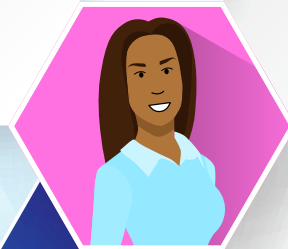


KnowledgeWorks Forecast 4.0

The Future of Learning: **Redefining Readiness from the Inside Out**



Executive Summary

Work is changing rapidly as we enter a new era fueled by exponential advances in digital technologies. In particular, the rise of smart machines and the decline of the full-time employee are reshaping the ways people work and are creating significant uncertainty about what readiness for further learning, career, and life will look like in 2040.

To help all learners prepare for the new employment landscape, this paper forecasts key characteristics of future work and proposes a framework for redefining readiness. As depicted below, that new foundation for readiness focuses on core social-emotional skills and foundational cognitive and metacognitive practices.

The paper goes on to explore how this new foundation for readiness might help people navigate new employment landscapes. These scenarios illustrate different ways in which two critical uncertainties could affect readiness by 2040:

- Will there be high or low technological displacement of human workers?
- Will the societal response be systemic and intentional or market driven?

The paper concludes by highlighting strategic opportunities for K-12 and post-secondary education to begin acting today to ensure that all learners have an equitable chance of being ready for further learning, career, and life in 2040. In addition, a discussion guide offers ways of beginning to make sense of the changing nature of work and readiness in your context.

We owe it to current and future students to reframe our approaches to readiness. This is the most urgent issue on the horizon for learning.

Table of Contents

Redefining Readiness for the Era of Partners in Code.	4
The Changing Nature of Work	6
A New Foundation for Readiness.	11
Four Scenarios on the Future of Readiness.	18
– Partnering for Mobility	20
– Checking for Upgrades.	25
– Finding New Meaning.	30
– Working the Platforms	35
Redefining Readiness: Opportunities for Education	40
– Opportunities for K-12 Education	41
– Opportunities for Postsecondary Education.	45
Current Efforts to Redefine Readiness.	49
Making Sense of Readiness Redefined in Your Context	50
Further Reading.	53
Appendix	54

Redefining Readiness for the Era of Partners in Code

Work is changing rapidly as we enter a new era fueled by exponential advances in digital technologies. As we described in *The Future of Learning: Education in the Era of Partners in Code*,¹ these technologies are combining with cultural, economic, and institutional shifts to create an era of partners in code in which we can expect to be developing new uses for and new relationships with machines that are increasingly wearable, connected, and smart. We called this era one of partners in code because we forecast that our lives will become inextricably linked to the code in our digital devices as we increasingly use them to navigate, make sense of, and contribute to the world around us. We are already seeing shifts in this direction and anticipate that society will be reconfigured as advances in digital technologies continue to accelerate. While people have used

and worked alongside various kinds of machines for centuries, the defining characteristic of the new era is that our machine partners will be increasingly capable of cognition.

One impact of this era shift is the need to redefine readiness to help all learners prepare for the new employment landscape. As we wrote in the forecast:

The changing nature of work will bring to the fore a societal debate about the role of people in the workplace and what it means to be career-ready. Reflecting this debate, the K-12 sector will no longer push students toward post-secondary options that might not adequately prepare them for the new world of work. Instead, education at all levels will prepare learners continually to reskill and upskill and to know how to partner constructively with machines.

EDUCATION AND THE ECONOMY



Readiness for college, career, and life is one of the central purposes of education at all levels. Education systems have historically followed economic eras. Those eras' dominant paradigms of production have traditionally shaped the ways people have organized teaching and learning. For much of the 20th century, mastering content guided teaching, curricula and classroom structures, as students learned to follow instructions and produce output according to criteria set by teachers, much like the expectations of factory work. In the late 20th century, education stakeholders increasingly questioned this focus on content acquisition as higher-order skills such as creativity, communication and critical thinking came to be seen as essential. In its place, thinking and doing emerged as increasingly important organizing principles. Many schools shifted their teaching to focus on project-based work and other ways of cultivating inquiry, analytical thinking, problem solving and other complex cognitive practices. Despite this pattern, the relatively slow pace of change in education can make it difficult for K-12 schools and postsecondary institutions to adapt as quickly as the economy.

Today, rapidly transforming technologies and shifting employment structures are once again changing production paradigms, calling into question the role that people play in the workplace and the ways in which they organize and access work. As a result, there is an intensifying need for K-12 schools and postsecondary institutions to respond with how they educate learners.

As artificial intelligence and machine learning improve over the coming decades, there will be a need to redefine how people contribute in the workplace. Our collective choices about smart machine partnerships at work will influence what readiness looks like in the future. In this paper, we define readiness as the core skills and practices that are necessary for people to navigate and thrive across further learning, career, and life, throughout their lifetimes.

A **time horizon** is a point in the future that is being explored. This paper explores a time horizon of 2040, allowing us to develop current critical uncertainties into scenarios of the future that look different than our current reality and to reduce the temptation to frame the future as an extension of the present.

To help education stakeholders ensure that education systems and experiences support all learners in preparing for the world in which they will live and work in the year 2040, this paper takes a deep dive into the future of readiness. It combines insights from ethnographic research along with scenarios for the future of readiness to propose a new foundation for readiness and show how people might apply that foundation as critical uncertainties about the future play out. It also highlights opportunities for K-12 and postsecondary education to act today to ensure that all learners have an equitable chance of being ready for further learning, career, and life in 2040. As you read through this paper, consider what key skills someone being born today might need when they transition from school to their next stage in life, and what a portrait of a graduate might look like given the changes highlighted in this paper.

The Changing Nature of Work

As the era of partners in code emerges, work is being reshaped by two drivers of change: the rise of smart machines and the decline of the full-time employee. Those drivers of change are being made more pronounced by technological acceleration. While it is clear that these drivers of change are transforming work, there is significant uncertainty about what work will look like in 2040.

A **driver of change** is a major shift combining multiple trends to identify a broad pattern of change.

The Rise of Smart Machines

Advances in artificial intelligence, machine learning and robotics and other forms of automation are leading to the rise of smart machines that will increasingly be able to perform tasks that people carry out today. As smart machines develop further and get cheaper, they will alter or eliminate cognitive and manual routine tasks and will also increasingly impact the cognitive and manual non-routine tasks often associated with white-collar professions and knowledge work.

We know that the rise of smart machines will impact work. We do not yet know the extent and nature of that impact. Smart machines have the potential to augment the contributions of people in the workplace, creating new jobs; reconfiguring current work; and making many jobs safer, easier and more interesting. However, such technologies also have the potential to cause significant displacement of human workers, at least for a time. Signals of change point toward both possibilities.



A **signal of change** is an example, or early indicator, of how a future possibility is beginning to play out today.

Even today, people in a wide range of jobs use or work alongside smart machine partners. For example, robots such as one called Baxter now work alongside people on production lines and factory floors, learning and re-learning tasks with relative ease and affordability. Baxter learns programs when its hands are moved through the motions required to perform its assigned tasks.² Some doctors are using machine learning to help diagnose illness.³ Chess players are partnering with smart machines to compete in advanced chess leagues.⁴ Indeed, technologies that augment human intelligence are present in nearly every adult's life. Among them, smartphones and smart home assistants such as Amazon's Alexa⁵ and Google Home⁶ enable people to extend their short-term memories by looking things up and getting reminders. GPS-enabled devices not only help people find their way, but can also recommend shorter routes as traffic conditions change. In addition, programs such as Skype's real-time language translator⁷ allow people to

bridge language barriers instantly. These examples illustrate the potential for smart machines to augment human intelligence.

At the same time, we are also seeing signals of change that point toward technological displacement. For example, lights-out manufacturing, in which factories are fully automated and only a few people are employed to tend to the machines, is on the rise. Transportation is on the verge of being automated: the ride sharing company Uber is trialing self-driving cars;⁸ and Uber Freight is taking orders for autonomous trucks,⁹ potentially displacing millions of workers. Artificial intelligence is replacing some insurance industry employees, including thirty-four people who were laid off from Japan's Fukoku Mutual Life Insurance,¹⁰ and is writing some news stories.¹¹ Smart machines are also competing with people's ability to perform complex cognitive tasks in medicine and the arts: robotic surgeons such as the Smart Tissue Autonomous Robot have been shown to outperform human surgeons,¹² and an artificial intelligence recently completed a painting considered to be the equivalent of an original Rembrandt.¹³

With signals of change supporting both the potential for smart machines to create or reconfigure jobs and to cause widespread technological displacement, experts are making divergent projections. Supporting the possibility that new and reconfigured jobs will employ people faster than smart machines can displace us, economist James Bessen of Boston University points out that automation has historically created or redefined jobs instead of destroying them. He argues that technology is not eliminating jobs but is instead creating the demand for new skills. Bessen forecasts an increase in jobs, specifically those associated with computer use, due to technological change.¹⁴ Similarly, the World Economic Forum projects modest job growth through 2020, with requisite skills changing rapidly.¹⁵ A recent Pew survey of some 1,896 experts examining the potential effects of robotic advances on the economy in the year 2025 found that 52% of respondents thought that technology would create more jobs than it would displace.¹⁶

DEFINING DIFFERENT TYPES OF TASKS



Cognitive and manual routine tasks are tasks or jobs that are well-defined, routine or “rules-based.” Examples include many accounting, transportation, construction, repair, monitoring, and production-based tasks and jobs.



Cognitive and manual non-routine tasks are tasks or jobs that are less well defined and that require situational adaptability, persuasion, problem solving and creativity. Examples include managerial, creative, medical, caring and science-based tasks and jobs.

Both routine and non-routine tasks will be affected by the rise of smart machines.

Supporting the potential for widespread technological displacement, a 2013 study by Carl Frey and Michael Osborne of the University of Oxford suggests that 47% of current US middle-class jobs are at risk due to automation over a twenty-year period.¹⁷ A 2015 McKinsey Global Institute study brings the threat of technological displacement much nearer term, stating that 45% of the activities that workers do today could already be automated.¹⁸ The OECD estimates that technology already accounts for a nearly 80% drop in labor share among its member countries indicating that, even in those countries experiencing GDP growth, much of that growth can be attributed to increased technological efficiency rather than human output. This drop provides strong evidence that displacement is already underway.¹⁹

While the full impact of smart machines in the workplace is not yet clear, we can anticipate that their rise will force us to reevaluate the role of people in the workplace, either almost entirely or in regard to the kinds of skills we need to thrive and the frequency at which we need to acquire new ones.

The Decline of the Full-Time Employee

Technology is also changing the structure of work, due in large part to the lower coordination costs afforded by the Internet and the access to an expanded labor pool resulting from globalization. The Internet is making it increasingly cost effective for firms to access people with specialized skills on the open market instead of employing people full-time. Globalization has opened up an international talent pipeline and continues to give firms access to cheaper labor markets and specialized talent. Such shifts are contributing to shortening employment tenure, the spread of contingent and project-based work, and the rise of taskification.

By 2040, we will likely see a significant decline in full-time employment, with more people piecing together career

mosaics comprised of a variety of jobs and work experiences. Career mosaics could include radically different types of work, sometimes with different jobs and tasks spread over a period of time and sometimes with them taking place concurrently. For people employed full time by one organization, jobs and job descriptions are likely to become more and more fluid, flexible, and project based. Employees are likely to move through their workplaces horizontally rather than vertically, taking on a wide variety of tasks and projects as needs change.

Already, average job tenure is falling. Today, the average adult holds 11.7 jobs in his or her lifetime.²⁰ To put that statistic in perspective, if the average adult works for fifty years, that person will have a new job roughly every four years. The structure of work will change further in the coming decades as project, short-term workers and independent contractors take on more contingent, project-based work. McKinsey Global Institute estimates that 54 to 68 million people in the United States already work in the project-based economy.²¹ Intuit forecasts rapid growth in this arena, with the independent workforce exceeding over 40% of the US workforce by 2020.²²

Taskification is also on the rise. This term refers to the breaking down of formal jobs into discrete tasks, often at lower wages and with informal job structures. Current examples of taskification include Amazon Mechanical Turk,²³ an online, crowd-sourced marketplace where individuals and businesses coordinate on



“human intelligence tasks,” or tasks that computers are currently unable to complete. Task Rabbit²⁴ is an online platform that matches freelance labor with people who need tasks, such as house cleaning, home repair, or running errands, completed. The ride sharing services Uber²⁵ and Lyft,²⁶ which have disrupted the taxi industry, use algorithms to match drivers with riders. These algorithms tell drivers where to go and then collect payment, while the drivers’ task is simply to drive.

Generational attitudes may also affect the structure of work. Compared to older generations, the Millennial generation, born between 1982 and 1995,²⁷ has already shown less loyalty to traditional institutions, including employers. Its expectations for engagement have helped shift some workplace structures to be less hierarchical, and its “always on” habits have blurred the boundaries between work and home life. As generation Z, born from 1995 to 2010,²⁸ enters the workplace, they will view short-tenure employment, project-based work, and taskification not as emerging phenomena but the new normal for structuring work. This perspective will influence their ideas of what work should be and what it should look like and could further exacerbate the decline of the full-time employee.

As digital technologies continue to advance and people’s expectations about what work looks like continue to change, it will become increasingly easy to break down many existing jobs into tasks and to manage them algorithmically. The risk of technological displacement due to automation could also increase. While we do know what balance of full-time employment, short-term contracts, project-based work, and taskification will emerge by the year 2040, we can anticipate that the structure of work will become increasingly granular, with fewer full-time employees than exist today. Depending on what societal structures and supports exist around work, the employment landscape could also become more competitive.



Accelerating Technology

While work has historically changed in response to available technologies and social and organizational structures, the rise of smart machines and the decline of full-time employment promise to have huge impact given the exponential rate at which digital technologies are advancing. This rate is already making the cycle of change much more rapid than in the past, and it will only continue to pick up speed. As the rise of smart machines and the decline of full-time employment continue to shape work between now and 2040, we can expect the employment landscape to change very rapidly. In face of this rapid rate of change, education stakeholders need to anticipate how work might evolve and need to redefine readiness for a new era.

A HISTORICAL VIEW: FOUR INDUSTRIAL REVOLUTIONS

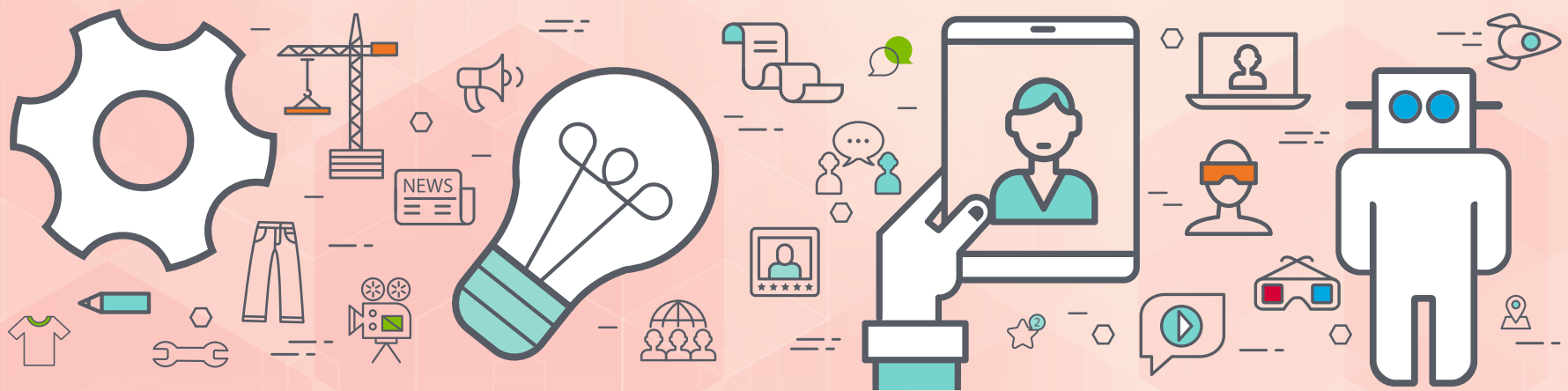
Technology's changing the means of production, and thus changing the ways we work, is not a new phenomenon. Looking back at the 18th and much of the 19th centuries, the **First Industrial Revolution** took place, causing predominantly rural and agrarian societies to become increasingly urban and industrialized due to the technological advances such as the steam engine and the emergence of textile and iron industries.²⁹

The period between 1870 and 1914 brought on the **Second Industrial Revolution** due to such technological advances as the telephone, the light bulb, the internal combustion engine and due to the application of electricity to create mass production. During this period, many pre-existing industries experienced growth; and new industries, such as steel, electricity, and oil, emerged.³⁰

The 1980s introduced the **Third Industrial Revolution**, also known as the Digital Revolution.³¹ During this period, technology advanced from mechanical and analog electronic devices to digital ones. Developments during this period included many

communications and information technologies, among them the personal computer, the Internet, cell phones, and smart phones. Again, these technologies affected many established industries, causing significant disintermediation; and enabled the creation of new ones such as the computer industry (both hardware and software development), web development, and mobile communications.³²

The **Fourth Industrial Revolution**, which is unfolding around us and which we call the era of partners in code, builds upon the technological advancements that emerged during the third Industrial Revolution to represent new ways in which emerging technologies might become embedded in our organizations, societies, and bodies. This industrial revolution is characterized by technological advancements in robotics, artificial intelligence, nano- and biotechnologies, the Internet of Things, 3D printing, and autonomous vehicles.³³ These technologies will be increasingly wearable, embedded in the world around us, connected to other devices, and smart.



A New Foundation for Readiness

A series of in-depth interviews and site visits with employees working at cutting-edge organizations and as independent contractors helped us examine ways in which the changing nature of work is beginning to impact workers today.³⁴ Based on that ethnographic research and on additional secondary research, we forecast key characteristics shaping work in the year 2040 and a new framework for readiness that education stakeholders can begin integrating into practice, policy, and systems design today.

Future Work Characteristics

By 2040, most work will have the characteristics described below. These characteristics are emerging from cutting-edge work today and will become more pronounced by 2040.



Market-driven and user-centered: Technology and globalization are creating an expansion of middle classes and are opening new markets around the world. Massive data streams are revealing insights about market niches and opportunities to design targeted goods, services, and experiences. To gain market advantage, organizations will frequently need to reposition themselves and shift strategic goals. Market-driven work will be highly problem-driven, ambiguous, and volatile.



Data and metrics driven: Work at all levels will be increasingly quantified, with individual performance assessed and contributions to corporate goals measured. Frequent measurement and quick feedback will drive a practice of constant improvement and learning.



Modularized and recombined: Work will be increasingly broken down into discrete parts – whether projects, tasks, campaigns, or initiatives – each with its own team, culture, approach, and goals. Modularization will require thoughtful design of work flow and component pieces, along with extensive coordination and synthesis to meet high-level goals.



Grounded in Relating: Relationships will help determine success and will frame how work is conducted. Leading-edge work is already collaborative, team-driven, collegial, and inclusive. Cultivating productive relationships will continue to be an essential component of work in many contexts.



Interwoven with Learning: Both organizations and workers will need to adapt frequently, learning repeatedly in response to changing conditions. The act of working will become learning, as people adopt new skill sets to align with employment opportunities. Constant learning will blur the lines between our personal and professional lives and will drive some workers to take on passion-based projects to learn new skills.

Drawing upon these future work characteristics and considering the speed at which the rise of smart machines and the decline of the full-time employee are impacting work, we forecast that the skills and traits that define readiness for further learning, career, and life will shift away from a bias toward knowledge and cognition. In place of academic

content, college readiness, and near-term job-specific skills, readiness will come to be defined by a new foundation that undergirds people's ability to develop the more ephemeral skills necessary to succeed in specific contexts.

This new foundation for readiness starts with core social-emotional skills and practices. Layered atop them are foundational cognitive and metacognitive practices that effectively address the new nature of work in 2040. This new foundation for readiness promises to prepare all learners to adapt and grow effectively to meet the opportunities presented by a new world of work.

Cognition is the process of acquiring knowledge and developing understanding through thought, experiences, and senses.³⁵ Cognition includes such processes as attention, evaluation, decision making, judgement, and memory.

Metacognition can be defined as "thinking about thinking." It involves higher-order thinking skills, such as analysis, synthesis, and critical thinking, as well as knowledge about when and how to use certain strategies for learning and problem solving.³⁶

Helping People Grow: Core Social-Emotional Skills

The core of the new foundation for readiness lies in developing a strong inner self that is resilient, reflective, and able to develop positive connections and relationships. Our emotion system is an important mechanism for sensing, interpreting, and communicating information about the world and other people. It affects our executive function — our decision-making, focus, and attention — as well as our memory, our relationships, our physical and mental health, and our learning. If we cannot manage them, our emotions can sabotage our goals and relationships.

In the context of future readiness, social-emotional skills provide the basics for building effective work practices, learning strategies, and career development approaches that will lead to success in academic pursuits, work, and life. More specific social-emotional skills and their future importance are detailed below, with quotes from our research interviewees illustrating how current cutting-edge work demands them.

Self-Discovery: Deep Self-Knowledge

In order to create fulfilling and successful careers, workers will need to continue to discover their own personal and professional strengths, weaknesses, passions, and emotional patterns. Self-discovery will also help people develop visions for their lives and will fuel creativity.

"Confidence is important. Not just confidence in what you know, but confidence about what you don't know. Being able to say, 'I haven't done this before, I have no idea, but I am going to figure it out.'"

— Mobile engineering manager, cognitive game company, KnowledgeWorks interview

Individual Awareness: Emotional Regulation

Workers will need to be able to recognize their own emotions; understand the triggers that create them; and shift to more desired, productive emotional states.

“There are definitely certain moments where you have this big project, and you’ve been working on it for a really long time, and a deadline is coming up, and literally no aspect of your project is working. You just want to take your laptop and throw it off the top of the building...Those are the times when you have to just take a deep breath and think about what you need to do and just sit down and get it done.”

— Software engineer, digital music company, KnowledgeWorks interview

Social Awareness: Empathy and Perspective-Taking

Success at work will increasingly come from building social relationships of all kinds to support learning, collaboration, and innovation. In order to understand their behaviors, workers will need to be able to recognize others’ emotions and perspectives. Deep empathy will also be critical for building inclusive work environments that are truly collaborative, innovative, and adaptable.

“I’ll go to my boss and say, ‘I messed this thing up, I don’t know how to fix it, I need your help.’ And he says, ‘Okay, cool, I see what’s going on, here’s what I think you can do; also, I take ownership in not supporting you in the way that you could’ve been supported to keep this from happening in the beginning.”

— Logistics manager, outdoor education nonprofit, KnowledgeWorks interview

Helping People Navigate: Foundational Cognitive and Metacognitive Practices

The core social-emotional skills above enable a set of foundational cognitive and metacognitive practices that will help workers overcome the challenges of navigating, adapting, and growing in the emerging work environment. These foundational cognitive and metacognitive practices will help people move successfully from one situation to the next and adapt as the circumstances around them change. These practices and their significance are detailed below and on the next two pages, with quotes from our research interviewees illustrating their application in current cutting-edge work.

Thrive in Ambiguity and Uncertainty

Rapidly changing market positioning and new service niches can leave workers with fluid work goals and vague work tasks. The fast pace of work and volatility of priorities can be challenging for those without the skills to manage themselves and figure out solutions. To thrive in this context, people will need to:

- Create structures to organize, plan, and prioritize work;
- Develop adaptability and resourcefulness;
- Manage emotions;
- Balance confidence with humility; and
- Seek out help.

“I had no guidance other than ‘Go figure it out.’ What makes you a valuable employee is the ability to champion something that you aren’t necessarily comfortable with and succeed outside your comfort zone.”

— Senior software engineer, digital music company, KnowledgeWorks interview

Communicate and Create with Numbers

Accelerating technologies are creating a multitude of ways to capture data and mine it for strategic insight. Data and analytics describe the performance and impact of teams, individuals, and products. Drawing upon numerical literacy to create and communicate stories is essential for success. To thrive in this context, people will need to:

- Use metrics and data tools to guide and assess performance,
- Develop insight and meaningful narratives from data,
- Use math to generate ideas, and
- Use data to make informed decisions.

"I'm very data driven. If they want to see a 350% increase in revenue driven by my work from last quarter, I need to dive in and look at if it's even humanly possible."

— Director content marketing, crowdfunding company, KnowledgeWorks interview

Learn Anything, Anywhere

Building learning ecosystems of mentors, online supports, formal classes, and informal study will be necessary for future success. While different work opportunities will present different types of learning and educational opportunities, all workers can expect to be learners, mentors, and teachers in some capacity. To thrive in this context, people will need to:

- Create learning resource ecosystems to support their goals;
- Give and receive feedback;
- Cultivate mentors, both internally and externally and both formal and informal;
- Use side projects to grow skills and fuel passions; and
- Reflect on their learning processes, goals, strengths, and weaknesses.

"I observe people who've been here five or six years; they're always asking questions, and that's something I'm trying to mimic. It shows that they're constantly trying to learn more and more. No one's a master at what they do. Everyone's trying, everyone's learning, so that's refreshing."

— Mobile engineering manager, cognitive game company, KnowledgeWorks interview

Cultivate Inclusive Communities

Innovation, breakthroughs, and creative problem solving require diverse contributions and approaches. Leveraging the perspectives and experiences of diverse peers cannot happen without a practice of inclusion and emotional safety in which team members feel that they can collaborate openly and take risks without negative consequences. To thrive in this context, people will need to:

- Share responsibility;
- Focus on results, not personal agendas;
- Create trust and psychological safety; and
- Coach others and help them figure things out.

"We have an increasingly diverse workforce in terms of backgrounds, but also in the ways that people think. We have this whole interesting combination of people who have been at big companies, small companies, startups their entire [working] lives, companies that did things really well, companies that did things really poorly. You have this collision of ideas. Collaborative teams get things done here."

— Senior software engineer, digital music company, KnowledgeWorks interview

◆ Make Friends with People and Machines

The future workplace will be characterized by intimate relationships with people and machines. Knowing how to augment and improve performance by partnering with both people and smart digital tools and software will be critical to successful work performance. To thrive in this context, people will need to:

- Communicate clearly across all levels;
- Practice active listening;
- Manage non-productive emotions and shift to more productive emotional states; and
- Use software tools, artificial intelligence, and digital assistants to grow their value and performance.

"Knowing what resources you have at your disposal and whether that's people or tools, your own experience, other people's experiences [is key to success]."

— Senior software engineer, digital music company, KnowledgeWorks interview

◆ Take Initiative and Self-Advocate

Fast-paced work environments are focused on achieving growth targets and market success, not on planning individual workers' careers. To gain career mobility across work and employment settings, workers will need to seek out opportunities, communicate their value, and pitch themselves. The motto "Work for it, don't wait for it," will be a guiding principle. To thrive in this context, people will need to:

- Negotiate projects with managers or identify and champion new ones;
- Pitch themselves to others, demonstrating their value;
- Be proactive and autonomous; and
- Experiment with new jobs, tasks, and skills.

"The only reason I have this position today is because I've literally had to ask for it each step along the way. Every stage of my growth, it wasn't given to me, I had to ask someone, 'Can I do this? How can we make this happen?'"

— Content marketing team member, crowdfunding company, KnowledgeWorks interview

◆ Think Differently

Novel ideas come from unconventional or unexpected ways of looking at a problem or idea. Using various cognitive frameworks and disciplinary models is important for creativity and innovation. Workers, either individually or collaboratively in groups, will need to learn how to diversify their thinking. To thrive in this context, people will need to:

- Use frameworks and models from diverse disciplines,
- Reflect on their thinking and problem-solving approaches,
- Branch ideas to expand them and build off others' ideas, and
- Synthesize ideas into deeper understanding.

"I'm happy about having had so many liberal arts [classes], because when you're learning so many different types of subjects, you don't study English the same way you study computer science. You don't ever view art history and geology in similar manners. I found that these different approaches to learning, these different ways of tackling problems, helped develop my creative thinking and my resourcefulness."

— Senior software engineer, digital music company, KnowledgeWorks interview

Solve Problems

The collective problem solving of a company is what drives it forward into new markets with innovative products, services, and experiences. Problem solving – or finding plausible and meaningful solutions to a challenge – will comprise future work. Approaching problems as learning opportunities will help grow organizational and human capital. To thrive in this context, people will need to:

- Think analytically and critically to break down problems,
- Use analogies and provocations to inspire approaches, and
- Practice empathy to discern human needs and value.

“There’s still tons and tons and tons of stuff I don’t know, but coming here, I approached it less of like, ‘Oh, I don’t know any of this,’ and more of like, ‘Okay, here’s my challenge. What don’t I know? What tools can I give myself in order to actually solve this problem?’”

— Senior software engineer, digital music company,
KnowledgeWorks interview



Developing the Uniquely Human

This new foundation for readiness promises to equip young people to navigate the uncertain and rapidly changing future of work. It will provide a foundation for success regardless of exactly how the rise of smart machines and the decline of the full-time employee end up affecting work in 2040. As this framework demonstrates, redefining readiness at the K-12 and postsecondary levels will focus more on helping people develop uniquely human aptitudes and practice resilience than on training them for specific jobs or skills. Without a focus on the inner human core, rapid skill development will be very difficult. There will be a place for job-specific training, but how people will access it and how people will draw upon the foundation for readiness to achieve success could vary greatly depending on how two critical uncertainties related to the future of readiness play out.

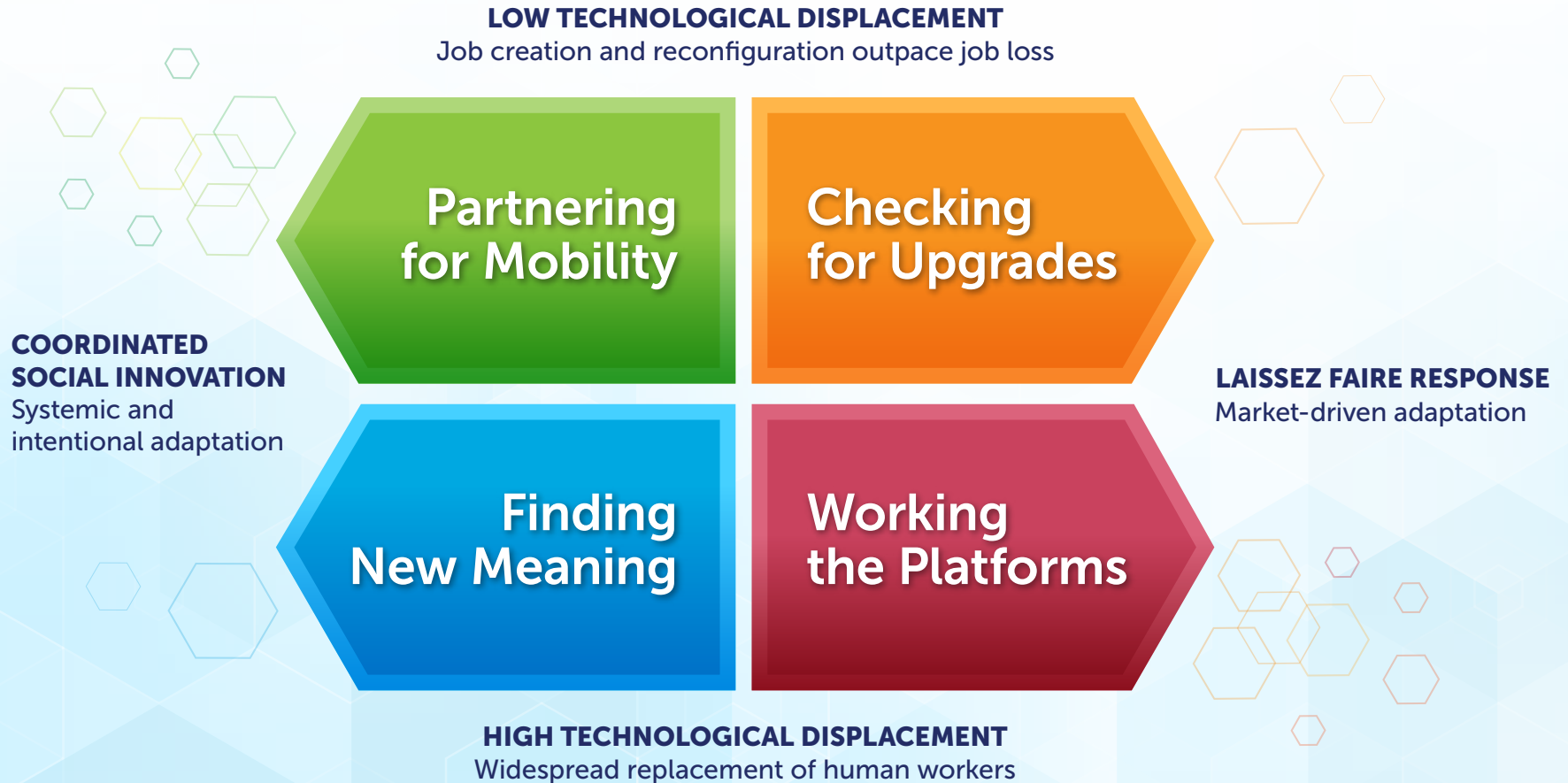
A New Foundation for Readiness



Four Scenarios for the Future of Readiness

Today we can identify the rise of smart machines and the decline of the full-time employee as key drivers of change reshaping work and can project future work characteristics based on current cutting-edge experience. However, we cannot yet know how those factors and people's responses to them will unfold to redefine readiness for 2040. As we consider possibilities, two critical uncertainties promise to shape the future of readiness and influence the contexts in which people might apply the new foundation for readiness to achieve success:

- Will there be high or low **technological displacement** of human workers?
- Will the **societal response** be systemic and intentional or market driven?



The first critical uncertainty explores the ways in which different levels of technological displacement might impact human workers. On one extreme is a high level of displacement, with the rate of displacement outpacing the rate of job creation. On the other extreme is low technological displacement, where many existing jobs are reconfigured and the creation of new jobs outpaces the rate at which other jobs are eliminated.

The second critical uncertainty focuses on the question of whether the societal response to the changing nature of work will be systemic and intentional or market driven. At one extreme, coordinated social innovation reflects intentional systemic adaptation, such as the New Deal programs created in response to extreme levels of unemployment during the Great Depression. On the other extreme, a laissez-faire approach reflects market-driven adaptation, as exemplified by private-sector employment training programs such as the Apple Store Leader program, which trains employees in the skills Apple sees as being vital to managing its stores.³⁷

To explore how these critical uncertainties might shape what readiness looks like in the year 2040, this paper explores four scenarios at their intersection.

Each scenario explores what readiness could look like by 2040 when two extremes combine and how the new foundation for readiness might apply.

Each scenario includes the following:

- A short overview,
- Two profiles of fictional personas aged thirty-five and under that illustrate what it might take to develop readiness in the scenario,
- A list of defining features recaps distinctive elements of the scenario,
- Three signals of change highlighting current developments that support those defining features,
- A list of readiness factors in action illustrating which dimensions of a new foundation for readiness apply most directly to the scenario, and
- Strategic considerations for K-12 and postsecondary education.

In addition to exploring the intersection of the critical uncertainties, the scenarios include some details drawn from developments, such as automated performance management systems, that are nascent today but which could develop further by 2040. They also make some assumptions about how contextual factors, such as the role of unions, might support possible future developments.

Partnering for Mobility

Low Technological
Displacement
+
Coordinated
Social Innovation

While automation has eliminated some jobs and changed others, new occupations have emerged. Many people work full-time but for short stints, completing rapidly evolving project-based work that is coordinated by organizations. Partnerships across employers, communities, and state and federal agencies use predictive analytics to project workforce needs and to provide timely skill development through adaptive career pathways. This coordinated approach helps individuals develop mosaic careers and find their niche in a constantly changing labor market.

Overview

With many unsafe manual tasks and routine cognitive tasks having been eliminated by automation and with new human-machine partnerships, workers are supported in accessing occupations that provide high-value services and experiences. Jobs are designed to leverage artificial intelligence systems and robots so as to allow people to maximize their unique contributions. Career mobility depends on workers' ability to keep up with their machine partners and to continue to add distinctly human value.

Employers are still the major players organizing work. They hire, evaluate, and pay workers in relatively traditional ways, although they rely heavily on smart algorithms and data analytics to streamline work assignments and coordination. Most work assignments are project-based, lasting several months to a year, and most employees stay at an organization for one to three years. The combination of flexibly-staffed project teams and short employee tenure allows organizations to realign quickly to new market opportunities and bursts of demand.

Reskilling (developing new skills) and upskilling (building off or improving existing skills) are constant. Strategic partnerships between employers and regional lifelong learning offices use predictive modeling to anticipate

workforce needs and to align training programs and credentials through adaptive career pathways. Workplace performance data and review mechanisms provide employees with a constant stream of feedback that helps them identify what skills they might need for career growth and recommends platforms for continued education. Because new skills are the currency for mobility in this employment landscape, employers that provide high-quality performance feedback and training are in demand. It is not uncommon for employees to negotiate richer education benefit packages while keeping salaries constant.

To support people in keeping pace with the need for constant reskilling and upskilling, public-private partnerships have invested in new learning and employment infrastructures, including free postsecondary education at many state colleges and universities and expanded micro-credentials and certificates that dynamically link learning pathways with careers. Success of such strategies depends on robust workforce data and nuanced analytics that help tailor flexible and adaptable learning pathways. To provide this information, the U.S. Bureau of Labor Statistics has rebooted to monitor and track workforce trends and emerging needs. In addition, most states have replaced their Departments of Economic Development with Departments of Lifelong Learning. These departments have become centers of education and social policy innovation. Innovations include assigning to every K-12 and postsecondary student a personal learning bot that leverages artificial intelligence and machine learning to provide smart support and feedback and managing education tax credit funds that support individuals in finding and rediscovering their niches in a constantly changing labor market.



FUTURE READINESS PROFILE

Darryl: 30, Senior Data Scientist

When he graduated from high school, Darryl enrolled in the career development program at his regional Lifelong Learning Center, which had facilitated a strong partnership among the state university campuses and regional employers, creating stackable micro-credentials to prepare workers for emerging high-demand fields. An analysis of his K-12 student record and after-school learning experiences and an in-person interview produced a set of employment scenarios and questions that helped Darryl filter job possibilities and explore training and development pathways. Having liked his STEM project work in high school, he focused on the data science career theme.

In focusing on that theme, Darryl pursued a university apprenticeship program that integrated study and work, allowing him to experience how data science jobs differed in various industries. He completed project work in transportation, warehousing, and order fulfillment, learning about industry-specific issues, experiencing diverse organizational cultures, and taking stock of opportunities for job mobility.

Now, Darryl is known for his strong management and inclusive team-building skills, something he learned from an outstanding mentor who remains a career confidante. These leadership skills have helped him land various project-lead positions at StreamMe, an innovative entertainment company, stretching his tenure to almost three years. Darryl currently oversees a team comprised of three data scientists and a group of data bots. He works across the sales, marketing, and product development departments deploying the bots to improve analytics and reveal new insights for strategic decision-making. Even though Darryl is working full-time, he checks in regularly with his counselor at the Lifelong Learning Center to review his work-life portfolio. They discuss what performance scores need improvement and how Darryl can best communicate his work experience to reflect his value.



FUTURE READINESS PROFILE

Sofia: 27, Social Resources Advocate

As the first in her family to graduate from high school and pursue higher education, Sofia wanted to put her skills to use helping disenfranchised communities. Having come from an immigrant family that worked mostly in domestic service, social justice was important to her. In her job at the County Social Resource Agency, Sofia responds to voice and video inquiries from low-income residents and helps direct them to specific social and emergency services, which may include medical care, mental health support, housing, legal advice, or education.

Most inquiries come from non-English speakers who are in crisis mode. As a social resources advocate, Sofia needs to listen actively to callers' stories and determine the best way to direct them to the services they need. Each call represents a unique human story. Voice and facial recognition software interprets and translates the calls, including callers' emotional state, and makes preliminary recommendations for services. Sofia adds value by detecting more nuances and by asking contextual questions that help her glean additional information about the callers' needs. Her job was almost fully automated by an artificial intelligence referral system, but controlled trials showed that a combination of social resource advocates plus artificial intelligence tools resulted in more successful service placements.

Sofia's lifelong learning account managed by the Department of Lifelong Learning supports her on-the-job technical training, building out her work-life portfolio and her qualifications for other service-related jobs in the county. Custom research bots provide her with policy and legal updates affecting her clients as well as with more immediate information such as reports of extreme weather that might increase requests for food and shelter. A deep-learning system maintained by the county allows her to create apps to improve services for client groups whom she regularly serves. Additionally, Sofia's work is tracked against performance metrics that she uses as feedback to help her maintain high-quality machine-assisted services. With these supports, she will be able to translate her demonstrated experience into other high-touch, care-based service roles.

PARTNERING FOR MOBILITY

DEFINING FEATURES

- **Partnerships** between people and machines outpace solo robot or solo human performance, creating a flourishing of smart assistants and machine-assisted occupations.
- Data-driven feedback for individual workers helps them choose skill-building opportunities as they develop portfolio-based **mosaic careers**.
- Detailed workforce analytics and modeling provide employers and credentialing institutions with a shared vision of workforce needs that supports the design of **adaptive career pathways**.
- Free higher education and an expanded system of **micro-credentials and certificates** drive skill acquisition and ongoing learning to improve job mobility.
- Public-private partnerships build a **lifelong learning and employment infrastructure**, supporting workers with skills and practices for mobility across projects and employers.

Signals of Change

- Companies such as Talent Analytics³⁸ are using predictive analytics to create job-pathway maps inside organizations based on employee talent and organizational needs and to create predictive job maps that support workforce planning.
- Partner4Work, the City of Pittsburgh's Workforce Development Board, has partnered with the Community College of Allegheny County to offer tuition-free, micro-credentialed vocational training,³⁹ with additional supports, for sixty students.
- Platforms such as MentorCloud⁴⁰ and MentorPitch⁴¹ match top experts and mentors with mentees, helping mentees develop as professionals, gain valuable skills, and benefit from the guidance of people with more professional experience.

Readiness Factors in Action

In a world of new machine-assisted jobs and systemic social support, new opportunities emerge as workers leverage artificial intelligence and data streams to identify skill development opportunities and take advantage of both adaptive career pathways and a broad range of workforce-aligned credentials. Particularly relevant dimensions of the new foundation for readiness are listed below.

Social Awareness: Empathy and Perspective-Taking

Sofia's skills in social awareness allow her to identify and recognize her clients' emotions and ask them discerning questions that help her direct them to the services that they need, ultimately improving both her performance and her clients' experience.

Create and Communicate with Numbers

Darryl's job is rooted in making sense of data and communicating new insights via analytics. Sofia also is skilled at interpreting feedback data to improve her own performance.

Cultivate Inclusive Climates

Darryl's strong reputation depends in large part on his ability to build inclusive teams and help his collaborators shine, thus improving overall team performance.

Make Friends with People and Machines

Sofia's success reflects her ability to grow in collaboration with her smart machine partners. She uses her access to lifelong learning to find ways of making her automated partners help her do her job better, thus ensuring that she remains a valuable contributor.

Strategic Considerations

- Educators will need to model positive behaviors that help students learn how to develop positive, healthy relationships across diverse contexts.
 - K-12 schools and postsecondary institutions will need to help students develop human-machine partnerships in ways that augment and leverage their uniquely human capabilities.
-

Checking for Upgrades

Low Technological
Displacement
+
Laissez Faire
Response

As they move from project to project, professional nomads seek constantly to improve their performance by upgrading their skills, digital tools, and social capital. With their digital assistants, they shoulder responsibility for building their own capacity, cultivating professional mentoring networks, and seeking out collaborative project teams. Individuals must chart their own paths through a highly fluid landscape of independent, contingent employment.

Overview

In this fluid employment landscape, contingent work is closely tied to the emerging needs of organizations that are reconfiguring work processes as they leverage artificial intelligence systems and smart devices. Professional nomads follow short-term project contracts and worker-friendly labor markets. Many workers juggle multiple contracts to hedge against having no work. Employers focus on doing more with less, creating highly effective human-machine partnerships that leverage smart systems and retain a small number of full-time employees. Extensive use of contingent project workers allows organizations to expand and contract as market needs vary. Full-time positions, for those who can find them, average one to three years and leverage specialized knowledge and expertise.

Most occupations are heavily integrated with artificial intelligence systems that combine specialized human expertise with insights from data mining and decision-making algorithms. Keeping current with digital tools and software applications is necessary to continue to be effective in these integrated environments. Individuals must constantly upgrade their technical and domain expertise to find the next project.

With little on-the-job training and no coordination among post-secondary institutions and employers or other

systemic supports, individuals must find their own way. Professional and social lives overlap as workers are “always on.” Every social interaction could be the source of a new gig, a new mentor, or a new insight into a key technology or market shift. Building trusted social capital, a solid reputation, and strong support networks is necessary to ensure consistent contracts and access to organizational decision-makers.

In addition, individual workers must seek out learning and reskilling opportunities, whether on the job or during off-peak employment periods. Successful workers consider learning a necessity for which they take responsibility. However, low-skill workers often scramble to access the resources, relationships, and ongoing learning necessary to keep up with the rapid pace of change. Many communities have demonstrated against the new human-machine workforce configuration, creating a backlash against automation, including boycotts of employers who do not hire mainly human.

Some socially conscious employers and wealthy benefactors seek to improve local and regional employment participation rates and worker mobility by partnering with innovative mayors and governors to create data-driven postsecondary education and reskilling programs. Other stakeholders cling to old paradigms or insist that the market will prevail. The U.S. Bureau of Labor Statistics attempts to regulate automation by advocating for tax abatements for organizations that hire mainly human. Divides exist among organizations looking for new efficiencies through automation, organizations that insist on hiring human to reflect their values or reach niche markets, and organizations that lack the resources to invest in the latest automation infrastructure.



FUTURE READINESS PROFILE

Damian: 25, Residential Health Aide

Damian completed his associate degree in physical therapy at a community college but soon realized that he needed more technical knowledge to be able to work in state-of-the-art health residences. He attended a work-and-learn program to supplement his degree with a credential as a machine-assisted health aide. There he learned how to partner with care-bots in different settings to health monitoring, therapy, and social engagement support.

Damian's current job is a six-month stint at Loyola House, a senior citizen residence. Loyola House is a smart-health residence embedded with sensors, health monitors, and other input devices that capture data about its residents. Damian partners with Gini, his mobile care-bot, to mine various data streams, such as diet, sleep, mobility and social interaction, for a daily snapshot of his patients. Each day, Gini helps Damian stay on top of each resident's activities, medications, and issues. Gini is also able to perform support functions such as bringing medications to Damian, checking to make sure that residents who have not left their rooms for some time are doing well, and capturing video to show Damian how residents are interacting so that he

can quickly take stock of social groups and dynamics. Gini enables Damian to perform as much work as two or three health aides used to do. Plus, the data-rich reports that Gini provides supports Damian in having rich discussions about the residents with the residence's lead nurses and medical director.

Despite being a great fit at Loyola House, Damian will leave after a group of residents moves to a more intensive medical health facility. Because he knows he always has to be looking for the next gig, Damian keeps in touch with his social network from his work-and-learn program and regularly visits with two of his favorite instructors about new ways to apply his skills. He carefully curates his career portfolio, including links to his community college coursework and work-study credential, along with video clips from professors and work supervisors discussing his strengths – one of which is that he is "highly adaptable."



FUTURE READINESS PROFILE

Roxanne: 31, Cybersecurity Project Manager

Roxanne spent four years in the military as a network specialist stationed abroad before she returned home and continued her education through her veteran's benefits. Now, companies hire her on a project basis to break down their firewalls and then redesign them for better security. Roxanne likes the independence of being able to move from project to project, getting to know different industries and organizational concerns and sometimes new cities.

Through her string of projects, she has collected a rich set of references and professional colleagues, both internal IT professionals and the non-techies whom she considers friends. They often refer to her as the go-to expert for shoring up corporate networks. In turn, Roxanne often reconnects with some of her military buddies and subcontracts with them to prevent attacks on her systems so that she can keep her skills current and learn how to build more secure systems. Her reputation is one of a positive, no-nonsense professional who is disciplined, thorough, and up-to-date with current attacks and fixes.

Even though Roxanne's portfolio is full of praise, successful results, and diverse experiences in the civilian and military fields, she keeps seeking out ways to expand her knowledge. She thinks of herself as a craftswoman because each project that she takes on has a unique solution and strategy. As such, new approaches require not only cutting-edge technical knowledge but also a broad, creative approach to problem solving that may draw upon history, philosophy, or even music. During downtime, Roxanne enrolls regularly in intensive online courses, earning supplemental certificates and targeted credentials in areas that she hopes will open new opportunities. She also pursues self-study projects with her peers. Roxanne points to her military training as the foundation for such discipline, resourcefulness, and focus on outcomes.

CHECKING FOR UPDATES DEFINING FEATURES

- Extensive human-machine partnerships help employers do more with less, expanding the impact of fewer full-time employees and pushing many people into **independent, contingent work**.
- **Individuals must take responsibility** for staying relevant to organizations' needs and for maintaining their ability to partner with rapidly changing smart devices and artificial intelligence assistants.
- **"Always-on" workers** blur the lines between work, play, and social life as every moment has the potential to contribute to building necessary professional social capital and experiences.
- **Response to the new automation infrastructure varies**, as some people protest to keep jobs human and others partner to create local innovations in support of worker mobility.

Signals of Change

- Organizations such as Skillshare⁴² and programs such as Udacity's nanodegrees⁴³ offer highly specialized classes designed to help people upskill or reskill rapidly and at minimal cost.
- BMW's apprenticeship program,⁴⁴ a partnership between the automaker and Greenville technical college, is designed to produce highly skilled workers who meet BMW's needs. The program was created because of the difficulty that BMW had in finding qualified candidates for its South Carolina plant.
- Though farmers have long been partnering with technology, recently some have been utilizing drones⁴⁵ to map fields and robots⁴⁶ to help weed crops. Partnering with these machines has made these farmers' work more efficient and has increased the impact of human labor while reducing the number of people involved.

Readiness Factors in Action

In a world of contingent work and little social support, building skills for career mobility is a key goal. Contingent work is closely tied to the emerging needs of organizations that are reconfiguring work processes as they leverage artificial intelligence systems and smart devices. Successful workers keep current with how these rapidly changing human-machine partnerships affect project-based work. Particularly relevant dimensions of the new foundation for readiness are listed below.

Individual Awareness:

Emotion Regulation, Take Initiative and Self-Advocate

Both Damian and Roxanne must promote themselves and advocate for each job, proving their value and skills. Despite being a good fit at Loyola House, Damian acknowledges the reality of having only a six-month contract and focuses on taking positive steps toward getting the next one. He does not let his emotions sabotage his career mobility.

Thrive in Ambiguity and Uncertainty, Think Differently, and Solve Problems

Roxanne's projects can be ill-defined and vague, yet they are high stakes for the client. Her clients expect her to "figure it out" and "make it work" with little direction. She relies on her creative approaches to problems, analogous thinking, and her diverse disciplinary background.

Learn Anything, Anywhere

Both Damian and Roxanne direct their own learning and career development. They create ecosystems of support, resources, learning experiences, and relevant credentials so that they can continue to attract and secure project work.

Strategic Considerations

- Schools will need to foster mastery in flexible contexts that help prepare students for an employment landscape that requires ongoing learning in uncertain environments.
 - Educators will need to learn about artificial intelligence and intelligence augmentation and will need to develop and model new teaching and learning mindsets that work with smart machine partners.
-

Finding New Meaning

High Technological
Displacement

+

Coordinated
Social Innovation

Artificial intelligence and automation have streamlined global production to such an extent that dividends from extreme efficiencies now fund a new social infrastructure. Paid work has become just one of several options for earning a living and contributing to society. Social policy and political will enable new social support structures and platforms for exchange that leverage human potential and ingenuity and fuel a human-centered economy.

Overview

Though many jobs have been eliminated, social systems and supports have helped create a new human-centered economy that derives value from human emotions, affective qualities, and creative capabilities. Universal basic income programs, automation efficiency taxes, and other mechanisms for funding social supports and redistributing resources differ by state yet share the goals of buffering people against changing family and economic conditions, liberating human potential, and creating productive opportunities to carry out meaningful work with social purpose.

In this new climate, highly compensated work has shifted to fields that leverage human emotions and uniquely human capacities and practices such as relationship cultivation, decision-making, artistic thinking, creative production, and novelty generation. Touch- and relationship-intensive caring roles such as nurses, educators, child- and elder-care providers, and companions have expanded and diversified, combining artificial intelligent expert systems with human expertise.

As cheap, mass-produced products have flooded the market, artisanal one-of-a-kind production has also grown in value. Artisans and craft producers add value by developing close relationships with their customers.

Furthermore, the arts have been reinvigorated as key sources of innovation and strategic thinking. People see art productions as important shared community experiences and see artistic thinking as unlocking shared understanding in the business world by helping stakeholders reframe problems creatively, find relationships among unrelated events and ideas, develop different perspectives on issues, and use imagination to spark insights and generate novel ideas.

In addition, new civic funds stimulate a range of community infrastructure projects, local social enterprise ventures, and care-based or cultural production collectives. Most people participate regularly in such ventures, either as a way of gaining new perspective on future opportunities between work engagements or as a way of adding value on top of their basic income. Participation in these efforts is compensated with various forms of credits and vouchers for goods and services. The U.S. Bureau of Labor Statistics has transformed its focus to coordinate and track these efforts, measuring both participation and social impact contribution.

As preparation for traditional careers has become less important, education has been forced to reevaluate its purpose. A focus on personal growth has led to credentials that certify proficiency in social-emotional and metacognitive skills, as well as higher-order cognitive practices. Some people have found it difficult to transition to an economic model based on personal goal-setting and intrinsic definitions of success. A cultural divide exists between traditionalists who believe that paid work is the only valid form of compensation and contribution to the economy and those who measure value and impact in broader terms.



FUTURE READINESS PROFILE

Amanda: 29, Smart-Clothing Entrepreneur

Amanda initially started WellWear as a side project in high school. WellWear's mission is simple: to make clothing that helps people be well. Amanda developed her first WellWear piece while she was interning at the Northside DIY Make Lab. It was a long-sleeve T-shirt in various colors that provided tiny pulses to remind people to breathe when their heart rates escalated. At the Make Lab, Amanda got to try out various ways to experiment with sensors and learn how to make clothes that help people feel better. After rave reviews and consistent sellouts at community craft markets and on her online store, she decided that designing sensor-enabled clothing was her calling.

Amanda used money from her monthly universal basic income dividend to enroll in a series of hybrid courses in entrepreneurship and business management. In addition to offering lectures, online discussions, and homework, the courses provided weekly in-person support for developing individual projects. A successful crowdfunding campaign helped Amanda purchase some basic cutting and sewing equipment, and soon she had her own small craft shop.

In keeping with her company's mission, Amanda checks in regularly on SoGood, the social impact project hub that matches volunteers with projects. Participating in several collaborative projects funded by the civic participation fund introduced her to other compassionate creatives in her area. For low-income children, she helped make coats that converted into sleep sacks for napping in comfort; for elderly people, she contributed to the design of sweaters whose weave tightens or loosens depending on body and external temperature. Amanda loves these projects, as she feels that they let her make a meaningful contribution to her community and she gets to meet and co-create with wonderful people.

Amanda doesn't have a degree, but she has a long list of completed credits, certifications, and work experiences that she has accumulated over the years. She sees her life, work, and education as one exploration and application of her purpose.



FUTURE READINESS PROFILE

Humberto: 34, Corporate Artist in Residence

Humberto had been a strong math student at his STEM early college high school, but when he enrolled in college he decided to major in art, his true passion. Part of what compelled Humberto in math was its beauty and elegance. He kept a minor in data science to exercise that form of thinking but went on to get a Masters in Fine Arts. Upon graduating, he participated in a series of community art installations sponsored by the Civic Arts Initiative, an automation dividend program in his city. Because the installations were intended to help communicate several environmental-, health-, and energy-related public policy issues at the community level, Humberto was part of a diverse team of public health, climate, energy, and transportation professionals and artists.

While focusing on art, Humberto continued to keep up with data science through various learning opportunities. Some were in-person seminars hosted by local tech companies and universities, and others were virtual courses that lasted several weeks to a year. Some of these learning opportunities contributed to additional certifications in specific subject matter and skills; others were purely for personal growth. All of them became a part of Humberto's interactive portfolio showing his development as an artist-scientist and eclectic thinker.

At his current position as Corporate Artist in Residence, Humberto works on special projects that involve diverse team members with creative problem solving skills and flexible thinking frameworks. His team contributes at critical moments in projects, aiming to visualize possibilities and provoke new thinking to reveal alternative strategies, novel design concepts, or new insights into problems. One of Humberto's side projects is a game that helps kids identify their passions and cultivate provocative thinking and problem solving in daily life.

FINDING NEW MEANING

DEFINING FEATURES

- Robust social infrastructure and policies support a new **human-centered economy**, driving growth in the caring professions, the arts, and civic projects.
- Many jobs and other productive occupations leverage artificial intelligence to support **uniquely human capacities** such as intuition, emotion, artistic thinking, and persuasion.
- While the specific mechanisms for **funding social supports and redistributing resources** vary by state, there is shared understanding that people need a steady foundation on which to build meaningful contributions.
- Career planning has become **life planning**, with education shifting its focus toward **personal growth** over access to the labor market.

Signals of Change

- In an effort to help address the social cost and inequalities created by technological displacement, Bill Gates, co-founder of Microsoft, recently proposed a tax on the robots⁵² that are replacing human workers.
- Experiments in universal basic income⁵³ are taking place all over the globe. For example, Y Combinator plans to pay 100 families in Oakland, California, \$1,000-\$2,000 per month; and Utrecht, the Netherlands, plans to give 250 Dutch citizens the equivalent of \$1,100 per month.
- Stanford University's wildly popular course, Designing Your Life,⁵⁴ employs design thinking to help students think beyond career preparation to navigating broader decisions about life after graduation.

Readiness Factors in Action

A world with widespread automation and coordinated social innovation requires individuals to develop deep self-awareness and to engage in ongoing self-development so that they can effectively steer their own passion-based careers. Employment opportunities emerge from continuous discovery and refinement of individual passion and purpose and from developing the skills to link that passion and purpose to a job, project, venture, or creative pursuit. Particularly relevant dimensions of the new foundation for readiness are listed below.

Self-Discovery: Deep Self-Knowledge

Amanda and Humberto follow their own passions to find work that is both meaningful to them and productive for society. The mission of Amanda's clothing company reflects her personal values and purpose, making her social-impact clothing projects as important as her commercial sales.

Solve Problems, Cultivate Inclusive Communities

Amanda's side projects through the civic participation fund require solving problems and using collaboration and imagination as she weaves her expertise into the group. Humberto's work also requires working effectively with diverse teams to illuminate new perspectives on projects.

Think Differently

Amanda's and Humberto's work lives reflect their ability to think differently and to take risks in exploring new ideas and concepts. Since Humberto is paid for his ability to develop and apply creative thinking frameworks to problems, thinking differently is his most marketable skill.

Strategic Considerations

- Educational pathways will need to help learners develop self-awareness that can serve as a compass for lifelong learning journeys.
 - K-12 schools and postsecondary institutions will need to prepare learners for a world where paid work may no longer be the primary organizing principle.
-

Working the Platforms

High Technological
Displacement
+
Laissez Faire
Response

In this highly competitive and heavily automated scenario, most workers carry out extremely fragmented tasks managed through dispatching platforms instead of through traditional employers. Reputation management is key to finding successful matches. Quantified workers develop emotional resilience by devising their own strategies for maintaining a positive outlook. They also develop competitive strategies for navigating employment platforms and persisting to piece together enough work.

Overview

With a focus on economic productivity through intensive automation, extreme taskification is the norm for all but the most highly-skilled people. Most workers interface directly with dispatching platforms, rather than with employers, to find discrete pieces of short-term work. Most employment is precarious and transactional. Low-skilled workers compete locally for personal service, physical labor, and administrative tasks, while middle-skilled workers compete globally for professional and knowledge work. High-skilled workers often play roles such as decision makers and strategists, using artificial intelligence, augmentation technologies, and creativity to help direct organizations and platforms and to secure scarce full-time employment.

With a proliferation of sensor networks and advances in data collection and processing, quantified workers' performance is highly monitored, aggregated, and assessed. People are as good as their most recent performance and reputation scores. Even full-time employees within a single organization tend to move from task to task as algorithmic management tools assign work and coordinate output.

Some dispatching platforms serve as reliable hubs of professional development and support, while others effectively function as digital piece-work factories. A few

unions have developed platforms to protect workers from abuse. They offer members opportunities to improve skills, build reputations, and move toward relatively satisfying work. People with effective entrepreneurial skills and network-building social capital can use platforms and smart devices to create small businesses or to provide skilled production and experiential services, particularly in the trades, artisanal specialties, and the care economy.

In this very granular and competitive landscape, post-secondary degrees are typically seen as luxuries that are slow to translate into high performance scores that drive income. In place of traditional degrees and certificates, most people assemble dynamic work life-logs that capture evidence of competency through easily comparable quantifiable performance metrics. Those with resources to earn post-secondary degrees often thrive when they can leverage those degrees to work in decision-making and strategic positions or in highly specialized fields, but sometimes even they have to work the platforms long enough to build the reputation needed to transition into organizationally-based work. In contrast, workers who lack marketable skills usually find it hard to move beyond the grind and low wages of transactional piece work, especially given the lack of social safety nets and readily accessible training.

In the absence of a coordinated response to intensive automation, communities have become polarized economically. Chronic unemployment and under-employment are common. A shrinking tax base has strained public infrastructure and services in many places. Some communities have adapted as alternate economies, such as the maker, sharing, collaborative, and open source economies, have emerged or as local benefactors have supported pockets of innovation. Despite the challenges of working in a highly platform-based landscape, some people value the flexibility and self-determination that now characterizes most work.



FUTURE READINESS PROFILE

Marika: 29, Super-Tasking Virtual Reality Designer

Marika is a Super Tasker, managing her own virtual reality design practice on UpWork and other reputable matching platforms. Her work includes both international clients with whom she interacts digitally and local clients with whom she can meet to discuss task specifications. Mostly, Marika simply does her bit and passes on the work for integration into a larger project. For now, she likes it that way. Working the platforms allows her to go on work binges and then take time off when she feels the need for a break. Not that she has much choice – not many designers can snag full-time work these days, even with extensive portfolios.

During Marika's first year or two working the platforms, she lost several bids to others with more experience or with distinguishing features to their work portfolios. Then she met some members of the local Digital Arts Guild at a social networking event and got some crucial tips that helped her excel at platform-based work. By learning to use software-coding bots to code basic features in a 3D scape, she developed a specialty in designing the emotionally engaging interactions and nuanced experiences that hook users. The emotional intensity, flow, and aesthetic of her work make her a highly valued, in-demand virtual reality designer.

Marika also improved her management of platform-based work by registering at an open virtual academy to learn basic business skills, including account management, financial planning, client relations and negotiations, and project management. In addition to keeping her organized, these skills helped her develop the confidence not to underbid in a competitive market. She learned to manage her personal brand by completing an online tutorial in data analytic tools that determine her hit rate for various types of portfolio content and her success rate in winning bids. Included in the analytics are her client feedback scores, which rate her high in the affective skills that help her stay calm under pressure, meet deadlines, and focus through ambiguity.

Now that Marika's scores have increased and her brand has become more widely known, she is often asked to share her skills by teaching small classes and seminars for those looking to cultivate similar skill sets. To compensate for having little social interaction at work, she also mentors at a virtual reality community lab and teaches virtual reality at a summer camp for kids.



FUTURE READINESS PROFILE

Dennie: 29, Smart Building Repair Person

Dennie remembers seeing the dispatch request notifications appear whenever he would sneak a few moments to turn his smart lenses on while sitting in class during high school. He was always looking for opportunities to make extra money via platforms such as Task Rabbit and Thumbtack: errands, yard work, delivery, cleaning out attics, house painting. He knew that such work was a dead end, but it provided him with the extra money he needed to contribute to his family's finances.

Also during high school, Dennie started helping his uncle, who was a plumber. Dennie learned the basics of the craft and admired how his uncle systematically approached problems. While many of his peers took on internships and unpaid tasks to build their reputations, Dennie found the work he did with his uncle fascinating enough to enroll in the community college's smart building technology certification program, a move that many thought was a gamble given how long the program took and the speed at which the employment market moved. Students learned about the automated processes that control and operate the maintenance systems in intelligent buildings, including heating, ventilation, air conditioning, lighting, security, and other systems. Increasingly, these automated systems became sensor-based and integrated with artificial intelligence and dispatch functions. However, despite advances in smart-building technology, students still had room to solve problems when the software failed or sensors only showed a part of the problem.

Dennie liked the mix of old-fashioned trade and cutting-edge technology, using artificial intelligence as a partner. He joined the smart building services union and gained access to a dispatching platform that managed residential buildings in the heart of the city. After his apprenticeship with the union, he became active on the platform, going out on his own repair gigs. As a newbie on the platform, his performance rating was low, but his uncle and some of his plumber friends added references that bumped his score into the competitive "reliable service" range. One gig followed another, and soon Dennie was regularly busy, responding to repair calls, logging into the platform to record his completed tasks, and monitoring his client satisfaction ratings.

As required by the union, Dennie must update and renew his certificate regularly to stay current in building systems technologies. Luckily, the union offers courses through the community college. On his own dime, Dennie also enrolled in business management and financial planning classes to help him manage his money. Dennie's dream is to leverage the dispatching platforms to develop his own small business with a team of professionals to tackle bigger jobs with more continuity.

WORKING THE PLATFORMS

DEFINING FEATURES

- **Extreme taskification**, or the disaggregation of full-time jobs into discrete tasks, characterizes work for most people, with a small group of super-skilled, specialized workers retaining full-time, consistent employment in hard-to-code positions.
- Most people are **dispatched** through matching platforms that seek to connect the right person with the right task efficiently and at low cost.
- **Quantified workers** are heavily monitored and evaluated through data capture and analytics, driving reliance on scoring mechanisms to inform automated matching.
- Traditional certificates and degrees have been replaced by **work-life logs** that record quantifiable performance metrics showing proof of work and experience.

Signals of Change

- BetterWorks,⁴⁷ a Silicon Valley startup, has created a platform for “quantified work” that gives employees the ability to see what others are doing through real-time performance measurements and collaborative goal setting.
- Dynamo⁴⁸ gives a glimpse of what a union might look like in a gig or taskified economy. Designed for workers employed through Amazon’s Mechanical Turk⁴⁹ platform, the site allows workers to discuss workplace issues, write petitions, and advocate for change.
- Sony’s Lifelog App⁵⁰ helps people collect massive amounts of data, from their sleep patterns to how many calories were in a piece of pizza⁵¹ they ate last year. The app is intended to help users remember everything, instantly, by logging all the data they possibly can.

Readiness Factors in Action

A heavily quantified, platform-based employment landscape with little social support places significant responsibility on individuals to demonstrate value and manage effective contribution across multiple platforms over time. This landscape is tough on the psyche, demanding emotional resilience and high levels of initiative to conquer the platform. Particularly relevant dimensions of the new foundation for readiness are listed below.

Individual Awareness: Emotional Regulation, Thrive in Ambiguity and Uncertainty

Platform work is highly uncertain, with algorithms, not people, matching job seekers to tasks. Marika and Dennie learn to redirect negative emotions that may arise and to focus on positive emotions that help them be productive and perform well.

Communicate and Create with Numbers

Both Marika and Dennie find ways to translate their performance and experience into data that can be processed by matching and dispatching algorithms. Without the opportunity to interact directly with recruiters, they need to understand platform algorithms and analytics so that their profiles attract matches.

Take Initiative and Self-Advocate

Both Marika and Dennie understand that they need to be the drivers of their own careers. They self-advocate, seeking out new learning opportunities that will help them succeed in platform-based work.

Strategic Considerations

- Education institutions will need to align traditional diplomas and degrees with the nonlinear and fluid nature of platform-based work.
 - Learning communities will need to play an active role in helping students cultivate their personal brands, looking beyond traditional academic attainment and extracurricular involvement to reputation management.
-

Looking across the Readiness Scenarios

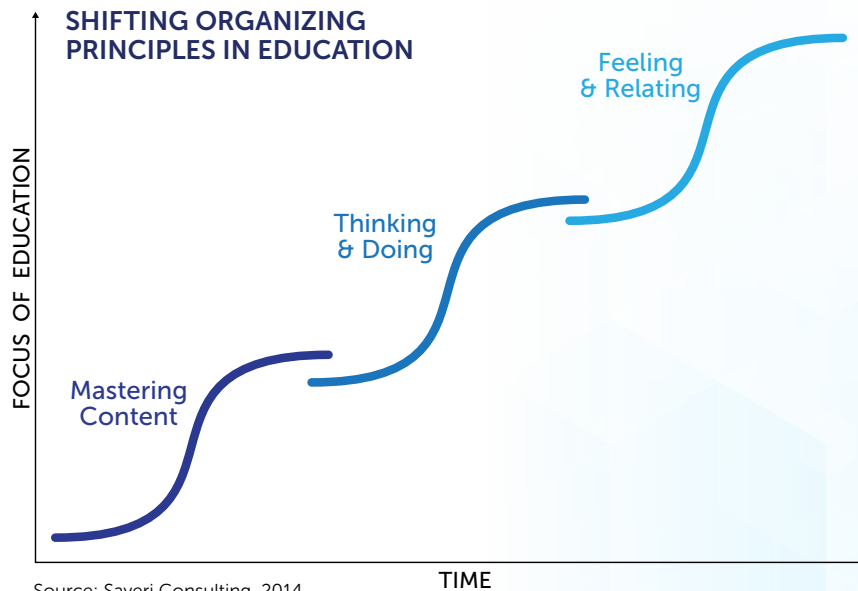
The four scenarios for the future of readiness explore critical uncertainties about the extent to which smart machines will reconfigure or replace human work and the degree to which the societal response will be systemic and intentional or market driven. In depicting future possibilities, these scenarios can guide consideration of how the new foundation for readiness might apply in different employment landscapes and in preparing for change today. Readiness in 2040 will likely reflect elements of all four scenarios, along with other developments that we have not explored, foreseen, or imagined.

While each scenario highlights some of the future readiness factors more than others, we see the new foundation for readiness as being relevant to all of them. Indeed, choosing different details for the profiles could have brought different factors to the foreground. For example, “think differently” and “solve problems” are highlighted in the Finding New Meaning scenario but could also be a way out of super-tasking in Working the Platform.

In order to help students prepare for the employment landscape that they will be navigating in 2040, education stakeholders need to consider how the new foundation for readiness, and the specific ways in which it could affect success in different readiness scenarios, might affect K-12 and postsecondary education. Education stakeholders should also consider how they might activate the new foundation for readiness no matter how the future of readiness plays out.

Redefining Readiness: Opportunities for Education

As highlighted in the introduction to this paper, education systems have historically followed economic eras. To prepare for a future in which smart machines will be able to perform increasingly complex, non-routine work and full-time employment will be decreasingly common, today's education systems must change their central operating principles. They must continue to shift from a limiting focus on mastering content and must also move beyond the more recent focus on thinking and doing to establish a new focus on feeling and relating.



Leveraging the emotion system to interface with the world and to connect deeply with other people represents the uniquely human capacity that people bring to work. This capacity will ensure that we will continue to add distinctive value alongside smart machine partners. Establishing a new focus on feeling and relating will help education institutions and systems align with a future of readiness in which the core social-emotional skills and foundational cognitive and metacognitive practices that we have described in this paper will be more important and enduring than specific content or job- and task-related skills. While there will still be a place for both mastering content and thinking and doing, making feeling and relating central to learning will enable students to develop the skills and practices necessary to meet the emerging realities of work with adaptability and resilience.

This is the lens through which education stakeholders must imagine ways of incorporating the new foundation for readiness into schools and other learning communities. More specific opportunities for K-12 and postsecondary education are highlighted on the following page.

Opportunities for K-12 Education

Because they help shape the foundational behaviors and practices affecting how young people approach learning and their lives, K-12 educators have the opportunity to cultivate a new approach to readiness in deep and far-reaching ways. Some guiding principles for responding to this opportunity and incorporating the new foundation for readiness appear below.

Teach and integrate skills-based social-emotional curricula.

The foundational cognitive and metacognitive practices that will enable success in the emerging workplace leverage core social-emotional intelligence skills: deep self-knowledge, emotional regulation, and empathy and perspective-taking. These skills are the building blocks for developing successful relationships with peers, collaborators, mentors, and clients. They also provide the foundation for practices that will help workers thrive in ambiguous and uncertain settings, develop adaptive behaviors for self-advocacy and problem solving, navigate challenging circumstances, and engage in personal reflection.

Just as educators scaffold numeracy and literacy across grades, they can guide the development of emotion-based skills and practices over time. Both individual development and the emotional climates in classrooms and schools can be assessed to track progress and to inform teaching strategies, as well as school programs and policies. Teachers and administrators can foster students' readiness for further learning, career, and life by treating social-emotional intelligence as a foundational curriculum that is developed in scope and sequence across the K-12 experience.⁵⁵ In addition, more states can incorporate social-emotional intelligence into educational standards.

Nurture aspirational visions. The K-12 years should strongly support self-discovery and experiences that inspire learning. Students should have the freedom to follow the natural ebb and flow of encountering their passions, exploring them deeply and then moving on to other interests that may spark new motivations and inspiration. Overscheduling squelches the organic process of self-discovery that propels a learner forward.

In contrast, exposure to big ideas, awe-inspiring questions, and new experiences has the power to draw in students and to help them find purpose, engage in collaboration, and make connections to the broader world around them. Indeed, research from the Greater Good Science Center suggests that experiencing awe helps bind people to the social collective and drives curiosity and wonder.⁵⁶

Developing aspirational visions — future images of themselves in the broader world — can provide students with a useful filter to guide their learning journeys, giving meaning to academic content and skill development and providing intrinsic motivation to persist in the face of setbacks and failures. Asking students what issues they would like to address instead of what career they want to pursue can be one way of helping students set enduring long-term aspirations. Whatever the approach, continual development of both aspirational goals and visions of possible future selves will help students engage in self-directed learning during the K-12 years and beyond.

Bring ambiguity and uncertainty into the classroom. Future work environments will not have a syllabus and worksheets with example problems showing people what to do. Work tasks will likely be vague, emergent, and approachable through multiple solution pathways. To prepare for such conditions, students need to experience uncertainty, ambiguity, risk, and failure in ways that strengthen their ability to ask questions, make reasoned approaches, and seek help. Students also need to balance self-confidence and humility and become skilled at emotion regulation so that they can navigate the ups and downs of an uncertain work environment.

The more prescriptive learning activities are, the less likely they will contribute to students' ability to navigate ambiguity and uncertainty at work, in further learning, and in their lives. In contrast, looking for ways to bring passion-driven, open-ended projects; peer-based collaboration; and play-centered experimentation and creation into learning environments will help foster productive approaches to ambiguity and uncertainty.⁵⁷

Encourage and support cognitive diversity and flexible thinking.

Most future work will include significant amounts of informed decision-making and creative problem-solving using data and inputs generated by machine partners along with insights from human co-workers. Developing such skills requires safe, open, and comfortable learning environments where students can dig deep into their own experiences, learning, and perspectives to share ideas freely. This kind of sharing is a hallmark of creativity and innovation. In addition, recognizing and appreciating diverse disciplinary and cognitive perspectives, including the arts and creative practices, will be a core aspect of successful collaboration at work. Developing students' metacognitive abilities to reflect on thinking and to acknowledge diverse frameworks and their outcomes will also contribute to success. To encourage creative thought and personal growth, learning environments need to be psychologically and socially safe, stress-free, and physically supportive. In addition, students need to develop comfort in using thinking frameworks from diverse disciplines to stimulate ideas and identify novel approaches to problems.⁵⁸ Allowing all students down time and flexible schedules to "mess around," daydream, and explore ideas is critical for helping them develop cognitive flexibility.⁵⁹

Use technology to augment human capabilities. Creating new knowledge and developing novel insights will be important human contributions to future workplaces. People will also be working alongside a variety of digital tools and machine partners that will augment our contributions in ways that can be hard to imagine today. To help prepare learners for future

human-machine partnerships, educational technology needs to be designed, integrated, and applied in classroom activities in ways that support and augment human strengths. Students need to develop positive machine relationships that show an understanding of collaboration and the ability to make technology tools their partners.

When designing curricula and learning activities, educators can use technology to stretch the boundaries of thinking and to push higher-order analysis, synthesis, and creative and generative thinking. They can use technology to help students ask deeper questions; identify analogies for idea generation; and engage in lateral thinking and idea generation to imagine new concepts, ideas, and narratives. Technology should serve not as an endpoint but as means to facilitating deeper thinking.

Renegotiate definitions and markers of success. Traditional notions of school success are rooted in an achievement model that includes demonstrations of mastery of discrete bundles of skills and knowledge. Achieving an externally predetermined level of performance is the goal. In the future workplace, mastery will be elusive. As technologies continue to evolve to do more and different kinds of cognitive work, human jobs will require new kinds of context-dependent skills and knowledge. People will need to adapt quickly and to advocate for themselves in the pursuit of skill development. Future definitions of educational success and understandings of career possibilities will need to correspond with this new employment climate.

To help renegotiate definitions and markers of success, educators can consider shifting achievement metrics and assessments from a learning model that focuses on acquiring a defined set of knowledge and skills toward a learning model that addresses dynamic, emergent, and continuous learning along with social-emotional development. They can develop more comprehensive, yet individually supportive, ways for students

and teachers to understand progress in these areas. They can also identify more complete ways for schools and school districts to describe their performance. In addition, students and educators would benefit from shifting their expectations around career outcomes to reflect the need for continual reskilling and to consider the possibility that some knowledge-based jobs may be more susceptible to automation than some jobs involving more manual tasks.

Prioritize the development of a reflective learning practice.

People will excel in the future workplace when they can apply human creativity, aesthetics, and emotion in novel ways, often leveraging digital tools. Social and economic mobility will come from applying new digital tools and software to create opportunities for career and life pathways. Constant reflection on passion, purpose, aspirations, and goals will help people direct their learning and self-development. In this context, it is important for K-12 students to see reflective learning modeled by educators and other adults in their lives. Likewise, exposure to educators and other adults who employ and model growth-mindset strategies will be critical for illustrating patterns of reflection, self-assessment, emotion regulation, persistence, and work-around strategies in face of obstacles.

To help K-12 students develop a reflective learning practice, educators can find ways to get students actively engaged in their learning journeys, including both successes and failures. For example, educators can support students in setting and monitoring progress toward age- and context-appropriate goals. They can also facilitate access to real-world learning experiences and simulations that enable students to practice skills and reflect on outcomes. In addition, educators can embed reflection into curricula and redesign assessments to place more emphasis on reflection. Teachers can also ask students about their reasoning, acknowledge it, and help them channel it. Lastly, teachers can share their own meta-cognitive processes.

Rethink teacher preparation with social-emotional intelligence at its center. The changes needed to support students in preparing for the emerging world of work will require teachers who are themselves emotionally intelligent and who can model the skills and practices described in the new foundation for readiness. A growing base of psychological research shows that social-emotional skills are more predictive of success and adaptation than are intellectual skills; specifically, the emotional quality of our earliest attachments is perhaps the single most important influence on human development. It makes sense, then, that teachers, who spend hundreds of hours interacting with children, be educated in emotion science and trained in social-emotional intelligence.⁶⁰

To help achieve that, teacher education needs to be redesigned with emotional intelligence at its core. For example, teachers need more concerted training in asking meaningful, respectful questions that help students' curiosity unfold and confidence grow. Teachers and other student-facing adults also need more training in creating emotional climates that support diverse learning experiences and productive social interactions. Above all, teachers need to understand how to be in relationships with students in ways that foster openness, trust, safety, and self-discovery.

Seek to cultivate deep partnerships with afterschool, summer, and out-of-school-time learning providers. Afterschool, summer, and out-of-school-time programs offer vital support for many learners, helping them develop and practice skills, complete homework, try out new activities, and explore their interests in safe settings. These programs often engage learners in more experiential and project-based learning than their schools provide and have been shown to have a positive impact on both academic achievement and school attendance. Afterschool, summer, and out-of-school-time programs have long played a vital role in fostering social and emotional skills,

with many programs encouraging positive behavior, sparking engagement, and supporting the development of aspirational visions through career exploration.⁶¹

K-12 education would benefit from cultivating deep partnerships with afterschool, summer, and out-of-school time programs, encouraging exchanges of information, expertise, and best practices among staff and working to incorporate extended learning opportunities into students' personalized learning journeys. By changing approaches to factors such as time, structures, and graduation requirements and addressing logistical issues such as liability insurance and transportation, K-12 education can extend the range of experiences available to help students prepare for further learning, career, and life. K-12 education can also collaborate with afterschool, summer, and out-of-school-time programs to credential a broader range of learning experiences and may even consider shifting its role to focus less on providing learning and more on certifying mastery.

In many K-12 environments, responding to these opportunities will mean rethinking how learning is structured and organized; how resources, such as time, technology, and people are allocated to create meaningful learning opportunities; how learning is assessed and progress tracked; how space is used; and how educators are supported in modeling reflective learning and aspirational personal development. Redefining readiness requires taking a long view. Education stakeholders need to find ways of responding to these opportunities with the future in mind while also attending to immediate needs such as addressing equity.

WHAT MIGHT REDEFINING READINESS LOOK LIKE FOR K-12 EDUCATION?

Responding to these opportunities to incorporate the new foundation for readiness into K-12 learning environments could mean that:

- Students are grouped in new ways to follow flexible learning pathways.
- Classrooms become more fluid and open, enabling new ways of structuring learning.
- School schedules⁶² are transformed to allow for more interdisciplinary collaboration, deep reflection, and personalized learning.
- Curriculum is inverted, with core social-emotional competencies shaping how inquiry projects are designed and what school and classroom rituals anchor the learning climate and culture.
- Educators redefine their roles to focus less on content or grade specialization and more on foundational skills and practices.
- Community partners become key assets for introducing new kinds of learning experiences that stretch students' comfort zones and expand their aspirations.⁶³

Opportunities for Postsecondary Education

The changing nature of work is shortening the shelf-life of job-specific skills, transforming the nature of human contribution relative to that of smart machines, and coordinating work and productive processes in new ways that shift the focus of training and preparation for work. Although in the near-term postsecondary education institutions will continue to bear at least partial responsibility for helping students to get ready for their first careers, postsecondary education can no longer be viewed as an endpoint or as a final stage in the transition to work. Instead, it must be seen as one part of a lifelong pursuit of learning for personal and professional development. To that end, postsecondary institutions need to strike a balance between immediate and future workforce needs, helping learners enter the current job market while at the same time helping them lay the foundation for future readiness. Some guiding principles for responding to this shift and incorporating the new foundation for readiness appear below.

Integrate support for deep personal development. The new foundation for readiness represents practices that people will hone over their lifetimes. To help people prepare for the future work environment in which such skills will constantly be transformed, postsecondary institutions need to help people develop their human core. Deep personal development will prepare students to become more resilient and adaptable; will enable them to push through discomfort, navigate change, and identify aspirational goals; and will enable them to use new technology tools, including artificial intelligence, in service of their goals.

Postsecondary institutions can integrate support for deep personal development by creating robust programs that integrate the liberal arts across disciplines, especially in STEM fields. In so doing, institutions can look for ways to combine departments or to merge offerings in ways that allow students to create multifaceted learning without facing administrative hurdles. In addition, institutions would benefit from making social-emotional curriculum a core requirement of any program. They can begin incorporating that curriculum by finding ways to engage students in small-group reflective practices that allow them to flex their social-emotional skills and develop their inner selves. Institutions can also simulate prospective industry and occupational work situations to help students explore the kinds of challenges they might face and the ways in which strong social-emotional practices can help them thrive. In addition, institutions could offer lifelong learning experiences focused specifically on deep personal development.

Help students design their lives. Students' lifelong success will stem from the ability to identify and generate opportunities for diverse trajectories in work, civic, and social life. As key contributors to lifelong learning, postsecondary education institutions can play an important role in preparing students to develop a playbook of career and life strategies to guide their choices in a rapidly changing world of work. Individuals need support in strategizing for career and life options and choices rather than for linear career paths that may not endure.

Postsecondary institutions can provide such support by helping students look beyond their first jobs to imagine the possible arcs of their lives. Career planning could be recast as life planning, with counselors helping students explore what kinds of choices certain educational pathways provide and how those pathways might advance their personal visions and help them make an impact. Institutions could even help students and clients explore what success and fulfillment might look like in a future employment landscape in which paid work may no longer be a core element of identity.

Develop flexible and diverse pathways and programs. Given the shortening shelf-life of many skills, postsecondary institutions need to consider how credentialing and degree pathways and job training programs can help students develop timely skills while at the same time helping them develop the persistent readiness attributes that will serve them even if the skills associated with

a specific pathway or program become obsolete. Developing competency-based pathways and programs, micro-credentials, stackable degrees, and certifications can help institutions support learners in developing both dimensions.

In developing flexible and diverse pathways and programs, institutions can articulate how their offerings help students develop foundational skills as well as context- and discipline-specific ones. Postsecondary institutions can also cultivate deep partnerships with local and regional industries and employers to project emerging workforce needs and provide insights into future in-demand competencies. In order to reach all students, institutions might also explore diverse formats and modes of learning, including face-to-face experiences, virtual and blended environments, and online social learning experiences. They can also consider ways of certifying attainment of competency regardless of where or how learning took place. Lastly, forming strategic partnerships and providing learning opportunities in and through creative venues may contribute to accessibility, convenience, and relevance for busy learners.

Support entrepreneurial career planning. As Ben Casnocha⁶⁴ advocates, having a start-up approach is key to successfully transforming a career in our rapidly changing world. Entrepreneurial career planning requires being flexibly persistent and being able to adapt to breakout opportunities. Postsecondary institutions need to help students determine passions and aspirations by creating opportunities for students to test assumptions about industries and professions.

Offering internships, project work, apprentice-ships, and network-building opportunities, will enable students to develop their initial competitive career advantage. Reaching further, postsecondary institutions can also create fluid programming that allows students to enter and exit formal learning processes at the right moments and for strategic purposes that advance their career and life aspirations rather than when institutional timelines demand.

This fluid programming may include flexible learning pathways, modular or stackable credentials, and other mechanisms that help lifelong learners with frequent skill acquisition and personal growth and help institutions develop new business models for a new era.

Support students in creating their own learning ecosystems.

To thrive as lifelong learners and navigate the rapidly changing employment landscape, students need to learn how to identify their own learning needs, strengths, and weaknesses; how to identify learning goals and pathways for career mobility; and how to navigate educational resources, including assessments and credentialing opportunities. Postsecondary institutions can support students' ongoing success by helping them create learning ecosystems that can evolve and support them over their lifetimes. These learning ecosystems, which might include faculty, other experts, digital tools, social networks, content, and learning experiences, will be key for students' lifelong personal and professional growth.

To support students in creating their own learning ecosystems, postsecondary institutions can provide courses, support structures, and other opportunities that help students develop reflective practices. Institutions can also use supportive structures and coaching to help students develop and maintain strong relationships with faculty, mentors, and peers. In addition, postsecondary institutions can help students identify and assess digital tools, including artificial intelligence, that can help them build useful social networks and access resources and experiences that will contribute to their learning. Institutions can also consider how they might foster interconnected learning ecosystems that help learners move easily among different kinds of learning experiences, resources, and supports, not all of which they offer directly.

Support adult learners through the reskilling and upskilling process. Reskilling and upskilling will be frequent in the emerging world of work. However, for many adults, the established narrative of choosing a field and sticking with it might make the need to

reskill and upskill challenging. Postsecondary institutions can help learners foster future-ready expectations about the evolution of job skills; help them see how to build off their prior experiences; and help them realize that the new foundations of readiness can be cultivated by anyone, regardless of age.

To support adult learners through the reskilling and upskilling process, postsecondary institutions can help adult learners make realistic assessments of what skills will help them stay relevant in relation to current and emerging employment opportunities and can then ensure that programs help learners develop those skills in a timely manner. Cultivating deep partnerships with local and regional industries and employers can help postsecondary institutions provide appropriate guidance and offerings. In addition, postsecondary institutions can cultivate personalized learning pathways – including new kinds of structures reflective of lifelong learning needs – that are informed by the evolving nature of job-specific skills and are oriented around learners’ needs and previous experiences. Postsecondary institutions can also foster peer networks that help adult learners develop foundational readiness practices in supportive settings. Lastly, finding ways to lower barriers to access promises to help adults meet lifelong learning needs; such approaches could involve advocacy along with adjustments to institutional policy and financial structures.

Looking across these opportunities, postsecondary institutions would benefit from placing greater programmatic focus on helping learners deepen core social-emotional skills and effectively apply the foundational cognitive and metacognitive practices in service of continual self-renewal and reinvention. Additionally, institutions would benefit from re-examining their organizational, program, and delivery structures so that they can be more modular, flexible, and nimble to address workers’ changing lifelong needs.

WHAT MIGHT REDEFINING READINESS LOOK LIKE FOR POSTSECONDARY EDUCATION?

Responding to these opportunities to incorporate the new foundation for readiness into postsecondary learning environments could mean that:

- Postsecondary programs focus more on supporting deep personal development as well as context- and discipline-specific skills and knowledge.
- Postsecondary offerings and business models diversify, with a multitude of formats and structures engaging learners and increasing access.
- Postsecondary institutions contribute to student-driven and student-designed ecosystems of supports that evolve over time and reflect students’ strengths, weaknesses, and needs.
- Institutions help students plan for both their careers and their lives and respond to changing conditions.
- More learners weave in and out of postsecondary learning experiences as their career development needs dictate.
- Postsecondary institutions collaborate more extensively with workplace partners.
- Faculty professional development shifts to reflect both a greater focus on supporting the development of foundational cognitive and metacognitive practices and ongoing learning related to relevant workplace skills.

Imagining New Education Systems

The opportunities on the previous pages highlight some ways of responding to the new framework for readiness to ensure that learners will be prepared to navigate whatever combination of technological displacement and societal response come to pass by 2040. You will no doubt question some of the opportunities and identify others not listed here. Because a new economic paradigm is emerging, it will take many perspectives and many practices to transform today's education systems to respond effectively and fully to the changing nature of readiness. It will also take patience, perseverance, and iteration.

We owe it to current and future students to reframe our approaches to readiness. This is the most urgent issue on the horizon for learning.

CURRENT EFFORTS TO REDEFINE READINESS

While this paper explores what readiness might look like in 2040, there are many organizations working diligently to redefine readiness now. A partial list of such organizations appears below.

Ashoka Changemakers

Pioneers in the field of social entrepreneurship, Ashoka Changemakers seeks to create positive change. Started in 2012, its Start Empathy initiative partners with elementary, middle, and high schools to prioritize empathy, teamwork, leadership, and changemaking in students.⁶⁵

CASEL

The Collaborative for Academic, Social, and Emotional Learning (CASEL) works to make evidence-based social and emotional learning an integral part of education for students in the preK-12 education system.⁶⁶

Center for Curriculum Redesign

The Center for Curriculum Redesign brings together academic institutions, international organizations, non-profits, and corporations to design academic curricula that address what students should learn in the 21st century.⁶⁷

Connecting Credentials

This national campaign established by Lumina Foundation and Corporation for a Skilled Workforce seeks to create a credentialing ecosystem that reflects the needs of 21st century learners, employers, and the economy.⁶⁸

Deeper Learning

This competency framework seeks to create dynamic learning environments that help students foster deep understanding of core content so that they can use that knowledge to solve problems, think critically, communicate effectively, and be self-reflective about their learning.⁶⁹

Partnership for 21st Century Skills

The partnership's framework for 21st century learning includes student outcomes representing skills, knowledge, and expertise that students need to succeed in work, life, and citizenship, along with necessary support systems.⁷⁰

The Readiness Project

By identifying readiness abilities and practices and surfacing deep and persistent readiness gaps, along with common traps in systems and settings, this campaign by the Forum for Youth Investment aims to build a national movement making readiness a right and within reach for all youth.⁷¹

Redefining Ready!

Launched by AASA, The School Superintendents Association, Redefining Ready! is a national initiative to introduce new research-based metrics for assessing whether students are college, career, and life ready.⁷²

Yale Center for Emotional Intelligence

Through conducting research on the power of emotions and partnering with schools, the center creates educational approaches that teach emotional intelligence to children and adults, helping them develop the skills they need to succeed in school, work, and life.⁷³

Making Sense of Readiness Redefined in Your Context

By exploring future possibilities and opportunities to respond, education stakeholders can help ensure that the plans you make today will support students in being ready for whatever further learning, career, and life look like in 2040. The discussion and activity prompts below will help you apply the ideas in this paper to your context.

1. Readiness Framework Responses

Gather a group to discuss your responses to the new foundation for readiness using some or all of the prompts below.

A Divide into pairs or groups and assign each group one or two profiles from the scenarios, making sure to reflect all the scenarios across the groups. Ask participants to discuss the following:

How do the core social-emotional skills and foundational cognitive and meta-cognitive practices from the new foundation for readiness help the characters in the profiles navigate the scenarios?

What other kinds of issues and tasks might the characters encounter in their scenarios, and what specific skills and practices might help the characters respond productively?

How might you help students or staff develop the skills and practices that came to the fore of your discussion?

B Discuss the implications of the new foundations for readiness for both classroom teachers or faculty and education administrators. Then consider:

How might your organization provide educators with training in social-emotional intelligence?

What resources are available to support educators' development in this area?

What educational programs, expert practitioners, or providers in your area address social-emotional skills, and how might you partner with them?

Conclude by making a list of resources and programs that you can contact to explore how you might develop social-emotional intelligence in your organization. Also, list other action steps that you can take to follow up on your conversation.

C Divide into teams by grade level (and by subject if there are enough people). Create a list of core curriculum activities by grade level. For each activity, examine how the activity can be revised, enhanced, or modified in ways that address the foundational cognitive and meta-cognitive practices in the readiness framework. What new resources, tools, partners, or colleagues would help make these redesigns successful? Share the redesigns with another team and get feedback to inform further revisions.

2. Scenario Responses

Looking back at the readiness scenarios, explore your responses to them, either on your own or with a group, by exploring the questions below.

A Using a blank scenario grid with the axes labeled, list how each scenario might support or create challenges for organization's vision, mission and values. Consider:

In which scenarios do you see alignment with your vision, mission, and values?

Which scenarios might create challenges for your vision mission, and values?

If you are working in a group, discuss and then vote on the most important insights from this discussion.

B Next, explore how your organization's vision, mission, values might be revised to reflect the emerging world of work and the new framework for readiness. Consider:

What new elements might need to be incorporated into your vision, mission, and values?

What might you need to remove or rephrase?

C Either on your own or with a group, consider what your responses to these questions might suggest for your organizational strengths and weakness in responding to the changing nature of work and readiness. As you explore, write down the areas of opportunity that you see for your organization. These could be areas where your organization is strong, points of weakness where it could improve, or even blind spots. You might also discuss one or more of the strategic considerations embedded in the scenarios.

3. Education Opportunities

Looking back at the “Redefining Readiness: Opportunities for Education” section of this paper, pick one of the opportunities that seems relevant to your organization and prototype how your organization might respond to it. Alternatively, you can prototype a response to one of the opportunities that you identified when exploring the readiness framework or the readiness scenarios. To create your prototype:

- A** Generate ideas for new products, services, programs, tools, or partnerships that would respond to the opportunity that you selected.
- B** Select one solution to develop further.
- C** Develop your solution either by drawing or by building a model using available materials. As you do so, consider:
 - What is your solution called?
 - What does it do?
 - How does it work?
 - Who is involved?
 - What benefits does it create? For whom?
 - How does your solution respond to the opportunity that you selected?
- D** After developing your prototype, discuss what it might suggest for your organization’s practice and consider how you might move forward.

Further Reading

The resources listed below provide additional perspectives on the future of readiness, learning and work.

Future of Readiness

- *Four-Dimensional Education: The Competencies Learners Need to Succeed* by Charles Fadel, Maya Bialik, and Bernie Trilling⁷⁸
- "The New Learning Economy and the Rise of the Working Learner" by Parminder Jassal and Hope Clark⁷⁹
- "Preparing Students for a Project-Based World" by Bonnie Lathram, Bob Lenz, and Tom Vander Ark⁸⁰
- "Ready by Design: The Science (and Art) of Readiness" by Stephanie Krauss, Karen J. Pittman, and Caitlin Johnson⁸¹
- *Rethinking Readiness: Deeper Learning for College, Work, and Life* edited by Rafael Heller, Rebecca E. Wolfe, and Adria Steinberg⁸²
- *Foundations for Young Adult Success: A Developmental Framework* by Jenny Nagaoka, Camille A. Farrington, Stacy B. Ehrlich, and Ryan D. Heath with David W. Johnson, Sarah Dickson, Ashley Cureton Turner, Ashley Mayo, and Kathleen Hayes⁸³

Future of Learning

- "Certifying Skills and Knowledge: Four Scenarios on the Future of Credentials" by Jason Swanson⁸⁴
- *The Future of Learning: Education in the Era of Partners in Code* by Katherine Prince, Andrea Saveri, and Jason Swanson⁸⁵

Future of Work

- *The Fourth Industrial Revolution* by Klaus Schwab⁷⁴
- "The Futures of Work" by the Foresight Alliance⁷⁵
- *Machines of Loving Grace* by John Markoff⁷⁶
- *The Second Machine Age* by Eric Brynjolfsson and Andrew McAfee⁷⁷

Appendix

About the Authors

Katherine Prince leads KnowledgeWorks' exploration of the future of learning. As Senior Director, Strategic Foresight, she speaks and writes about the trends shaping education over the next decade and helps education stakeholders strategize about how to become active agents of change in shaping the future. Katherine holds a BA in English from Ohio Wesleyan University, an MA in English from the University of Iowa, and an MBA from The Open University and is a member of the Association of Professional Futurists.

Andrea Saveri of Saveri Consulting makes the future actionable for clients through research-based foresight, visual maps, forecast artifacts, and highly creative engagement experiences. She partners with clients to create clear strategic pathways to transformation and resilience in a highly complex world. In her practice at Saveri Consulting, Andrea has worked with diverse education clients in projects focused on bringing long-term futures thinking, emotional intelligence, and a maker mindset to all learners. As Director of Action Collab Services for the Institute for the Study of Knowledge Management in Education, she is developing methodology-based services that enable educators to accelerate their capacity for collaboration, innovation, and design. Andrea is a graduate of Harvard University and the University of California at Berkeley.

Jason Swanson is the Director of Strategic Foresight at KnowledgeWorks, where he helps lead the organization's research into the future of learning, develops publications, and works with education stakeholders to generate actionable insights. Jason holds a BA in Public Policy from West Chester University and an MA in Foresight from the University of Houston. He is a fellow with the Royal Society of Arts and is a board member of the Association of Professional Futurists.

Acknowledgements

Many thanks to KnowledgeWorks colleagues Nancy Arnold, Sarah Jenkins, Mary Kenkel, Jesse Moyer, Anne Olson, Lillian Pace, Judy Peppler, Lydia Sites, Kate Westrich, and Matt Williams, as well as to Diana Divecha, for their feedback on this paper; to Todd Garvin for creating the design; and to Jillian Kuhlmann for managing its production and release. Thanks also to Christa Simone for contributing to the ethnographic research and to Anne Boysen of After the Millennials for sharing expertise on generational differences.

References

- Prince, K., Saveri, A., & Swanson, J. (2015). The Future of Learning: Education in the Era of Partners in Code. KnowledgeWorks. Retrieved from <http://www.knowledgeworks.org/future-learning/forecast>.
- <http://www.rethinkrobotics.com/baxter>.
- Hu, J. (2016, December). How Machine Learning is Revolutionizing the Diagnosis of Rare Disease. NBC News. Retrieved from <http://www.nbcnews.com/mach/innovation/how-machine-learning-revolutionizing-diagnosis-rare-diseases-n700901>.
- Advanced Chess. (2017). Retrieved from https://en.wikipedia.org/wiki/Advanced_Chess.
- Echo & Alexa Devices. Retrieved from <https://www.amazon.com/echo-superbowl-commercial/b?ie=UTF8&node=9818047011>.
- Google Home. Retrieved from <https://madeby.google.com/home>.
- Skype Translator. Retrieved from <https://www.skype.com/en/features/skype-translator>.
- Davies, A. (2016, September). We Take a Ride in the Self-Driving Uber Now Roaming Pittsburgh. Wired Magazine. Retrieved from <https://www.wired.com/2016/09/self-driving-autonomous-uber-pittsburgh>.
- Carson, B. (2016, October). Uber Has Quietly Launched Its Own "Uber for Trucking" Marketplace Called Uber Freight. Business Insider. Retrieved from <http://www.businessinsider.com/uber-to-launch-uberfreight-for-long-haul-trucking-2016-10>.
- McCury, J. (2017, January). Japanese Company Replaces Office Workers with Artificial Intelligence. The Guardian. Retrieved from <https://www.theguardian.com/technology/2017/jan/05/japanese-company-replaces-office-workers-artificial-intelligence-ai-fukoku-mutual-life-insurance>.
- Gallego, J. (2016, August) The Future of Writing? China's AI Reporter Published 450 Articles During Rio Olympics. Futurism. Retrieved from <https://futurism.com/the-future-of-writing-chinas-ai-reporter-published-450-articles-during-rio-olympics>.
- Shademan, A., Decker, R.S., Opferman, J.D., Leonard, S., Krieger, A., & Kim, P. C. (2016, May). Supervised Autonomous Robotic Soft Tissue Surgery. Science Translational Medicine, 8(337). Retrieved from <http://stm.sciencemag.org/content/8/337/337ra64>.
- Reynolds, E. (2016, April). This Fake Rembrandt Was Created by an Algorithm. Wired Magazine. Retrieved from <http://www.wired.co.uk/article/new-rembrandt-painting-computer-3d-printed>.
- Bessen, J. (2016, January). How Computer Automation Affects Occupations: Technology, Jobs, and Skills. Boston University School of Law. Retrieved from <http://siepr.stanford.edu/system/files/SSRN-id2690435.pdf>.
- Leopold, T., Ratcheva, V., & Zahidi, S. (2016, January). The Future of Jobs: Employment, Skills, and Workforce Strategy for the Fourth Industrial Revolution. World Economic Forum. Retrieved from http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf.
- Smith, A., & Anderson, J. (2014, August). AI, Robotics, and the Future of Jobs. Pew Research Center. Retrieved from <http://www.pewinternet.org/2014/08/06/future-of-jobs>.
- Frey, C., & Osborne, M. (2013, September). The Future of Employment: How Susceptible Are Jobs to Computerization? Oxford Martin School, Oxford University. Retrieved from http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf.
- Chui, M., Manyika, J., & Miremadi, M. (2015, November). Four Fundamentals of Workplace Automation. McKinsey Quarterly. Retrieved from <http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/four-fundamentals-of-workplace-automation>.
- The Economist. (2013, October). Labour Pains. The Economist. Retrieved from <http://www.economist.com/news/finance-and-economics/21588900-all-around-world-labour-losing-out-capital-labour-pains>.
- Bureau of Labor Statistics (2015, March). National Longitudinal Surveys. Bureau of Labor Statistics. Retrieved from <https://www.bls.gov/nls/nlsfaqs.htm>.
- Manyika, J., Lund, S., Bughin, J., Robinson, K., Mischke, J., & Mahajan, D. (2016, October). Independent Work: Choice, Necessity, and the Gig Economy. McKinsey Global Institute. Retrieved from <http://www.mckinsey.com/global-themes/employment-and-growth/independent-work-choice-necessity-and-the-gig-economy>.
- Intuit. (2010, October). Intuit 2020 Report: Twenty Trends that Will Shape the Next Decade. Intuit. Retrieved at <http://about.intuit.com/futureofsmallbusiness>.
- Amazon Mechanical Turk. Retrieved from <https://www.mturk.com/mturk/welcome>.
- TaskRabbit. Retrieved from <https://www.taskrabbit.com>.
- Uber. Retrieved from <https://www.uber.com>.
- Lyft. Retrieved from <https://www.lyft.com>.
- Boysen, A. (2015). Generations Timeline. After the Millennials. Retrieved from <http://afterthemillennials.com/generations-archetype-turnings>.
- Boysen, A. (2015). Generations Timeline. After the Millennials Retrieved from <http://afterthemillennials.com/generations-archetype-turnings>.
- The Economist. (2012, April). The Third Industrial Revolution. The Economist. Retrieved from <http://www.economist.com/node/21553017>.
- Richmond Vale Academy. (2016, July) Second Industrial Revolution: The Technology Revolution. Richmond Vale Academy. Retrieved from <http://richmondvale.org/second-industrial-revolution>.
- Techopedia. (2017). Digital Revolution. Techopedia. Retrieved from <https://www.techopedia.com/definition/23371/digital-revolution>.
- The Economist. (2012, April). The Third Industrial Revolution. The Economist. Retrieved from <http://www.economist.com/node/21553017>.
- Schwab, K. (2016). The Fourth Industrial Revolution. Geneva, Switzerland: World Economic Forum.
- Saveri, A. (2016). KnowledgeWorks primary research, Millennial edge worker interviews. KnowledgeWorks.
- Oxford Living Dictionaries [Def.1]. In Oxford Living Dictionaries, Retrieved on April 5, 2017 from <https://en.oxforddictionaries.com/definition/cognition>.
- Metcalfe, J., & Shimamura, A. P. (1996, January). Metacognition: Knowing about Knowing. Cambridge, MA: MIT Press.
- Jobs at Apple. Retrieved from <https://www.apple.com/jobs/ca/retail.html>.
- Talent Analytics. Retrieved from <http://www.talentanalytics.com>.
- Partners4Work. (2016). Microcredentialing. Retrieved from <https://www.partner4work.org/programs/microcredentialing/>.
- Mentorcloud. Retrieved from <https://www.mentorcloud.com>.
- MentorPitch. Retrieved from <https://mentorpitch.com>.
- Skillshare. Retrieved from <https://www.skillshare.com>.
- Udacity Nanodegrees. Retrieved from <https://www.udacity.com/nanodegree>.
- Apprenticeships at Greenville Technical College. (2017). <http://gvltec.edu/apprenticeships>.
- Anderson, C. (2014). Agricultural Drones. MIT Technology Review. Retrieved from <https://www.technologyreview.com/s/526491/agricultural-drones>.
- Coren, M. J. (2016, July). Here They Come: Cheap Robots are Coming for Our Farm Jobs by Taking the Most Brutal Tasks First. Quartz. Retrieved from <https://qz.com/726667/cheap-robots-are-coming-for-our-farm-jobs-by-taking-the-most-brutal-tasks-first>.
- BetterWorks. Retrieved from <https://www.betterworks.com>.

48. Dynamo. Retrieved from <http://www.wearedynamo.org>.
49. Amazon Mechanical Turk. Retrieved from <https://www.mturk.com/mturk/welcome>.
50. Lifehacker. (2014, September). Sony's Lifelog Tracks All Your Activities, Not Just Exercise. Lifehacker. Retrieved from <http://www.lifehacker.co.uk/2014/09/04/sonys-lifelog-tracks-all-your-activities-not-just-exercise>.
51. Vijayasarathy, S. (2017, February). Sony Lifelog Now Analyses Food Photos to Count Calories, Offer Nutritional Advice. Gadgets 360. Retrieved from <http://gadgets.ndtv.com/apps/news/sony-lifelog-now-analyses-food-photos-to-count-calories-offer-nutritional-advice-1659426>.
52. Delany, K.J. (2017, February). Droid Duty: The Robot that Takes Your Job Should Pay Taxes, says Bill Gates. Quartz. Retrieved from <https://qz.com/911968/bill-gates-the-robot-that-takes-your-job-should-pay-taxes/>.
53. Weller, C. (2017, January). Basic Income Experiments to Watch Out For in 2017. Business Insider. Retrieved from <http://www.businessinsider.com/basic-income-experiments-in-2017-2017-1/#kenya-1>.
54. Designing Your Life. Retrieved from <http://designingyour.life>.
55. CASEL. Rating Framework. Retrieved from <http://www.casel.org/guide/ratings>.
56. Keltner, D. (2016, May). Why Do We Feel Awe? Greater Good Science Center, University of California, Berkeley. Retrieved from http://greatergood.berkeley.edu/article/item/why_do_we_feel_awe.
57. Vander Ark, K. & Vander Ark, T. (2017, March). The Rise of AI Demands Project-Based Learning. Getting Smart. Retrieved from <http://www.gettingsmart.com/2017/03/rise-of-ai-demands-project-based-learning>.
58. Ehrenfreund, M. (2015, March). Finland's New Plan to Change School means Combining Subjects. The Washington Post. Retrieved from https://www.washingtonpost.com/news/work/wp/2015/03/24/finlands-radical-new-plan-to-change-school-means-an-end-to-math-and-history-class/?utm_term=.83e38525b50c.
59. Ito, Mizuko (2013) Hanging Out, Messing Around, and Geeking Out: Kids Living and Learning with New Media. Cambridge, MA: The MIT Press.
60. Sroufe, A. & Siegel, D. (2011). The Verdict Is In: The Case for Attachment Theory. Psychotherapy Networker. Retrieved from <https://www2.psychotherapynetworker.org/magazine/recentissues/1271-the-verdict-is-in>.
61. Layard, R., Clark, A.E., Cornaglia, F., Powdthavee, N. & Vernoit, J. (2014) What Predicts a Successful Life? A Life-Course Model of Well-being. The Economic Journal, 124(1), 720-738. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1111/eoj.12170/full>.
62. The Riley Institute. Workforce Skills. Retrieved from <https://riley.furman.edu/education/projects/white-riley-peterson-policy-fellowship/workforce-skills>.
63. Schwartz, K. (2016, October). Why A School's Master Schedule is a Powerful Enabler of Change. KQED News. Retrieved from <https://www.kqed.org/mindshift/2016/10/24/why-a-schools-master-schedule-is-a-powerful-enabler-of-change>.
64. This is Finland. The Truth About Finnish Schools. This is Finland. Retrieved from <https://finland.fi/life-society/the-truth-about-finnish-schools>.
65. Hoffman, R., & Casnocha, B. (2012). The Start Up of You. New York: Crown Business.
66. Ashoka Changemaker Schools. <https://www.ashoka.org/en/program/changemaker-schools>.
67. Casel. Retrieved from <http://www.casel.org>.
68. Center for Curriculum Redesign. Retrieved from <http://curriculumredesign.org>.
69. Connecting Credentials. (2016, August). Retrieved from <http://skilledwork.org/projects/connecting-credentials-national-campaign>.
70. Deeper Learning. Retrieved from <http://deeperlearning4all.org>.
71. Framework for 21st Century Learning. Retrieved from <http://www.p21.org/our-work/p21-framework>.
72. The Readiness Project: An Introduction. (2015). Retrieved from <http://sparkaction.org/content/about-readiness-project>.
73. National College and Career Readiness Indicators: About Us. Retrieved from <https://www.redefiningready.org>.
74. Yale Center for Emotional Intelligence. Retrieved from <http://ei.yale.edu>.
75. Schwab, K. (2016). The Fourth Industrial Revolution. Geneva, Switzerland: World Economic Forum.
76. Calder, J., Croasmum, B., Grim, T., Justman, M., Kent, C., & Nauth, K. (2016). The Futures of Work. The Foresight Alliance. Retrieved from <http://www.foresightalliance.com/futures-of-work/>.
77. Markoff, J. (2015). Machines of Loving Grace: The Quest for Common Ground Between Humans and Robots. New York, NY: Ecco, an imprint of HarperCollinsPublishers.
78. Brynjolfsson, E., McAfee, A., (2014). The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Machines. New York, NY: W.W. Norton and Company.
79. Fadel, C., Bialik, M., & Trilling, B. (2015). Four-Dimensional Education: The Competencies Learners Need to Succeed. Boston, MA: Center for Curriculum Redesign.
80. Jassal, P., Clark, H., (2016). The New Learning Economy and the Rise of the Working Learner. ACT Foundation. Retrieved from <http://actfdn.org/new-learning-economy-rise-working-learner>.
81. Latham, B., Lenz, B., & Vander Ark, T. (2016, August). Preparing Students for a Project-Based World. Getting Smart. Retrieved from <http://www.gettingsmart.com/publication/preparing-students-project-based-world>.
82. Krauss, S., Pittman, K., & Jonson, C. (2016). Ready by Design: The Science (and Art) of Readiness. The Forum for Youth Investment. Retrieved from <http://sparkaction.org/readiness/science-paper> <http://sparkaction.org/readiness/science-paper>. Chicago, IL: The University of Chicago Consortium on Chicago School Research.
83. Heller, R., Wolfe, R. E., & Steinberg, A. (2017) Rethinking Readiness: Deeper Learning for College, Work, and Life. Cambridge, MA: Harvard Education Publishing Group.
84. Nagaoka, J, Farrington, C. A., Ehrlich S. B., Heath R.D., Johnson D.W., Dickson S., Turner A.C., Mayo A, and Hayes K. (2015, June) Foundations for Young Adult Success: A Developmental Framework.
85. Swanson, J. (2015). Certifying Skills and Knowledge: Four Scenarios on the Future of Credentials. KnowledgeWorks. Retrieved from <http://www.knowledgeworks.org/certifying-skills-and-knowledge-four-scenarios-future-credentials>.
86. Prince, K., Saveri, A., & Swanson, J. (2015). The Future of Learning: Education in the Era of Partners in Code. KnowledgeWorks. Retrieved from <http://www.knowledgeworks.org/future-learning/forecast>.



KnowledgeWorks is a nonprofit organization dedicated to advancing personalized learning that empowers every child to take ownership of their success. With nearly 20 years of experience exploring the future of learning, growing educator impact and working with state and federal policymakers, our passionate team partners with schools and communities to grow a system-wide approach to sustain student-centered practices so that every child graduates ready for what's next.

Learn more at KnowledgeWorks.org.

© 2017 KnowledgeWorks Foundation. All rights reserved.