them.

The use of contract or freelance workers will likely involve, at least at first, more traditional roles rather than higher-knowledge roles, due to the scarcity of higher-knowledge talent. Those too, however, will eventually work themselves into the gig economy, as more high-skilled workers choose that path. HR departments, too,

will have to adapt some of their basic functions to more closely align with emerging patterns of acquiring just the right talent at just the right time.

Even among permanent employees, we can expect changes in worker expectations. Work hour and location flexibility, vacation policies and work-life balance issues are becoming increasingly prominent in the criteria that talented young knowledge workers consider when deciding which job offer to accept. Although these changes are not coming specifically from AI and other technologies, they are changes that leaders need to deal with as they address changing conditions. We should expect such changes to accelerate as more young knowledge workers enter the job force.

In the future, successful leaders will be those who can deliver on the changing expectations that workers have. This will require a change in many longstanding policies and facilitation of nontraditional work environments. Even more than this, though, it will require a change in organizational culture.

A change in organizational culture

A 1992 study by Harvard Business School Professor James Heskett and John Kotter found that corporate cultures

that focus on adapting to the pace of change that was already starting to accelerate back then produced better financial results than more static organizational cultures did. Long before "agile methodologies" became a buzzword, these researchers recognized benefits from financially successful cultures that were similar to those of agile companies today: 81

> We found that those cultures highly value employees, customers, and owners and that those cultures encourage leadership from everyone in the firm. So if a customer needs change, a firm's culture almost forces people to change their practices to meet the new needs. And anyone, not just a few people, is empowered to do just that.

They compared 12 companies that had performance-enhancing cultures to 20 companies that did not over an 11-year period and found dramatic results. Performance-enhancing firms showed a 682 percent revenue growth in comparison to 166 percent, 282 percent employment growth in comparison to 36 percent, 901 percent stock price growth in comparison to 74 percent and 756 percent net income growth in comparison to 1 percent. Kotter concludes:

> Leaders should shift the discussion about what the organization is trying to accomplish from "we want to

create and sell product or service x" to "we want to create and sell products or services that actively revolutionize people's lives." Give people a reason to become excited and committed to changing in pursuit of a positive, shared objective.

In general, the most fruitful success strategy is to begin with leadership tools, including a vision or story of the future, cement the change in place with management tools, such as role definitions, measurement and control systems, and use the pure power tools of coercion and punishments as a last resort, when all else fails.

A call for greater social responsibility

Another characteristic of growing importance to young knowledge workers is the desire to do good – to play a role in making the world a better place. Sixty-two percent of millennials state they want a career that enables them to have social impact.[82] And, as shown in the Heskett/Kotter study, shared social values have been shown to improve revenue, profit, employment growth and stock performance.

The concept of social responsibility is rapidly rising in the list of what motivates many of the most innovative young knowledge workers. The concept, however, is not new. The idea of social responsibility goes back to the

late 1700s, when states would revoke a business' license if the business acted irresponsibly. That practice was ended by an 1819 U.S. Supreme Court ruling that businesses had the same Constitutional protections that citizens had. This limited the rights of government to enforce socially responsible actions by businesses and made social responsibility voluntary.

Businesses today, however, are increasingly finding that social responsibility is profitable. Organizations are widely making efforts to give back to the community and are reaping benefits. Google's widely trumpeted initiative to use energy efficiently has not only raised its status in the eyes of consumers, but also has also cut the costs in its data centers by 50 percent.

Subaru's U.S. auto plant follows a zero-landfill policy that claims to have deposited less waste in landfills over the last two decades than a coffee-shop patron who throws a single paper cup in the trash has deposited in that one action. Not only that, but they have partnered with the U.S. National Park Service to apply their zero-landfill practices to help reduce waste from visitors in national parks.

Target Corporation regularly donates 5 percent of its profits back into the community. This works out at $4

million per week, with more than $875 million having gone to local schools alone since 2010.

Such practices have built consumer loyalty for such companies. But they have also served to attract socially conscious knowledge workers to the brands, at a time when talented knowledge workers are increasingly scarce.

A change in hiring practices

In many ways, the scarcity of the talents that organizations need in order to make the most of emerging technologies is reversing traditional hiring roles. Increasingly, workers are in a position to choose employers instead of the other way around.

Organizations will have to "sell" candidates on the challenges available within them, as well as their culture and their commitment to work/life balance and social responsibility. This means more than just lip service to those ideals. Talented young knowledge workers want transparency and honesty in the places where they choose to work. Organizations will have to walk the walk and not just talk the talk.

With greater emphasis on some of the "softer" skills that knowledge workers need in order to set themselves

apart from what AI can do, approaches to hiring will have to adapt, too. Traditional hiring practices focus on filling, as organizational designer and Neo Innovation co-founder Jeff Gothelf[83] puts it, "a gap in a discipline-specific silo." Managers write a job requisition and HR assesses resumes to find people whose work experience fits that gap, with little to no consideration given to how well their skills equip them to add to the creativity or collaboration of the organization. Gothelf goes on to say:

> This style of hiring doesn't build organizational agility. Quite the contrary, it reinforces the barriers between disciplines and minimizes cooperation. Instead, HR teams need to start hiring for creativity, collaboration and curiosity. They need to seek out the non-conformists – the candidates that don't easily fit into a box. … The ones always pushing back on the status quo and forcing the business to rethink the way it presents itself to its customers. New hiring practices have to be put into place to attract these candidates. Interview structures and exercises have to be completely rethought. It's nearly impossible to assess a candidate's collaboration skills in a one-hour Q&A.

Uncovering soft skills

Candidate assessment will need to uncover candidates' soft skills, which are not easily detected in a resume, or

even in many interviewing approaches. In viewing resumes, leaders can look specifically for accomplishments that suggest outside-the-box thinking or advanced problem solving and be sure to explore those events in depth in the interview.

When inviting candidates in to interview, leaders can also ask them to prepare. They can describe an intriguing situation the candidate might experience on the job and ask them to be ready to discuss, in the interview, how they would handle it. The level of engagement they put into the exercise will tell volumes about their critical thinking skills and their ability to apply it to real-life problems. This is a form of behavioral interview inverted so that, instead of asking the candidate, 'Give me an example of when you solved such and such a problem' you ask, 'If faced with this problem, what would you do?'

Interviewers can also go beyond candidates' work life in the interview by asking about past self-learning endeavors and how they tackled them, even if the candidate didn't cite any on their resume. If their resume was loaded with job-related accomplishments, they may simply not have had space to include indicators that reveal their soft skills. The same goes for asking about what they are proud of having accomplished in volunteer activities and hobbies. If you find this difficult, try asking

the question, 'If I asked your best friend to describe what sort of person you are when you're not at work, what would they say?' And you could follow that up with, 'And suppose I asked someone who really doesn't like you – what reply would I get then?' If you don't see genuine creativity in the answers to those questions, this candidate may well not be creative at all.

Exploring how candidates have applied their skills in a team setting can help in assessing their collaboration skills. Interviewers can ask them to describe the most satisfying task they have ever done as part of a team and to walk the interviewer through the workings of the team, the candidate's contributions to it and the results they achieved.

Assessing soft skills can focus on past work experiences, motivations, challenges and interpersonal interactions, such as this sampling from a blog on assessing candidates for critical thinking (this is the kind of behavioral interview question mentioned above):[84]

- Describe a time when you anticipated a problem and took measures to prevent it.
- Tell me about a time when you took on a leadership role.
- Describe a project that you worked on where you went above and beyond what was

expected. What was your role? What got you excited about that particular project?

- What role does your manager play in motivating your best performance at work?

- In the past, when you have struggled with motivation at work, how have you overcome it?

- Describe a time when your work was criticized and how you handled the criticism.

- Provide an example of a time when you had to explain a complex technical issue to somebody who didn't have relevant technical experience.

Questions like these let interviewers see how candidates have handled the kind of challenges the organization expects them to face. They also challenge candidates to think on their feet, so interviewers can see their soft skills in action.

Finally, it's important to pay attention to candidates' questions. Do they ask generic questions that show little originality, or do they display curiosity and incisiveness? Do they ask questions that suggest they've researched your company and your industry? Questions that force interviewers to think on their feet are a sign that a candidate has the critical thinking skills and creativity that are at a premium for constantly disrupted markets.

Takeaways

Changes are taking place not only in technology, but also in the expectations of our workforces. Leaders must adjust to both sets of changes if they are to thrive in the rapidly changing marketplace.

Recognizing and adapting to the attitudes of the knowledge workers entering the workforce will be essential to maximizing their efforts. This will require massive changes in the way organizations run, in terms of work environment, structure and priorities.

It will also require that organizations look at hiring in a different way. Maintaining agility will often mean engaging workers from the gig economy to fill short-term needs rather than maintaining a larger, permanent workforce that is prepared for future possible needs. Extensive use of temporary workers may sometimes also be driven by the preference of workers for that type of lifestyle.

Even permanent workers may work less on the traditional 9 to 5 model than on one that is more flexible in both hours and location. Leaders will need to adapt to these changing expectations as they guide and encourage workers in collaboration toward meeting customer – and organization – needs.

Leaders will increasingly need to work as facilitators of workers' efforts rather than as directors of them. Although these changes are not directly the result of the disruptions that AI is producing, they are developing parallel to them and must be part of leaders' adaptation to the emerging market. They will be part of the change in the way that leaders operate in this rapidly changing world.

CHAPTER 10

Driving Change as Assimilators

L eaders must adapt to the changing culture as young workers enter the job market with expectations strikingly different from the ones that leaders

traditionally have encountered. These changes within their own business culture are not, though, the only culture changes to which leaders will have to adapt.

AI and other emerging technologies are accelerating the process of globalization. For example, as 3D printers become more prevalent, manufacturers will sell designs rather than finished products. Breaking into new markets won't be a multiyear, investment-heavy effort. Emerging technologies will greatly reduce logistics requirements and expand old, geographically limited markets into one, global market.

Suppliers, consultants, employees and consumers will come from all over the world. This will require leaders to expand their level of cultural awareness and sensitivity. International experience will become even more valuable than it is now. Assimilating workers from diverse demographics and backgrounds into the organization will become an essential component for expanding the broad range of perspectives and experience organizations need to compete in a global marketplace.

Diversity will become an issue that goes far beyond hiring. As globalization increases, it will require a far greater awareness of the cultures of consumers that businesses are now able to reach. This will affect even the way that developers choose what data to use in

constructing the base datasets that drive systems' machine learning. Attaining an increasing level of cultural awareness and learning how to effectively use it will become a key element as businesses seek to benefit from global opportunities.

The importance of global markets

The global markets that emerging technologies open to today's businesses are extremely promising. Denise Pirrotti Hummel,[85] CEO of cross-cultural advisory firm Universal Consensus, points out:

> Our economic development will forever be defined as our ability to succeed internationally. PwC forecasts India's real annual GDP growth until 2050 at 8.9 percent, Vietnam's at 8.8 percent, and China's at 5.9 percent. The list of fast-growing emerging markets goes on and on. The U.S. forecast is a meager 2.4 percent, comparable with most Western economies. The domestic companies that are likely to see incremental growth in the coming decades are those that are not only doing business internationally, but that are developing the strategic skill set to master doing business across cultures. Cross-cultural core competence is at the crux of today's sustainable competitive advantage.

Impediments to cross-cultural awareness

The problem, however, with mastering cross-cultural awareness lies in how immersed individuals typically are in their own culture. This is true even in our local workplace.

We rarely recognize the biases we have toward our own worldview because they are deeply ingrained in us. We trust them because we have formed them over years of experience. As a result, when faced with perspectives that don't match our own, we tend to interpret them as flawed and dismiss them.

Such cultural inflexibility is deadly not only to expansion into markets with unfamiliar cultures, but also to the ability to innovate. Maintaining a diverse mix of perspectives has repeatedly proven to be essential for innovation. A 2016 Harvard Business Review article[86] related a study of how homogeneity of perspectives can hinder group interactions.

> In the experiment, teams were asked to solve a murder mystery. First, students were individually given 20 minutes to study the clues and pinpoint the likely suspect. Next, they were placed into teams of three with fellow members from the same [fraternity or sorority] house and given 20 minutes to discuss the case together and provide a joint answer. Five

minutes into the discussion, however, they were joined by a fourth team member, someone from either their own house or another one.

After collectively naming their suspect, members individually rated aspects of the discussion. More diverse groups — those joined by someone from outside their own fraternity or sorority — judged the team interactions to be less effective than did groups joined by insiders. They were also less confident in their final decisions.

Intuitively, this makes sense: On a homogenous team, people readily understand each other and collaboration flows smoothly, giving the sensation of progress. Dealing with outsiders causes friction, which feels counterproductive.

But in this case their judgments were starkly wrong. Among groups where all three original members didn't already know the correct answer, adding an outsider versus an insider actually doubled their chance of arriving at the correct solution, from 29% to 60%. The work felt harder, but the outcomes were better.

In fact, working on diverse teams produces better outcomes precisely because it's harder.

Studies discussed in another Harvard Business Review article[87] supported the same concept. In one series of studies, some financially literate individuals were grouped in homogenous groups and others in diverse

groups and asked to price stocks in simulated markets. The diverse groups were 58% more likely to price stocks correctly than the homogenous ones. And, in another study of 4,277 existing companies, researchers found a direct correlation between the level of diversity on the companies' research and development teams and those companies' introduction of radical innovations over a two-year period.

Add to that McKinsey research[88] that shows that gender-diverse companies are 15% more likely to outperform the national financial median for their industry and ethnically diverse companies are 35% more likely and it's clear that diversity aids innovation. Homogenous groups are quicker to reach consensus because their similarities lead them to consider fewer details. Diverse groups consider more details and make a more comprehensive analysis.

Bias and AI

As if cultural inflexibility was not enough of an impediment to successful globalization, yet another problem affects AI. Human biases are often unintentionally transmitted into AI systems by their developers.

That's because the data that AI systems use to conduct analyses is not something that naturally occurs in our world and that developers "capture." Instead, it is something that developers create. Someone chooses what is included in a dataset and what is excluded. That's where the problem arises. If the data that is chosen to be included is chosen with an unintended bias, the dataset will contain that bias and its conclusions will reflect that bias. Hannah Wallach,[89] a senior researcher in Microsoft's New York research lab, points out:

> We often talk about datasets as if they are these well-defined things with clear boundaries, but the reality is that as machine learning becomes more prevalent in society, datasets are increasingly taken from real-world scenarios, such as social processes, that don't have clear boundaries.

The problem goes deeper than just the researcher's unrecognized biases. Data that originates from information that has been affected by historical inequities can carry those historical biases into the dataset and affect the conclusions reached. Kate Crawford, a senior researcher in that same lab, adds:

> The people who are collecting the datasets decide that, "Oh this represents what men and women do, or this represents all human actions or human faces." These

are types of decisions that are made when we create what are called datasets. What is interesting about training datasets is that they will always bear the marks of history, that history will be human, and it will always have the same kind of frailties and biases that humans have.

This process of choosing what data is included in a dataset and what is not is what led to the incident of the AI system that went against all medical knowledge and recommended that asthma patients suffering from pneumonia not be hospitalized. The data on which the system's recommendations were based came from records that showed which pneumonia patients were chosen for hospitalization over the course of doctors' treatment of their pneumonia. It didn't include doctors' actions that were taken at the first sign of pneumonia, only what occurred later in treatment.

Thus, no asthma patients were admitted later in treatment; they had all been admitted at the first sign of symptoms. Because the records of initial actions were not part of the dataset from which the system drew, the AI system saw no asthma patients admitted in the dataset it was given. Thus, it wrongly concluded that asthma patients should not be prioritized for hospitalization.

The same type of improper conclusion drawn from skewed datasets has been detected in AI systems designed to help judges determine which convicted felons should be incarcerated and which could be given probation. The datasets used were based on past sentencing patterns. As a result, the recommendations mirrored past practices of incarcerating a disproportionately large number of black felons while giving probation to a greater percentage of white ones. This shows that developers must consider not only the data itself, but also the context from which that data arose to avoid building unwanted biases into their systems. Brad Smith and Harry Shum, in their Microsoft whitepaper, *The Future Computed*,[90] point out:

> [B]ecause AI systems are designed by human beings and the systems are trained using data that reflects the imperfect world in which we live, AI can operate unfairly without careful planning. To ensure that fairness is the foundation for solutions using this new technology, it's imperative that developers understand how bias can be introduced into AI systems and how it can affect AI-based recommendations.

Diversity as a safeguard against unintended biases

Diversity in development teams serves a second purpose beyond providing more comprehensive analysis to AI system design. It also brings a greater range of perceptions of the data that can help the team avoid building unintended biases into the system.

It also brings a greater range of perspectives into team discussion of what the problems are that the system needs to address. Research shows that more diverse teams choose more diverse problems to work on. This leads to more innovative solutions. Timmit Gebru, a post-doctoral researcher at Microsoft's New York lab, says:

> In some types of scientific disciplines, it doesn't matter who finds the truth, there is just a particular truth to be found. AI is not exactly like that. We define what kinds of problems we want to solve as researchers. If we don't have diversity in our set of researchers, we are at risk of solving a narrow set of problems that a few homogeneous groups of people think are important, and we are at risk of not addressing the problems that are faced by many people in the world.[91]

An example of this can be clearly seen in a mistake that PwC narrowly avoided making[92] in its early efforts at

increasing diversity. A group of men were tasked with reversing a trend in which PwC's workforce was disproportionally low on women, despite an aggressive effort to hire women straight out of college. The group's initial assumption was that the women who left did so to start a family. The men thought the problem could be solved by PwC developing more programs to support new mothers.

But further data-driven analysis showed that those who left were doing so from entry level positions – a time before women typically left the workforce to start a family. At all other levels, a larger percentage of men left than women. But the aggressive effort to hire women for entry-level positions was not being carried into hiring for positions that required more experience. There, the replacements hired were overwhelmingly men. The problem was not that women starting a family were finding PwC unsupportive. It was a breakdown in diversity hiring at more experienced levels.

Had the group gone with its initial assumptions, their solution would not have addressed the real issue. This typifies again why homogenous groups are less effective than diverse groups. Their shared experiences and viewpoints can lead to premature conclusions that overlook the real issue. Fortunately, PwC's practice of

data-driven decision making ultimately saved the group from pursuing a plan that would have been a costly dead-end.

Development of AI systems, as much as possible, should reflect the demographic of people who will be affected by the recommendations that those systems make. Smith and Shum point out:

> [I]ndustry and academia should continue the promising work underway to develop analytical techniques to detect and address potential unfairness, like methods that systematically assess the data used to train AI systems for appropriate representativeness and document information about its origins and characteristics.

That is one of the key issues that groups like the AI Now Institute[93] seeks to address. The Institute brings together people from a wide range of disciplines and backgrounds to study the implications that AI has for our future, so it can most effectively avoid unintended biases and truly represent the full spectrum of people who will be affected by it.

Incorporating diverse perspectives throughout the organization

That is not to say that such work should be left to such cross-discipline, academic groups. It should be practiced within individual businesses, as well, if those businesses are to avoid unintended bias.

Rethink how you measure diversity

How you measure progress toward greater diversity is crucial to attaining it. Most organizations that set their sights on increasing diversity base their measurements on organization-wide metrics. Those can be deceptive, though, as they were for PwC before it started analyzing on a more granular level.

What appears to be a diverse mix of backgrounds and demographics across an organization can be misleading if targeted groups predominantly fill lower-level positions and higher levels remain largely homogenous.

Diversity consultant Aubrey Blanche[94] encourages organizations to measure diversity by job function and even by team to get a true picture of progress. This is especially crucial in teams responsible for innovation and expanding penetration into culturally diverse new markets.

Rethink where you target diversity initiatives

Similarly, make sure you're applying diversity targets to all levels of your organization, not just to entry-level positions. Are you striving to add diverse perspectives when hiring for higher-level positions? Are upper-level candidates measured strictly on demonstrated skills and experience, or is the absence of more prestigious job titles that typically accompany those skills and experience that often dogs minority candidates counted against them?

Striving to bring diverse perspectives into all levels of an organization doesn't stop with hiring. Are promotions and access to "special projects" whose importance and visibility put participants in those projects on a fast track for advancement assigned disproportionately to those who mirror the homogenous nature of higher levels of management, or do all demographics and backgrounds have an equal opportunity to climb the ladder?

Do minority employees advance in their careers in your organization at an equal pace to non-minority employees, or is there a pattern of them having to work twice as hard to get half as far half as fast? Diversity activist Bärí A. Williams[95] points out:

> Diversity gets people into the room, but inclusion keeps them there. True diversity is about more than just numbers; it must come with a heavy dose of inclusion. That means a company must be intentional about creating and fostering a culture where everyone has a seat at the table, not just entry to the room to watch as a bystander.

Inclusiveness is what is essential to bringing the benefits of a wide range of perspectives to spur innovation in organizations.

Rethink expectations about diversity

Incorporating diverse perspectives into teams goes beyond merely hiring people from different backgrounds. Recognize that friction will be part of the process. Don't expect to build a homogenous group of diverse people.

Placing one person from a different background in an otherwise homogenous group does not promote diversity. In practice, it can lead the group to grant wary tolerance to the "outsider" and the "outsider" to feel pressure to "fit in" with the culture of the homogenous group to have their opinions heard.

Recall the results of the *Harvard Business Review* article with the fraternity and sorority groups. The groups felt less confident of their decisions even though they

achieved superior results. This was because they had to work harder to find the solution when presented with more comprehensive data. But find the best solution they did. The same unease will affect diverse groups in business – even as they function more effectively.

Working in a diverse team feels harder but is more effective. Negative perceptions caused by being forced to step outside our comfort zone to consider other viewpoints provides a comfortable excuse to resist diversity efforts and retreat to our comfort zone.

This expectation of an unhealthy level of conflict in diverse groups often leads managers to resist or water down diversity. It can even lead managers to abandon the process as being troublesome and ineffective. But that's just part of our implicit biases. The benefits of applying diverse points of view to solving problems or forming strategies far outweighs the unease that examining additional points of view creates.

The scientific evidence is clear, and it is unanimous: Working in diverse groups encourages more comprehensive analysis and leads to superior results. Achieving diversity involves far more than just entry-level hiring practices. It needs to become part of the DNA of not only the whole organization, but of individual teams.

When pursued at this comprehensive level, it pays benefits far beyond what can be imagined.

Rethink the use of global "perks"

Many global professional services firms have adopted global mobility programs where employees get to spend some time in other countries, or even relocate there. These programs have been treated more as a perk than as training, but the interactions that those engaged in such programs experience aids in broadening their perspectives by exposing them to unfamiliar cultures. Peter Lacy,[96] managing director of strategy for the Asia-Pacific region at Accenture points out:

> Our clients increasingly operate seamlessly across borders. Our people need to be able to do the same. That mindset comes from being exposed to new business cultures and experiences that come with international placements.

"Exposed to new business cultures." A foreign placement isn't about introducing Head Office perspectives to overseas operations – in fact, it's the reverse. It's about bringing the perspectives of overseas operations back to Head Office. Qatar is a stunningly wealthy country. Would you like to grow your business there? How are you going to do that if you don't

understand how Qataris think, what they value, what they disapprove of and what they really want from you? Because their demands are unlikely to be the same as those of your customers in Omaha.

Employees with global experience are more attuned to recognizing the differing viewpoints of others and adapting strategies to successfully work with them. Participating in diverse teams, working abroad, etc., should be a personal performance metric. Many companies still measure the benefits of their global mobility programs merely through staff satisfaction and retention. The scientific research that supports the idea that diversity leads to better business performance, however, suggests we should budget more for such programs, involve more personnel in them and figure out how to calculate the benefits they bring to the company's bottom line.

Rethink hiring processes

A growing number of companies, including Apple, have taken steps to eliminate unintended bias from creeping into the resume review process, where decisions are made on who is invited for interview (and who isn't). They now use blind recruiting applications that hide names, photos and dates.

A growing number of other major companies are taking an opposite approach. They intentionally seek minority applicants through minority career sites like Jopwell to find qualified black, Hispanic and Native American candidates.

Another approach was developed by global tech consulting firm ThoughtWorks. Their interview process[97] relies on teams who, after interviewing a candidate, immediately debrief each other to detect what they call "bad smells" in each other's impressions.

These "bad smells," though, are not negatives in the candidate, but in the interviewers. They are the negative gut reactions that undetected biases often create. By examining vague negative feelings such as, "he didn't feel like a good fit" or "she talked too much" that, in most companies, would exclude the candidate from further consideration, interviewers can better determine which impressions are qualification-based and which are bias-based.

Another strategy that has proven effective is to stop telling people to be more inclusive and start involving them in the process of growing more diverse teams. Research shows that involving people in diversity taskforces[98] that approach the issue in the same no-excuses way that the business approaches profitability

helps break down implicit biases. The more a person works to enhance diversity, the more that person comes to recognize its value.

Takeaways

Granted, the topic of diversity produces eyerolls from many employees. PwC CEO Dennis Nally, in a 2013 opinion piece,[99] gave reasons why the word diversity itself has become divisive:

> When we talk about diversity globally, word choice can impede progress. In mature markets, people are often tired of talking about it – they have 'diversity fatigue.' In emerging markets, they don't always believe diversity is relevant, because they see it as an 'imported' concept.

The issue is not about trying to achieve someone's idea of fairness or political correctness. It's about bringing in new and fresh perspectives to spur innovation and develop more effective strategies as markets increasingly globalize. Incorporating more diverse perspectives has a measurable benefit to organizations' bottom line and should be pursued as an aid to profitability.

Driving Change as Risk Managers
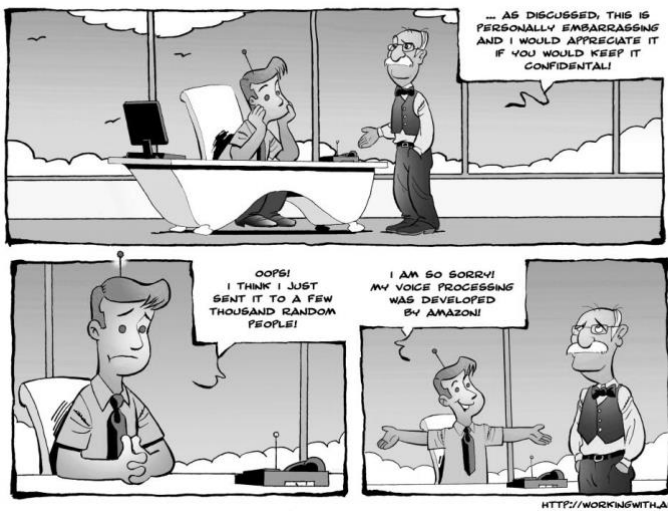
Two statements:

1. The global and instantaneous availability of information is one of the greatest benefits the Internet has conferred on the human race

2. The global and instantaneous availability of information is one of the greatest threats with which the Internet has presented the human race

The problem with those statements is that both are true.

We've seen it in recent events. In the wrong hands, information, our trusted sources and identity, can become a weapon. It can allow others to steal our identities, empty our bank accounts, damage our businesses, disrupt democracy and affect the course of a country. Add AI to the technologies we already have and the threat to us all could be terminal. We will only respond to cybercrime and "fake news" atrocities if every leader understands the risks and helps to manage them.

We live in an age of instantaneous communication. We can stream local events to the world simply by pointing our phones at them and commenting on them. We receive information as it happens in the same way. Unfortunately, this access to instant information also strips away the mechanisms intended to ensure that the information we receive is accurate and more or less objective.

The rise of digital communication has allowed individuals with malicious intent to weaponize information. Some cyber-criminals seek to use our own, personally identifiable information against us in attempts to defraud us or to defraud others under cover of our names. Others steal information from secure servers to publicly humiliate or blackmail victims. Elaborate networks disseminate information that is heavily biased or false with the intent of manipulating public opinion to better suit the geopolitical goals or to manipulate the markets to their benefit.

The sheer volume of available information accompanied by 21st Century time pressures makes the problem worse. A common trick used to manipulate public opinion is to use a headline that does not in fact reflect the material in the article itself. People read the headline, lack the time for a considered reading of the article, and assume that what they have not read supports what the headline says. Not infrequently, it does not. Information has been converted into misinformation, and weaponized.

It is already the case that large amounts of 'knowledge' people have about current events is in fact not knowledge at all but personal bias that has been skillfully played on by people for whom weaponization of

information and misinformation is their stock in trade. It has the potential to get a lot worse. Present technologies, enhanced by current and upcoming AI capabilities, could enable more potent tools for malicious efforts in information acquisition, falsification, and dissemination.

Weaponization of Information Acquisition

AI is already making it easier for attackers to gather and collate detailed information about targeted individuals through their social and professional networks. This accessibility dramatically reduces the skills and time needed by attackers to accomplish more sophisticated attacks.

Social engineering is the art of manipulating people to get them to give up confidential information. Industry reports suggests that one form of social engineering, phishing, can be linked to over 90 percent of cyber-attacks that resulted in a data breach. This form of social engineering targets the weakest link in cybersecurity defenses — the humans.

While digital systems operate on fixed, predictable programming that can be securely encrypted, humans possess too many variables to allow for airtight security: thoughts, emotions, and actions, among others. Only one

individual whose gullibility, doubt or fears can be exploited is needed for an attacker to compromise even the most robust cybersecurity protection.

Spear-fishing, where attackers seek specific targets, is even more successful than phishing. Although greatly aided by the wealth of personal information available on social media, it has required a tremendous amount of skilled labor and time to achieve its goals – until now. Attackers must first identify high-value targets and then perform extensive research on these targets' social and professional networks before being able to create messages with enough details for them to "ring true" for the recipient.

Such attacks are used when specific high-value information is desired. It has been used to obtain proprietary information from a competitor's top executives, for blackmail, or for public release to discredit a political opponent.

Today's sophisticated cyber-attacks could grow even more successful. AI, by automating the research effort, could give attackers more opportunity to target more executives and even their families. With the ability growing to target specific individuals more effectively, it would be easier for blackmailers or extortionists to work their way through their targets' personal and

professional networks to uncover damaging information that they could use against their targets.

AI-enhanced abilities in information creation could even affect generic spear-phishing and other social engineering efforts' effectiveness. With AI-aided systems able to analyze and emulate targets' writing styles, they could advance well beyond the now common, generic type of spear-phishing messages. Most worryingly, AI could keep learning and adapting to make subsequent attacks more effective.

Weaponization of Information Creation

Generating misleading content is as much a concern as weaponization of information acquisition. Basic AI tools have already been used to create news items or to post automated comments on articles. So far, though, these have been somewhat formulaic and have often been easily identified as fakes. Advancements in machine learning should make it possible for the quality of writing achieved by AI to improve to the point where identifying automated content would be much harder.

That would make it less expensive to generate content for mass disinformation campaigns and market manipulation. Instead of managing huge networks of

controlled news outlets and paying large troll armies to create and disseminate information, much of the content creation could be done by bots. With the scalability of AI, the only limit to the amount of content such bots could generate is the amount of computing power dedicated to the campaign.

One other element of information weaponization must be mentioned at this point: falsified documents, images, and videos to support disinformation campaigns. This forgery has become a standard tool among disinformation purveyors.

Advancements in AI systems' ability to accurately recognize image content – including facial recognition – has enabled them to map the intricacies of the human face enough to synthesize facial images that are virtually impossible to distinguish from actual photos. The same is true for speech recognition and language comprehension.

AI systems are increasingly able to synthesize human voices and form sentences that not only have the vocal characteristics of the purported speaker, but also follow that person's speech pattern. The potential misuse of these kinds of technologies to create highly convincing fakes of targeted individuals are apparent.

Software already exists – and in some cases can be downloaded as mobile apps – that can create such highly convincing fakes. One such app can put the head of one person on the body of another to make it appear that the targeted person was somewhere they never were or was doing something they never did. Such tools can make it much easier for large, well-funded actors to provide falsified images, videos or audios that are nearly perfect, to "prove" the misdeeds of someone they wish to discredit.

Weaponization of Information Distribution

AI greatly enhances information acquisition and information creation in conducting disinformation campaigns. It naturally follows that AI also has the potential to significantly strengthen disinformation campaigns in information distribution. We've already considered the possibility for widely distributed bots to replace the need for massive troll armies that have been identified.

Ubiquitous nature of social media in our society means that AI makes small groups or even tech-savvy lone wolves able to disseminate disinformation without third-party filtering, fact-checking or editorial judgment

of its accuracy or relevance. An individual with no track record or reputation could in some cases reach as many readers as CNN or the New York Times.

The use of bots in disinformation networks is growing to the point where it becomes hard to distinguish bots from humans in online interactions. The helpful individual on social media who seems to have an inexhaustible supply of shocking news articles on the subject you are discussing may not be human at all, but merely a well-trained bot.

That theory of bots competing to influence and polarize humans on social media is likely to multiply exponentially as advancements in AI tools and availability of open-source AI code makes these capabilities available not only to the major players that are already using them, but also to a much larger number of players who want to sway the opinions of others on an ever-widening range of subjects.

Preventing Information Acquisition

Raising awareness about phishing is crucial. We cannot be satisfied by merely reducing our organization's click-through rates regarding basic phishing emails. We must start building critical thinking and awareness to

resist well-crafted spear-phishing communications. For example, teach our employees that, if they didn't expect to be sent an attachment or a link, they should verify with the purported sender whether they actually sent that email.

In addition to phishing awareness, we should consider providing training to help our users detect elicitation and social engineering attacks through any channel.

Some AI-aided malware focuses on using AI capabilities to remain stealthy until the right target is identified. Others use AI techniques to learn how to emulate the user of the infected machine. The problem with AI is that it is difficult to understand how AI derives decisions and which actions are triggered by them. The program logic is no longer visible by analyzing the code. This only points to the need to expand our defensive cyber analytical techniques and hold our cybersecurity functions accountable to keeping the pace with technical advancements of our adversaries.

Stopping Information Creation

Fake information aimed at professionals in our organizations could, among other harmful things: drive pump-and-dump scams; influence M&A activity; or

sabotage our business decision-making to benefit the competition. We should consider playing a role in helping our users filter the information. For example, through our existing content filtering, we could display warnings to employees when they access fringe, hyper-biased news sites. This, of course, raises problems of its own since one person's biased site is another's most trusted information source.

We should include in the rest of our cyber awareness efforts information about and examples of fake content and fake social network profiles. Highlight the need to verify any decision-making information through multiple reliable sources.

Curbing Information Distribution

As with other concerns, we have to focus on building our employees' awareness of these tactics. Just understanding that these tactics are now a reality could help.

Through education we have to start changing the established perception that the more an item is shared, the more likely it is to be true. In reality, the opposite is increasingly true. Items with high shock value that often go viral are more likely to be fake.

Build awareness on how to evaluate the online support and acceptance of reports in question. If most of the source social media posts link to accounts that are new, that appear to be on a fringe, that seem to have early access to far too many shocking reports, etc. it is likely that the impression of broad acceptance of reports is manufactured.

Eventually, the industry would build publicly available tools that use AI to analyze the reliability of news items and its disseminators and promoters. We should continue watching the industry and evaluate any such solutions that could help our employees.

Takeaways

With disinformation likely to increase, it will become harder to discern truth from disinformation. Bot-driven disinformation will be able to spread faster than human fact-checkers can handle. Even messages we perceive as coming from a trusted source may be nothing but a sophisticated reproduction of that person's style created by a piece of malware. Under such scenarios, discerning what is real could be incredibly challenging.

In the past, we saw sophisticated spamming tools become readily available for use by anyone with a basic

level of tech-savviness. That has dramatically expanded the ranks of spammers. As advanced AI open source code becomes more convenient and more accessible to use, we likely will see the same migration of today's disinformation tools into the hands of a broader spectrum of attackers.

Nobody and nothing will be safe unless we focus on defending against these threats with better tools, processes and education to better identify and neutralize disinformation efforts.

Conclusion

E xhortations to prepare for AI have become commonplace. "AI is coming!" is the message. Well, AI is not coming. AI is already here. It's here in forms so simple and so integrated into the processes it

inhabits that it's often invisible. People use AI without knowing that that's what they are doing.

And yet, we are only at the beginning. And anyone who mistakes AI's true nature and imagines that it is no more than an amusing ability of robotic devices to pretend to be alive is going to miss out on what may well be the greatest opportunity for personal and social enrichment – both financial and cultural – the world has seen.

Think for a moment about the Internet of Things. When it first appeared, it would have been easy to dismiss it as flimflam. You could open your garage door, turn up the heating before you got home, and switch on the oven so that you would be welcomed through your front door by the aroma of a beef stew ready to eat. So what? What did it amount to, once the novelty was over?

And now think about just one of the subsets the Internet of Things has led to – the Industrial Internet of Things. Process industry operations on different continents all speaking to and being monitored and governed by a central supervisory device – and in real time! Faster response to individual customer demands, less wastage, lower operating costs and higher customer satisfaction. Who wouldn't want that? Only a business intent on its own demise.

And that is how it is with AI – and how it is going to be. This is the Fourth Industrial Revolution. It will bring rewards even greater than those conferred by the first three industrial revolutions. But only to those organizations whose leaders have prepared for it. It also has the potential to bring even greater social disruption and unrest than those earlier revolutions did. But it doesn't have to. And it won't – as long as the necessary shifts in skill sets have been engineered.

And that is the job of leaders. Leadership in an AI world demands that we be more sensitive than ever before to the situation and needs of those we lead. The opportunities are immense. The perils could be no less so. Seizing the opportunities and avoiding the perils is the job of today's leaders. Are you as fully prepared as you possibly could be? If so, you are in a tiny minority. If not, it's time to start filling the gaps. Because, in this revolution that has already begun, first adopters will reap benefits of a magnitude never before seen.

And those who wait will be left behind. And they'll never catch up.

About the Authors

Marin Ivezic is a Partner at PricewaterhouseCoopers (PwC), specializing in risks and cybersecurity of emerging technologies. His work on some of the most difficult technology problems that world-class organizations have experienced – including ones that involve AI – has given him ample opportunity to research the transformative nature of AI. He has worked with clients who adopted AI to eliminate thousands of jobs, increasing profits by cutting costs. And he has worked with clients who adopted AI to augment their workforce's skills and increase profits while *creating* additional jobs. These experiences led him to closely study the current debate on AI's effect on business' future.

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