PHILLIP BROWN AND EWART KEEP

Rethinking the Race Between
Education & Technology

Experts differ widely in their predictions about how technological innovation will change the labor market, but they all see a need for changes in education.

Technological innovation is changing the nature of many jobs and the qualifications employers seek in their workers, convincing more young people to pursue a college education and other postsecondary credentials—at least according to the conventional wisdom among public policy experts. This view of skill-biased technological change has been described as a race between education and technology. The Harvard economists Claudia Goldin and Lawrence Katz explain rising income inequality in the United States as a result of the education system failing to keep pace with technological innovation and the rising demand for higher-level skills. This analysis resonates well with the idea of a burgeoning knowledge economy and has helped fuel the global expansion of higher education.

Recent media headlines, however, proclaim a new phase of technological innovation, variously described as the fourth industrial revolution, the second machine age, the digital economy, or the platform economy, in which digital innovation will introduce a more pervasive and more fundamental transformation in the nature of work. The ensuing economic disruption raises important issues about the future relationship between education and technology. The prospect of widespread technological unemployment highlights a different relationship between education and technology than that offered by Goldin and Katz. In this scenario, automation and artificial intelligence (AI) advance so quickly that they reduce the need for many types of human labor and make it difficult even for those with advanced education to find a job.

Expectations about how digital innovation will develop will inevitably influence views on what educational and economic policies are needed to prepare for the future.

Opinions on the expected future direction of the labor market fall into three broad perspectives: labor scarcity, job scarcity, and the end of work. These theories reflect differences in both theoretical orientation and research design. For example, some people concentrate on the scale of technological unemployment, whereas others focus on changes at the workplace or new ways of working in the gig, platform, or internet economy. Although it is sometimes difficult to draw clear distinctions between these theories because the boundaries are somewhat fuzzy, it is still useful to consider the ways in which the overall thrust of these theories affects the policy choices that will be made.

Labor scarcity

If the nation is anticipating a growing need for workers with advanced skills, then education is at the heart of economic and social policy. Supporters of this scenario expect that as in the past, new positions and professions will emerge and create new jobs to replace any eliminated by new technology. Although there may be a challenging period of transition, especially for those displaced by automation, technological innovation will require new skills and create employment opportunities. Employers will be willing to pay a wage premium to those people who have the newly needed skills. This theory also maintains the view that the wage labor system is the most efficient and fair way of distributing job opportunities and wages. Investment in skills and certified knowledge remains the key source of individual opportunity, social mobility, and economic welfare.

Theorists subscribing to a labor scarcity view do not all agree on the expected scale or impact of digital innovation on skills and the labor market. Some of them, including David

SOUGWEN CHUNG *Omnia per Omnia*, 2018; Performance, Mana Contemporary, New Jersey

Sougwen Chung

Multimedia artist Sougwen Chung has been collaborating with robots since 2015, exploring the connections between handmade and machine-made designs as a way to understand the relationship between humans and computers. Her multifaceted artistic practice also includes filmmaking, painting, sculpture, installation, and performance.

Chung's 2018 piece *Omnia per Omnia* reimagines the tradition of landscape painting as a collaboration between herself, a team of robots, and the dynamic flow of New York City. The work explores the poetics of various modes of sensing: human and machine, organic and synthetic, and improvisational and computational. In another series, *Drawing with DOUG* (Drawing Operations Unit Generation), she engages in improvisational drawing performances with a robotic arm she named DOUG. In its first iteration, DOUG could move, see, and follow her gestures. In subsequent versions, DOUG could also remember and reflect on what it and others had drawn. Through her collaborative drawing performances with custom-designed robots, Chung is exploring the potential of machines to be artistic collaborators and ways for artists to participate in the rapidly developing field of machine learning.

Chung, a Chinese Canadian artist and researcher based in New York City, is an artist-in-residence at Google and the New Museum's cultural incubator, New Inc., and a former research fellow at MIT Media Lab. In 2017, she was one of three artists selected to participate in a new partnership between Nokia Bell Labs and NEW Inc. to support artists working with emerging technologies such as robotics, machine learning, and biometrics.

Autor, an oft-cited economist at the Massachusetts Institute of Technology (MIT), suggest that claims of widespread technological unemployment are exaggerated, pointing to periodic warnings over the past two centuries, including the Luddite movement of the early nineteenth century. He predicts that middle-skill jobs, combining specific vocational skills with foundational middle-skill levels of literacy, numeracy, adaptability, problem solving, and common sense, will not be hollowed out as others have predicted.

This conclusion stands in stark contrast to Oxford University's Carl Benedikt Frey and Michael Osborne, who claim that 47% of US jobs could be at risk of computerization. They suggest that jobs in transportation and logistics, office administration, and production are particularly at risk. They predict that for the immediate future computerization will be confined largely to low-skill and low-wage occupations. Convinced that technology is racing ahead, they highlight the need for low-skill workers to relocate to tasks requiring creative and social intelligence, which computers can't yet automate.

Erik Brynjolfsson and Andrew McAfee of MIT also believe there's never been a worse time to be a worker with only ordinary or average skills and abilities to offer because AI, robots, and advanced computing are "acquiring these skills and abilities at an extraordinary rate." But at the same time, the future looks bright for those with special skills or the right education, as they can use technology to create and capture value.

The labor scarcity approach also resonates with much of the literature on the gig or sharing economy, which observes that the restructuring of work leads people to work in multiple contexts, breaking established models of employment and career development. This view highlights the need to acquire new skills because more people will have an opportunity to use their skills, knowledge, and talent to earn a living, even if they do it outside the conventional model of organizational success.

What makes these arguments consistent is the idea of a race between technology and education to develop more advanced skills if people are to remain employable in tomorrow's labor market. The fundamental challenge remains the reform of education systems to prepare the future workforce to take advantage of new opportunities emerging within a technologically advanced economy. Klaus Schwab, founder of the World Economic Forum, suggests that what we mean by "high skill" is likely to change as it can no longer be limited to holding a degree or having a specific set of professional capabilities. People will need to adapt continuously and learn new skills and approaches within a variety of contexts.

In a widely cited study of skill content related to technological change, David Autor, Frank Levy, and Richard J. Murnane focus on tasks computers are likely to be able to perform and those where human skills remain important. They question Frey and Osborne's prediction of widespread job losses, because computerization typically leads to the redesign rather than elimination of jobs. In line with earlier accounts of skill-biased technological change, they argue that computers are most likely to replace routine manual and cognitive tasks, leaving human labor to focus on nonroutine cognitive tasks.

This interpretation of the relationship between technology and education has led to renewed calls to achieve a more detailed understanding of the changing needs of industry to ensure that education and training systems deliver the skills required in today's labor market. It has also bolstered calls for additional investment in science, technology, engineering, and mathematics (STEM) subjects, on the assumption that digital innovation will mirror past industrial revolutions and be characterized by an increasing demand for higher technical skills and expert knowledge. However, there is a growing realization that rapid advances in AI may have significant implications for the future demand for nonroutine cognitive skills, requiring a greater educational focus on individual agility, creativity, and lifelong learning.

There is already evidence that supports the view that job content and skills needs are changing due to digitalization. Research in Australia indicates that the time spent by workers on physical and routine tasks each week has declined by two hours over the past 15 years, mainly as workers have switched to other tasks within the same job and machines have taken over repetitive routine work. The same research also predicts that by 2030, Australian employees will spend an average of another two hours a week less on routine and manual tasks, and more time on creative and interpersonal tasks. The current trends in employability skills demanded by Australian employers in internet job postings suggests that organizations more frequently mention communication skills, followed by organization and planning, with teamwork, problem-solving, and digital skills also being mentioned.

The problem with these kinds of lists is that each individual item on them, such as communication skills, is vaguely specified and will mean different things in different organizations and workplaces. What might be seen as creativity in one retail store (e.g., shop-floor staff rearranging the way goods are displayed) may be seen as a disciplinary matter in another, where only headquarters staff determine how to display goods. This creates a challenge for education and training providers who must translate employer demands into learning opportunities.

In terms of the new digital skills, the Digital Skills Partnership in the United Kingdom, led by the Lloyds Banking Group and the Tech Partnership, has created an Essential Digital Skills Framework for use as a tool for working with adult workers to enhance their essential digital skills. The framework identifies five areas for life and work:

SOUGWEN CHUNG *dwell study (40.695045, -73.972466)*; Acrylic on canvas, 48 in x 48 in

- Communicating—in order to communicate, collaborate, and share online.
- Handling information and content—find, manage, and store digital content securely.
- Transacting—apply for services, buy and sell, and manage transactions online.
- Problem solving—find solutions to problems using digital tools and online services.
- Being safe and legal online.

Unfortunately, the capacity of many national education and training systems to respond to these challenges may be limited, particularly in countries where lifelong learning is not well established and where funding for learning is front-loaded toward an initial burst of such efforts during childhood and early adulthood, with the assumption that relatively limited reskilling or upskilling will be required later in working life. A race between education and technology assumes that education will have the resources (staff, funding,

pedagogic techniques, curriculum, and assessment system) to support responses to or anticipation of the effects of technological change. Moreover, although it is easy to specify the skills required to fill perceived skill gaps resulting from technological innovation, in many nations a large proportion of the youth cohort fail to acquire basic functionality in math and their native language that is also necessary.

The educational challenges posed by digitalization and resultant changes to work-related skill needs also have a familiar ring to them, particularly across the Anglo-Saxon world. They include lack of adequately qualified teachers and instructors; lack of appropriate workplace equipment and the ability to simulate workplace environments; lack of a curriculum and assessment regime that is attractive to students and that can reflect leading-edge workplace practice; and problems with patterns of student choice that do not favor, at least in sufficient numbers, STEM and computer-related courses. In other words, the problems and challenges will be familiar, and the history of their persistence over long periods suggests that their causes are deep-seated and relatively intractable. Digitalization and its effects on work may simply exacerbate preexisting weaknesses.

One response that has been made by commentators and policy-makers is that the traditional model of employers demanding "plug and play" employees, pretrained by traditional schools to be job ready to meet their organization's needs, is increasingly at variance with reality. Employers need to consider adopting an "invest and build" model in which they provide much more worker training. The World Economic Forum argues that "businesses will need to put talent development and future workforce strategy front and center to their growth. Firms can no longer be passive consumers of ready-made human capital. They require a new mindset to meet their talent needs and to optimize social outcomes." How easy it will be to persuade firms to adopt this new mindset is an open question.

Job scarcity

The literature that can be categorized under labor scarcity includes work by writers and researchers with divergent views on the impact of automation on existing and future levels of employment, but similar views on the supply-side solutions. Despite reference to changing skill requirements, occupational restructuring, and labor market disruption, the labor scarcity approach retains a largely optimistic outlook for new areas of jobs growth and skills upgrading, consistent with established theories of human capital and skill-biased technological change. It claims that there will be an increasing demand for high-skill workers and a reduction in demand for lower-skill workers as more routine jobs are automated and people retrain for more-skilled jobs. But it becomes more important to develop digital and other skills that complement, rather than compete with, robots and smart machines.

The job scarcity view recognizes that new technologies may enhance the skills of a relatively small proportion of the workforce, but the general direction of technological innovation is toward the redesign of existing jobs, where much of the knowledge content is captured in software that permits a high level of standardization and potential to deskill or automate a wide range of occupations, including technical, professional, and managerial roles. Job scarcity points to a significant mismatch between an expanding supply of educated and skilled workers and a scarcity of high-quality job opportunities, primarily resulting from the routinization and segmentation of job roles rather than technological unemployment.

It rejects the technological determinism associated with theories of skill-biased technological change. Proponents of this view argue that technology is not destiny but that firms deploy technologies in ways that sustain profitability as well as proprietary rights of owners, shareholders, and senior executives. This view is consistent with the political economist Joseph Schumpeter's characterization of capitalism as being in a state of "constant commotion" in the search for new markets, business practices, and productive use of labor. From this perspective, what is important about the digital revolution is that it has given company managers and executives new powers of control and command.

Labor and Monopoly Capital, the classic study by the American political economist Harry Braverman, argued that firms use technologies to enhance the power and control of business owners through a process of deskilling. He expressed skepticism about terms such as skill, training, and education, which he regarded as vague, making it difficult to assess claims of increasing skills upgrading over time. He questioned the assumption that the demand for educated labor will reflect the level of scientific and technological complexity within the economy because employers have considerable discretion over how technological innovation will influence job design. As he observed, "the more science is incorporated into the labor process, the less the worker understands of the process."

Writing in an era of US mass production, Braverman focused on production workers and clearly underestimated how technology might affect professional, managerial, and technical employment in the latter decades of the twentieth century. But he would not be surprised to see senior management apply the same strategy for these employees that is applied to production workers.

In *The Global Auction: The Broken Promises of Education, Jobs, and Incomes*, one of us (Phillip Brown) and colleagues argue that the twentieth century witnessed the widespread use of "mechanical Taylorism," where the knowledge of craft workers was captured by management, codified, and reengineered in the shape of the moving assembly line,

resulting in a clear divide between a semi-skilled workforce and the managers and professionals who controlled all aspect of factory life. Today, the same processes of knowledge capture are being applied to middle- and high-skill employees in the service sector. The book argues that the twenty-first century is an age of "digital Taylorism." Knowledge work is translated into routine work through the extraction, codification, and digitalization of knowledge into software prescripts and templates that can be fully automated or used by a small number of relatively low-skill workers.

A major implication of the job scarcity approach is its rejection of the labor scarcity view of a linear shift from low- to high-skill work. It highlights the restratification or segmentation of knowledge work to reduce the number of "developer" jobs that allow for any autonomy or creativity. Workers for this smaller number of executive, research, and managerial positions will typically be recruited from global elite universities.

Developer roles are distinct from "demonstrator" roles, in which people are employed to implement or execute existing knowledge, procedures, or managerial protocols. They include tasks performed by consultants, managers, teachers, nurses, and technicians, but delivered through digital software. Although well-qualified people can be employed in demonstrator roles, they have less opportunity to think outside the digital box of expert systems. However, this does not always eliminate the need for good customer-facing skills because even when customers are receiving a highly standardized service, they still want to feel that they are receiving a personalized service. This may contribute to a continuing demand for university graduates, but these jobs will likely be far removed from the archetypal graduate jobs of the past.

In turn, demonstrator roles are also distinct from "drone roles" that offer little discretion to employees, although a good level of literacy, numeracy, and teamwork skills are often required. Much of the work is digitally controlled and includes back-office functions such as data entry jobs or customer contact roles in call centers, where virtually everything is prescribed or scripted in software packages. Because they can be standardized and digitalized, these jobs are highly mobile. They are often filled by well-qualified workers; in developing countries the salaries are attractive, and in developed countries they might at least look like the type of job an educated person is looking for. A risk of these jobs is that as voice recognition and AI technology continue to improve, they are in danger of elimination.

Society has become familiar with the automation of manufacturing jobs, but technological displacement of white collar workers is new and potentially even more disruptive. Simon Head, the author of *Mindless: Why Smarter Machines are Making Dumber Humans*, suggests that many of those in professional and managerial jobs are part of a new working class that includes "physicians as well as call-center agents; teachers, academics, and publishers as well as 'associates' at Walmart and Amazon; bank loan officers and middle managers as well as fast food workers."

Richard Susskind and Daniel Susskind, the authors of *The Future of the Professions: How Technology Will Transform the Work of Human Experts*, have a very different perspective, viewing this trend as the liberation of the professions. They applaud the breaking of the monopoly of professional practices as expert knowledge becomes more widely accessible through new modes of digital communication and as machines become smarter. Nevertheless, their take is consistent with a job scarcity view because they acknowledge that "more and more tasks that once required human beings are being performed more productively, cheaply, easily, quickly, and to a higher standard by a range of systems. And there is no apparent finishing-line."

Some writers have also pointed to the ways in which digital technologies have been used to develop standardized hiring platforms that enable employers to create an "on demand" labor market to hire skilled workers for short-term assignments that lack job security or employment rights, let alone skills training or career progression. The platform operators are able to capture valuable knowledge such as customer information and to control billing, marketing, and business development.

The potential educational responses to this scenario are complex. What is clear is that if competition for the remaining layer of good jobs does further intensify, then education is at the center of this contest. The arms race of educational achievement (among individuals, social classes, and nations) will escalate. If education and credentials form the initial sorting mechanism for assignment to developer, demonstrator, and drone work, then an even clearer and potentially steeper hierarchy of educational institutions to feed these different strata of employment may loom. If the gaps in status and remuneration between these roles grow wider, the distinctions among educational providers and courses of study will also grow more stark, and the competition for places in elite institutions could become even more intense.

A logical corollary to this trend is that achievement in childhood would be even more liable to lock individuals into sharply differentiated career pathways, with opportunities to achieve substantial upward career shifts later in life further reduced. Prospects for social mobility would fall far short of what most people desire. There would be less incentive for governments to level the playing field on grounds of economic efficiency, but thorny question of social justice would loom ever larger.

Another focus for concern will be who pays for learning beyond the initial phase. There is already mounting evidence in both the United States and the United Kingdom that many

employers are scaling back the intensity of their efforts to upskill or reskill their workforce, limiting their efforts to a small number of employees viewed as high-potential talent and destined for developer roles. For those in demonstrator roles, and even more for those in drone roles, the likely prospect is that either they or the state will have to fund retraining, and many countries lack the mechanisms to support this task.

End of work

The end of work thesis found early expression in the work of John Maynard Keynes, who foresaw a risk of widespread technological unemployment. The current adherents of this position welcome the development as a means of transforming the labor market foundations of capitalism. They herald a postcapitalist era that will transform education, human labor, and the distribution of resources, including income and wealth. Writers such as Jeremy Rifkin see no need to make people more employable in this tech-enabled future because society will have reached what economists call the "optimum general welfare," where the marginal cost of producing additional products and services is zero.

To put this differently, it means that the profits typically made by those involved in delivering a college course, publishing a book, or making products are eliminated because of the declining cost of communicating, manufacturing, and selling. Rifkin suggests that over a third of the world's people are already producing their own information on relatively cheap smartphones and computers and that they can share it via video, audio, and text at near zero marginal cost. Likewise, Paul Mason, the author of *Postcapitalism: A Guide to Our Future*, concludes that "the real danger inherent in robotization is something bigger than mass unemployment, it is the exhaustion of capitalism's 250-year-old tendency to create new markets where old ones are worn out."

The point these authors and others are making is that the means of production are becoming cheaper because "information" is a positive sum good that is not used up in the same way as a physical product. New technologies have reduced the cost of communicating and advanced computing so that anyone with access to the internet can plug into a world of information. As the scope increases at the same time as costs decline, there is the potential for more social activities blurring the distinction between market and nonmarket activities.

Given this view of the future of work, it is no longer credible to argue that productivity creates more jobs than it replaces because "much of the productive economic activity of society is going to be increasingly placed in the 'hands' of intelligent technology, supervised by small groups of highly skilled professional and technical workers," according to Rifkin. In the same vein he claims that advances in machine intelligence, robotics, and advanced analytics can liberate

hundreds of millions of people from work in the market economy in the next 20 to 30 years.

Such a radical transformation of the occupational structure would render redundant the market distinction between labor supply and demand, between employers and employees, and between sellers and consumers. Paul Mason suggests that this will require people to participate in the creation of value in all areas of life, not just in the workplace. Individual value creation will be lifelong, giving rise to a new kind of person, networked in multiple ways and with multiple economic personalities. Rifkin calls these people "prosumers," who produce, consume, and share their own goods and services with each other as a result of new ways of organizing economic life.

Echoing Keynes's essay "The Economic Possibilities for Our Grandchildren," Rifkin raises the ultimate question of what the human race is going to do with itself if mass employment disappears from economic life. He argues that as tens of millions of workers are already been replaced by intelligent technologies, this question is now being seriously raised for the first time in intellectual circles and public policy debates.

It would represent a profound dislocation for the education and training system, particularly in countries such as the United States and the United Kingdom, where for the past three decades or more the focus has been on the role of education in equipping individuals to perform effectively in a changing labor market, matching education provision to the perceived needs of employers. If paid employment, at least in the traditional sense, vanished or became necessary for only a minority of people, the entire raison d'etre of modern mass education, particularly mass higher education, would be called into question.

If there is no fundamental economic justification for educational investment, it is likely that the education system will become more political, in the sense that it will come to reflect how nations define the meaning of citizenship. The aim would be to help people gain the skills to live fulfilling lives, with the judgment and knowledge to be capable of addressing the complex problems that humanity will face as lifelong prosumers.

It would also have profound implications for the selective role of education as it poses the questions of selection to what and selection for what. In a completely transformed labor market, academic credentials would have a very different meaning. If the straightjacket of competitive assessment slackened, it would significantly free the education system to experiment in pedagogical approach and curriculum design, and would dramatically change the work of teachers and college professors.

Under the end-of-work view, wider social, cultural, and citizenship goals of learning would presumably inform the education of prosumers. This is likely to include skills such

as learning to learn, communications, problem solving; and teamwork, with an emphasis on individual growth over the life course, rather than as a way of enhancing individual employability. If collective endeavor and social skills are going to rise in importance, then their development needs to start early and be supported in the secondary and tertiary phases by appropriate curriculum approaches, pedagogies, and methods of assessment. This will be a major challenge for education systems that favor traditional, individualized, regimented approaches to the organization and delivery of learning.

Choosing a path

The existence of three divergent views of the future of work reflects lack of consensus in research evidence. The disparity emerges not only from differences in research design but also from different contextual assumptions. The reality is that the same technological innovations can result in different outcomes depending on the extent to which companies and countries adopt practices and policies that aim to enrich jobs rather than maximize managerial control.

Indeed, much of the literature on the potential impact of digital technology indulges in forms of technological determinism, whereby technology is assumed to be an unstoppable force of nature that inherently shapes and drives change. New technology adoption is assumed to lead to inescapable effects on employment levels, work organization, job design, and skill needs. If that is true, then employment and skills policies can only react to, and seek to ameliorate if need be, whatever inevitable effects technology will wreak upon work and the requirement for employment-related skills.

Although some countries appear to be developing policy responses that echo this thinking, others, such as Germany, are acting on the belief that technology is not destiny and that government can and should seek to shape the way that digital technology is deployed. The German government's *Work 4.0* report argues that part of the response to digitalization needs to be an extension and strengthening of collective bargaining and worker codetermination arrangements in order to ensure that employees have a say in how technology is rolled out. Policies such as those recommended in the report are among the contextual factors that will influence the impact of digital innovation in education and the workplace.

All three theories acknowledge rapid technological change, even if there is disagreement about its impact on labor demand and job quality. They all acknowledge the need for digital skills and an even greater focus on social skills. These skills are seen to be more important because people will need to be flexible and adaptable within rapidly changing labor markets and work contexts. Moreover, although the technical and knowledge requirements of what people do for a living may change, the social context in which people interact, network, and produce will remain, and social skills are more difficult for smart machines to develop.

Finally, all three theories see a future role for education in the training of occupational elites. However, those subscribing to a skill scarcity view assume that high-level skills will be required by a large proportion of the workforce to stay ahead of the march of the robots, whereas the other two theories emphasize limited opportunities for high-skill jobs that allow for autonomy and creativity. Nevertheless, all three theories see a need for educational reform and a greater focus on lifelong learning. Where they differ is in the extent to which they see reform leading to a larger high-skill workforce and a more competitive meritocratic education system.

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Recommended reading

David Autor, "Why Are There Still So Many Jobs? The History and Future of Workplace Automation," *Journal of Economic Perspectives* 29, no. 3 (2015): 3-30.

David H. Autor, Frank Levy and Richard J. Murnane, "The Skill Content of Recent Technological Change: An Empirical Exploration," *The Quarterly Journal of Economics* 118, no. 4 (2003): 1279-1333.

Harry Braverman, *Labor and Monopoly Capitalism: The Degradation of Work in the Twentieth Century* (New York, NY: Monthly Review Press, 1974).

Phillip Brown, Hugh Lauder, and Sen Yi Chung, *The Death of Human Capital?* (New York, NY: Oxford University Press, forthcoming).

Erik Brynjolfsson and Andrew McAfee, *The Second Machine Age: Work, Progress and Prosperity in a Time of Brilliant Technologies* (New York, NY: W.W. Norton, 2014).

Carl Benedikt Frey and Michael Osborne, "The Future of Employment: How Susceptible Are Jobs to Computerisation?" Oxford Martin School (2013).

Claudia Goldin and Lawrence Katz, *The Race Between Education and Technology* (Cambridge, MA: Belknap/Harvard University Press, 2008).

Simon Head, *Mindless: Why Smarter Machines Are Making Dumber Humans* (New York, NY: Basic Books, 2014).

Klaus Schwab, *The Fourth Industrial Revolution* (Geneva, Switzerland: World Economic Forum, 2016).

Richard Susskind and Daniel Susskind, *The Future of the Professions: How Technology Will Transform the Work of Human Experts* (Oxford, UK: Oxford University Press, 2015).