

Foresight
Alliance

with support from
THE
ROCKEFELLER
FOUNDATION

The Futures of Work
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Foresight Alliance LLC
1424 F Street NE
Washington, DC 20002
(202) 525-7193
www.ForesightAlliance.com

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- Gillian Dowie, Youth Employment Associate Expert, ILO, Indonesia
- Ekkehard Ernst, Chief, Employment Trends Unit, ILO, Switzerland
- Garry Golden, Futurist and President, Forward Elements Inc., New York, United States
- Tanja Hichert, Futurist and CEO, Hichert & Associates, Cape Town, South Africa
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- Aida Kiangi, Business Manager, Windlab, Tanzania
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Foreword from The Rockefeller Foundation

A new robot with artificial intelligence can do the same work as a semi-skilled factory worker for the equivalent of about four dollars per hour ([see page 42](#)).

Three-fourths of workers in Asia and Africa who are over age 60 cite agricultural work as their main source of income, yet young, rural people are migrating to cities en masse ([see page 72](#)).

Some forecast that 40 percent of the workforce in the United States—nearly 60 million workers—will be freelance by 2020 ([see page 10](#)).

These are just a few of the major transformations that are taking place in the global economy, fundamentally altering the way that the world generates value and opportunity. These changes create both challenges and new openings for building more inclusive economies, one of our goals at The Rockefeller Foundation.

The Foundation has [supported the development of green jobs](#), [collaborated with corporations and nonprofits to identify innovations that could increase the employment of opportunity youth](#), and, most recently, [launched a campaign to support Americans in defining good jobs for themselves](#). What underpins all of this work is a belief in the importance of having a deep understanding of the contexts in which we work, a strong evidence base, and a future-oriented view. We aimed to advance these three values by supporting Foresight Alliance's review of diverse, future-oriented research that explores how work is changing.

There are a tremendous number of studies, forecasts, and scenarios about the future of work, but many do not focus on the potential implications for lower-income, marginalized, or otherwise vulnerable people. Foresight Alliance's cataloguing of scenarios in this report aims to help address that gap, by unpacking the potential effects for the poor, even from research that isn't explicitly focused on that population.

We hope that you consider the Foresight Alliance report a resource to you and a starting point for dialogue with us. How is your organization thinking about the future of work? How are you trying to build a more inclusive economy?

Best regards,

Claudia Juech, Associate Vice President and Managing Director for Strategic Insights
Rachel Korberg, Senior Associate, Strategic Insights

Introduction

Recognizing that jobs and livelihoods are being transformed in every region, this report presents an overview and evaluation of thinking about the future of work. We have put special emphasis on the implications for poor and/or otherwise vulnerable populations and studied scenarios for the next 15–20 years, with a concentration on Africa, South and Southeast Asia, and the United States.

The objective of this review is to evaluate documented trends and scenarios, and to explore their possible longer-term implications through foresight methodologies. The audience for this report is the philanthropic and development sectors—although the report can also stimulate thinking and discussion in the public and private sectors about effective strategies, policies, programs, and actions to equip individuals to attain secure livelihoods.

Foresight Alliance LLC conducted this work with the support of The Rockefeller Foundation.

Why is it imperative to explore the future of work?

Anticipating the future of work is essential to meeting current and future economic and social challenges.

- **Secure livelihoods are key.** Secure livelihoods are central to the wellbeing of individuals, families, communities, and societies.
- **Work is changing profoundly.** Work is undergoing fundamental changes in all economic sectors, geographies, and stages of national development.
- **The path to a secure livelihood is changing.** These changes in work will impact the pathway to sustainable livelihoods for the poor and vulnerable, as well as the interventions that are most effective to support them along that pathway.
- **Foresight thinking can offer a fresh point of view.** Foresight thinking—the systematic study of various ways the future may plausibly unfold—is a useful tool for organizing and interpreting the wealth of data and insights on the future of work that are arising from the fields of economics, development, business, and government.
- **Anticipation is key.** Most of the social and economic forces that are reshaping work operate on relatively long timescales—as do many of the available interventions to drive change.

Focus of the report

Summarizing, evaluating, and building on the many existing ideas about the global future of work is a challenging, even daunting undertaking. Key judgments were required to focus the report on the most important questions.

- **Poor and vulnerable focus.** For purposes of this work, “vulnerable” refers to individuals or groups more likely than the general population to have difficulty sustaining a stable, secure livelihood. Vulnerable populations may include women, individuals with little or no formal

education, individuals with few marketable job skills, ethnic and religious minorities, older workers, forced and child laborers, individuals who identify as LGBTQI, individuals with physical disabilities, individuals with chronic illnesses (e.g., HIV), and individuals who have spent time in prison.

- **Global focus.** With the guidance of The Rockefeller Foundation, the report covers the future of work globally with special focus on three geographies: sub-Saharan Africa, Asia, and the United States.
- **15- to 20-year timeframe.** The timeframe of interest in this research extends out two decades, to the 2030s. While the study is rigorously grounded in an understanding of the present, as well as historical perspectives, it explores the implications of how the present situation may change over the next one to two decades.

Foresight framework

This research applies a foresight point of view to explore the future of work. Broadly, this means that the report seeks to summarize and explore today's most prominent or important analyses of the future of work. It describes how each scenario may unfold and what actions have been recommended to prepare for various possible futures. It seeks to evaluate these postulated futures and their potential interactions for fresh insights.

Primary research consisted of approximately 30 interviews with experts in 16 countries, including seven in Africa and three each in South Asia and Southeast Asia. Extensive secondary research identified more than 600 literature sources. The project took a multi-stage approach that provided a framework to identify potential systemic changes in the world of work over a 15- to 20-year time horizon. It was executed using foresight best practices, including a search for weak signals of impending change; a broad, holistic overview of multiple issues; an explicit recognition that there are always multiple possible future outcomes; and attention to the connections and mutual influences among those possible futures.

In this report, individual ideas about the future of work are referred to as “scenarios.” These scenarios represent at least three types of futures thinking:

- Some scenarios describe an observer's *explicit forecast* of a future state. Such scenarios may be referred to as “forecasts” in the report.
- Other scenarios describe an observer's *preferred future*, stated as a desired future state or goal. Futurists often call such a scenario a “normative” or “aspirational” future.
- Still other scenarios aren't stated explicitly. Rather, these scenarios are implicit in the way the observer describes current trends and events. *Implicit scenarios* often assume that the future will be defined by continuation of present trends.

The report also identifies significant gaps in the current literature, where forecasts are lacking or key questions have not been addressed.

Scenarios that address a particular aspect of work are clustered together into scenario groups. Each chapter addresses an important dimension of the future of work and includes two scenario groups.

It is important to note that all of the scenarios described here—as well as the overall scenario groups—may be compatible, partly compatible, or mutually contradictory. For each aspect of work explored, the report does not attempt to resolve all contradictions within or between scenario groups, given the understanding that there is always more than one possible future.

Overview of the report

Important ongoing changes in the way work is structured, distributed, and carried out have the potential to make some workers more vulnerable, while providing other workers with opportunities to improve their circumstances. While these changes may be most evident today in higher-income countries, they will alter the path to secure livelihoods for workers globally.

Chapter 1. Flexible Work, Freelance Workers looks at the ongoing drive for workforce flexibility and the emergence of the “freelance economy.” **Chapter 2. Automated Work** considers the impact of software and robotics, which have the potential to eliminate some jobs, complement human workers in other jobs, and create entirely new jobs—thus generating a great deal of displacement and turmoil in global employment. Over the next two decades, negative consequences of automation are likely to fall hardest on the poor and vulnerable.

In lower-income countries a large number of workers—often the majority—are employed in informal agricultural work. Many suffer from chronically insecure livelihoods. For decades, many mainstream economists argued that the most viable pathway to a secure livelihood for agricultural workers has been to shift to an industrial job, usually while relocating to an urban center. But going forward, a confluence of large forces—work restructuring, workplace automation, and driving forces such as globalization, urbanization, economic inequality, and a glut of available workers—is reshaping the pathways to secure livelihoods in lower-income nations, in ways that are not yet fully recognized—or even fully possible to envision. These forces will produce disruption and both risks and opportunities for the poor and vulnerable.

Chapter 3. Emerging Work looks at how these forces will change two important aspects of secure livelihoods in lower-income countries: rural work and manufacturing work.

Finally, economists and others have begun to consider whether new economic approaches may better balance growth and economic inclusiveness, with positive impacts for the world of work.

Chapter 4. Transforming Work considers how structural changes, from restructuring jobs to income guarantees, could transform the world of work. And **Chapter 5. Report Conclusions** revisits the big story of the future of work, identifying big ideas and key implications, reviewing the unique perspective offered by foresight best practices, and offering suggestions for next steps to explore this crucial topic.

Driving forces for the future of work

A combination of economic, technological, and demographic and other social forces is poised to dramatically alter the path to secure livelihoods. For each scenario in the report, the “scenario summary” chart provides a short list of key driving forces propelling the changes anticipated in that scenario. The following is a full list of the pervasive driving forces that will impact the future of work.

Driving forces for the future of work

- **Aging.** In higher-income countries, many workforces are shrinking as populations age. In lower-income countries, rural populations have growing shares of elders. These aging populations will be less able to work, and in need of support.
- **Automation.** Automation of manufacturing, agriculture, and service jobs via software and robotics threatens to take jobs away from workers and demands more specialized skills.
- **Big data.** The analysis of massive datasets will increasingly impact hiring—through improved demand-forecasting, data-driven job allocation, and deeper knowledge of the workforce.
- **Complex manufacturing economics.** Rising global wages are just one factor among many that are driving shifts in the location of manufacturing operations.
- **Datafication and sensing.** Sensors are shrinking, falling in price, and gaining new capabilities, generating massive streams of data that can be leveraged by automation systems.
- **Drive for efficiency.** Employers seeking to maximize efficiency and workforce flexibility are relying on subcontracted, temporary, and casual work. “Taskification” is shifting work from formal jobs in higher-income countries to lower-income countries, at lower wages and often within informal structures.
- **Emerging-market tech and innovation.** Lower-income countries are carrying out more scientific and technological research, increasing their high-tech output, and developing vibrant technology-startup cultures.
- **Globalization.** Value chains are increasingly globalized, creating both threats and opportunities for workers.
- **HR analytics.** More and more companies are adopting “workforce analytics” software, often in combination with big data, to inform their human resources processes.
- **Inequality.** In many societies, wealth gaps and income inequality are rising, driven by economics, politics, business structures, and technology.
- **Machine learning.** Advances in machine learning are enabling computers to learn to respond optimally to real-world inputs, develop a computational model, and then use that model to perform real-world tasks.
- **Middle-class growth.** Middle classes are expanding in middle- and lower-income countries, led by Asia, especially China and India. Africa is increasingly contributing.
- **Moore’s law.** The power of computer microprocessors continues to double every two years or so, making computational power ever cheaper, more powerful, and more ubiquitous.
- **Poverty.** Poverty and associated factors make it difficult for workers to prepare for sustainable livelihoods or to transition from the informal to the formal economy.
- **Productivity.** Global productivity and output are rising, and are increasingly disconnected from workforce growth.
- **Robotics.** Robots are becoming increasingly inexpensive and flexible, capable of being “taught” to perform a procedure instead of requiring complex programming.
- **Skills gap.** As jobs become more demanding, employers in lower-income countries report a gap between job demands and the technical and “soft” skills of available workers.
- **Ubiquitous connectivity.** Connectivity to the Internet and mobile networks has reached

saturation levels in higher-income nations and many middle-income countries, and is rapidly expanding in lower-income countries.

- **Urbanization.** Rural workers are abandoning rural life and migrating to growing cities. Since most migrants are youthful males, rural populations in lower-income countries are becoming older and more female.
- **Women's empowerment.** Women are being recognized as fulcrums of change, and growing attention is being directed toward improving their access to resources and opportunities.
- **Youth bulge.** In many lower-income countries, a demographic “youth bulge” is swelling the ranks of job seekers. The formal sector is unable to absorb most of these workers in many countries.

Reading the report

This report offers an overview of the most important scenarios for the future of work, with particular focus on the poor and vulnerable. Each chapter of **The Futures of Work** forms part of an overarching narrative and includes:

- **Introduction.** A brief introduction, including a list of the topics whose potential futures will be explored.
- **Scenario groups.** A review of the existing prominent scenarios—explicit, preferred, or implied—for each topic.
- **Scenarios.** Within each scenario group, each scenario is introduced with a table describing the type of scenario (e.g., preferred future), the proponents of that scenario, its strength, its potential impacts on the poor and vulnerable, the key driving forces behind it, the timing with which it could unfold, and its geographic reach. Each scenario is then explained and illustrated with quotations from analysts and forecasters.
- **Implications for the poor and vulnerable.** Each scenario group concludes with an analysis of the group's implications for the future of work and workers, especially the poor and vulnerable.
- **Conclusion.** Each chapter concludes with a review of key insights emerging from the scenario groups in the topic. Where appropriate, the conclusion contains a cross-impact matrix illustrating the interactions among the various scenario groups.

Chapter 1. Flexible Work, Freelance Workers

From Jobs to Gigs

Introduction

Work is moving away from the 20th century model of 9-to-5, 40 hours per week and toward more fluid ideas about work and employment structures. Flexibility is rearranging the shape of conventional jobs. The “gig economy” is going further, developing new modes of working beyond the boundaries of the traditional job.

The first set of scenarios examined in this chapter, clustered under **Scenario Group 1. Workforce Flexibility**, are in some ways extensions of ongoing business trends aimed at maximizing efficiency, such as outsourcing and offshoring. An emerging difference, however, is that use of “flexible” approaches has intensified—reaching jobs that previously were too skilled to be outsourced or offshored, or were protected for other reasons (such as a need to be performed onsite). Job flexibility extends the employment model developed during the 20th century, but adds additional dimensions of fluidity to workforce management.

The ability of the Internet to erase both the effects of distance and the need for in-office collaboration is a key driver of the forecasts in this chapter. These effects are felt most keenly in **Scenario Group 2. The Gig Economy**, which is challenging the traditional model of employment with new work arrangements in which freelance work takes on a growing role. The gig economy is creating new models for work that move away from formal “jobs” and towards more open structures in which workers potentially gain greater autonomy but risk losing security. This feeds two contrasting futures: one in which workers are liberated from the constraints of traditional jobs while still enjoying a secure livelihood, and a more unsettled future in which a surplus of available labor creates an online labor market that has workers bidding against each other to win gigs at the lowest level of compensation, with little safety net.

To summarize, the two scenario groups are:

- **Scenario Group 1. Workforce Flexibility.** Employers in many places now face strong local and global competition. Competitive pressures and labor costs are pushing them to reduce overhead costs and explore new ways to further increase the flexibility of their workforces.

Flexible Work: Key implications for the poor and vulnerable

- For vulnerable workers, the trajectory of the “precariat” scenario could further diminish options and aspirations.
- New support structures for workers will be needed.
- Workforce analytics can provide better metrics of underprivilege.
- Gig economy methods could include formalizing the informal.
- Worker rights and social protections will continue to be problematic for vulnerable populations.

- **Scenario Group 2. The Gig Economy.** The gig economy, which includes contract work, freelance work, and work sourced from online marketplaces, is on a trajectory to grow substantially in both the short and longer term.

Scenario Group 1. Workforce Flexibility

Employers in many industries across the world now face intense, continual competition from two directions:

- Outsourcing, offshoring, and globalized trade
- The acceleration of product cycles, heightened consumer expectations for choice and quality, and disruptions from new waves of technology innovation

In this environment, employers are increasingly turning to part-time, contingent, and contract workers to meet their business goals. Often, their primary aim is efficiency: boosting business efficiency, making more efficient use of labor, and controlling labor costs. For instance, part-time workers are used to extend store hours, while temporary workers enable employers to expand or contract their workforces according to the ebb and flow of business needs.

This relentless pursuit of efficiency can in many cases conflict with fair and equitable labor standards, creating harms for both workers and society.

Scenarios for Workforce Flexibility

- **Scenario 1: Disposable workers.** Low-skilled workers increasingly face “take it or leave it” terms from their employers.
- **Scenario 2: Managing flexible work.** Managing and motivating flexible workforces will be a growing challenge.
- **Scenario 3: Workforce analytics.** Data analytics and workforce monitoring will bring both benefits and risks to workers and employers.

This scenario set explores how the drive toward workforce flexibility is evolving and where it might go. Collectively, the scenarios point to an increasingly bifurcated workforce, with an oversupply of unskilled workers and a perceived shortage of high-skilled workers.

Scenario 1: Disposable workers

Low-skilled workers increasingly face “take it or leave it” terms from their employers.

Scenario summary: Disposable workers

Scenario type	Present trends continue
Scenario position	Mainstream
Key proponents	Academic researchers, labor activists, journalists
Impacts on poor and vulnerable	Increases challenges to finding stable and secure employment
Strength	Medium
Key drivers	HR analytics, inequality, drive for efficiency
Timing	Continuing for at least several years, then potentially declining in intensity for the medium term
Geography	Higher-income countries, and increasing in middle-income emerging markets

A slow economic recovery and high rates of unemployment/ underemployment have given employers in many high-income economies more clout to dictate terms to low-skilled workers. In industries like retail, food service, and construction, competition is fierce and companies are seeking to cut costs and find efficiencies. In many cases, the efficiencies gained are coming at the expense of low-wage workers, who find few other options in the job market.

In high-income economies, for instance, employers in the low-wage service sector are increasingly turning to part-time contracts to cut costs and expand flexibility. According to Burt P. Flickinger III, managing director of the marketing consultancy Strategic Resource Group, “Over the past two decades, many major retailers went from a quotient of 70–80% full-time to at least 70% part-time across the industry.”¹ Flickinger believes that competition from Wal-Mart has pushed many retailers to adopt similar strategies.

This trend toward part-time and other flexible arrangements has momentum. The business software company Intuit forecasts that the freelance workforce will continue to grow during the 2010s, rising to 40% of the US workforce—nearly 60 million workers—by 2020.²

The practice is not confined to the United States. Retailers in the EU (and especially the UK) have “zero-hour contracts,” in which workers are on-call at short notice and have no guaranteed weekly work shifts.³ In France, 80% of new hires are brought in on contracts of three months or less. (Ironically, this is partly a consequence of government attempts to give workers more security, as businesses are hiring short-term workers in order to avoid the costly severance pay required when a full-time worker is fired.)⁴

The flexible work phenomenon extends to middle-income economies as well. India has a dynamic and growing temporary work sector. According to Moorthy Uppaluri, CEO of Randstad India, temporary workers will make up nearly 10% of employment in India's formal sector by 2025.⁵ (For a fuller look at this situation see **Scenario Group 2. Gig Economy** later in this chapter.)

New scheduling software intensifies challenges for workers

Automation is an indirect factor in the predicament faced by workers in the flexible economy. Over the last decade, employers have begun to adopt advanced employee-scheduling software from firms like Dayforce and Kronos — systems designed to help managers precisely forecast their staffing requirements and fluidly adjust employees' schedules to fit, based on factors such as sales history or weather. Managers can use the systems to minimize their staffing costs by assigning the least number of workers needed for a given shift. The software makes it easy to adjust a store's staffing levels even hour by hour, allowing staff to be cut during anticipated traffic lags during the workday.⁸

As a result, many part-time workers in the retail sector have begun to lose a predictable part-time work schedule. Instead they are given variable schedules or shorter shifts, at unpredictable times of day. In companies applying these systems with particular fervor, workers find that the erratic scheduling makes it impossible to arrange childcare or take on a second part-time job.⁹

Policymakers are gaining interest in reducing the harm to workers from practices like these. But ultimately, employers themselves may come to find such practices counterproductive. According to Joan Williams of the Hastings College of Law, employers are neglecting to account for the costs incurred by the higher employee turnover incited by such practices: "If you count [turnover costs], the savings disappear.... Rigorous data [is] needed to persuade people to change their financial models. Our hypothesis is that if you provide people with more stable schedules, you'll see lower turnover [and] absenteeism and higher worker engagement."¹⁰

Misclassified



Workers ranging from FedEx drivers and newspaper distributors to exotic dancers and construction workers are routinely classified as independent contractors.⁶ This practice is especially pervasive in the construction industry in states with weak unions. Research by McClatchy and ProPublica, using tax records, found that the rate of misclassification of construction workers as independent contractors ranged from 15.5% in Florida to 35.2% in North Carolina and 37.7% in Texas. Often, these misclassified workers are undocumented workers—but the practice has become more widespread as construction firms increase their use of independent contractors to stay competitive on construction bids.⁷

Image: Jim DeLillo (Flickr)

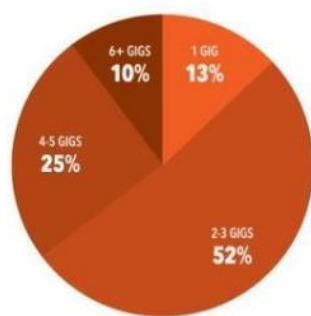
Scenario 2: Managing flexible work

Managing and motivating flexible workforces will be a growing challenge.

Scenario summary: Managing flexible work

Scenario type	Present trends accelerate
Scenario position	Nearly mainstream
Key proponents	Mainstream economists, business leaders, technologists
Impacts on poor and vulnerable	Reduces availability of traditional jobs, but may offer new opportunities to enter workforce
Strength	Strong
Key drivers	Globalization, skills gap, drive for efficiency
Timing	Continued intensification over next 10 years
Geography	Global, concentrated in higher-income countries

Making freelancing more secure



When Freelancers Union surveyed 1,100 US freelancers, it found that many reported having multiple work streams at the same time. Diversification of income sources can give freelancers a greater degree of economic stability, given the irregular nature of their work and income.¹¹

Image: Freelancers.org (screenshot)

A growing flexible workforce will require companies to adopt new tools and processes to motivate and manage these workers. Traditional employers have long used employee benefits as an important tool for boosting employee morale and loyalty, but these incentives aren't as applicable to flexible workers.

Addressing this challenge is likely to be a growing issue. While high-income economies may lead in the adoption of flexible workers, flexible work is also growing in middle-income economies, as noted above. Adecco, a temporary workforce staffing provider, forecasts that the contingent workforce will grow three to four times faster than the conventional workforce globally, and this growth will continue until contingent workers make up approximately 25% of the global workforce.¹²

Training instead of benefits

While many companies have cut back on worker training and development in recent years, the move toward a more flexible workforce may paradoxically spur more attention to the development of both internal and external worker capacities. According to John Boudreau, a management professor at the University of Southern California, companies

that rely on contingent and external workers need to consider ramping up training as a way to motivate and inspire these workers. “If you are not offering contingent workers a regular paycheck, then you have to give them something to keep their loyalty, such as learning and development programs. These programs benefit the workers by imparting valuable experience, while benefiting the organization.”¹³

A more collaborative approach to skills development is also recommended in “The Alliance,” a new model of workplace management proposed by Reid Hoffman, Ben Casnocha, and Chris Yeh in their 2014 book *The Alliance: Managing Talent in the Networked Age*. According to Hoffman:

In the networked age, people—and their networks—are truly your most important asset. The way to win is to adopt the “mutual investment” mindset. Invest in your employees so that they’ll view you as an ally and invest in you.¹⁴

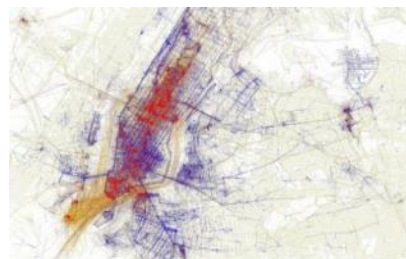
This approach suggests that companies need to embrace the fact that flexibility means most of their employees will leave at some point, and adapt by applying a “tour of duty” framework to all kinds of employment—short-term, medium-term, and long-term. For this to work, both managers and employees need to be explicit about expectations and timeframes, with even long-term employees accepting limited engagements that allow both parties to periodically recommit to the relationship.¹⁷

Worker satisfaction

As far as morale goes, early indicators suggest that many workers find satisfaction in flexible work. When MBO Partners surveyed independent workers for its “2014 State of Independence Report,” it found 82% of independent workers reporting that they are satisfied with the arrangement, and 76% planning to stay independent in the future.¹⁸

However, at the same time there is substantial anecdotal evidence that workers in the emerging “gig economy,” characterized by short-term freelance work, are displeased with their arrangements (see **Scenario 4: Rise of precarious work** under **Scenario Group 2. Gig Economy**). One explanation for this divergence in satisfaction is that satisfied flexible and independent workers are those who have skills that enable them to easily find new flexible work. Assuming their earnings are adequate, this gives them all the benefits of work flexibility, and likely also the option of switching to a conventional job if needed. For lower-skilled workers*, on the

Helping workers get the right skills



New York City and the City University of New York (CUNY) have developed the Labor Market Information Service (LMIS) to track real-time trends in skills demand, using live data from metro-area job listings. Analysis of the data makes it possible to modify CUNY training programs to give students more of the skills that employers are looking for.¹⁵

This data-driven approach to workforce development has also prompted the training nonprofit Grace Charities to modify its free business-skills development programs, adding skills such as medical records scanning and insurance claims processing—enabling low-skilled office workers to move into the healthcare industry.¹⁶

Image: Eric Fischer (Flickr)

other hand, it is likely that the lower the skill level required to perform a flexible job, the more that flexible work will come to resemble disposable work.

Thus (as discussed further in **The Gig Economy**), the divergence in satisfaction around contingent work likely reflects different skill levels and socioeconomic realities—and the fact that the contingent workforce encompasses both highly paid knowledge workers and vulnerable or disadvantaged low-wage workers.

Scenario 3: Workforce analytics

Data analytics and workforce monitoring will bring both benefits and risks to workers and employers.

Scenario summary: Workforce analytics

Scenario type	Present trends accelerate
Scenario position	Alternative expert scenario
Key proponents	Technologists, workforce and HR professionals, employment law scholars
Impacts on poor and vulnerable	Could create new forms of digital discrimination but also open new doors
Strength	Medium, but growing in intensity due to rapid innovation
Key drivers	Big data, datafication and sensing, HR analytics
Timing	Growing intensification over next 10 years
Geography	Growing use in higher-income countries

A flexible workforce requires mechanisms to match up the skills available among workers with the skills needed by employers. The emerging revolution in workforce analytics is poised to transform this equation. New data-driven tools will give employers the ability to develop “objective” metrics to evaluate potential workers. However, workforce analytics will also bring new challenges around securing workers’ privacy and protecting them from potential employment discrimination.

For example, the growing ubiquity of sensor data makes it increasingly easy for employers to monitor their employees while on the job. The software firm Sociometrics Solutions has developed badges that track tone, mood, and stress during employee conversations; when Bank of America deployed the badges at call centers, it found that its most productive call center was one where employees were allowed to take breaks in groups where they could blow off steam or share techniques for handling customers. When Bank of America adopted the group breaks at all call centers, productivity increased by 23% and employee voice stress fell by 19%.²⁰

When workforce analytics falls short

Many employers have adopted early workforce analytics in the form of Applicant Tracking Systems (ATS): software that compiles and tracks job applications. While the rise of Internet résumé submissions made ATS crucial for coping with the deluge of résumés, the software has proved inadequate in the face of a major issue. In many cases between 40% and 90% of applications are clearly unqualified, and ATS is supposed to weed out unqualified applications. Instead, the very narrow definitions of qualification used by ATS systems unintentionally exclude well-qualified workers.¹⁹ In this way, ATS systems are contributing to employers’ perception of a skills gap.

Wearing a mood-sensing badge makes such monitoring obvious to workers, but it is just as possible for employers to use such tools covertly. Companies interested in the mood of their workforce can do a sentiment analysis of the organization's voice, IM, and email traffic, examining the data to determine the mood of conversations depending on the use and frequency of certain keywords. According to IT executive Steve Pell, "I'm sure there are people out there who are doing [covert sentiment analysis]. I think it is not far away, the technology is there. It is not a technological issue, it is a market readiness issue."²¹ Drawing the line between permissible and impermissible employee monitoring will require employers and employees to redefine the boundaries around workers' privacy expectations.

Big data: benefits and risks for workers

Next-generation worker analytics tools are using big data approaches to better match jobs and workers. Companies like Gild, TalentBin, RemarkableHire, and Entelo are developing analytics tools that can search across social media and other online sources to identify potentially qualified workers.²²

These tools have the potential to make hiring more merit-based—and reduce the importance of social and professional connections, which underprivileged workers may lack.

Another potential benefit of these new metrics for workers will be a transformation in what it means to be a "skilled worker." Currently, workers have little opportunity to demonstrate their actual skills in recruitment processes but must instead rely on credentials, degrees, and other proxies for skills that are harder for lower-income people to acquire. New evaluation metrics will enable much more fine-grained measurement of actual skills, giving workers with limited education credentials more opportunities to prove that they can provide what an employer needs. Many "unskilled" workers have skills like diligence, reliability, emotional intelligence, creativity, and other "soft skills"—and workforce analytics will enable these skills to be targeted and identified.

However, workforce analytics will inevitably have downsides, which could create new issues for workers. Sean Worley, CTO of the big data firm Quid, explains, "Big data has its own bias. You measure what you can measure, and you're denigrating what can't be measured, like gut instinct, charisma. When you remove humans from complex decision-making, you can optimize the hell out of the algorithm, but at what cost?"²⁴

In the longer term, the employment system will transition away from the increasingly outmoded institutions and practices that remain grounded in the old paradigm of preparing workers for a 20th century, manufacturing-based

Unearthing Jade



Worker-analytics tools from Gild, a startup, mine open-source programming sites like GitHub to identify skilled coders whose software is well-regarded and reused by their peers. In one case, when Gild looked beyond Silicon Valley to find raw programming talent, it discovered a programmer whose code had been reused by 1,267 others. The programmer turned out to be Jade Dominguez, an impoverished young programmer who chafed against formal schooling, did not go to college, and had middling high-school grades. Gild went on to offer him a position with an annual salary of \$115,000.²³

Image: Jade Dominguez @Twitter (screenshot)

economy. Today, educational credentials are used as a crude proxy for ability, intelligence, and skills, and résumés are still used as a capsule description of experience and capabilities. The hiring process is still grounded in a combination of luck, personal connections, and a subjective “feel” for a potential employee’s fit within an organization. All of this will change as the flexible economy takes hold and workforce analytics precisely rates the value and potential of every worker.

Workforce Flexibility: Implications for the poor and vulnerable

- **A bridge from informal work.** In lower- and middle-income economies, if flexible workforce practices are misused they could sharpen even further the strong divide between formal, often privileged workers and informal or excluded workers, with new flexible work forms being used to extract only the labor needed from excluded workers. However, if flexible work forms are structured as a path to skills development, they could be a way to help workers bridge the gap between the informal and formal sectors. (For more about the informal economy, see sidebar, “The futures of the informal economy,” on page 69 in the **Rural Work** section.)
- **More meritocracy, less exclusion.** In some scenarios, the flexible workforce will be more meritocratic, grounded more on demonstrated skills and reputation than on academic pedigrees. More granular identification and evaluation of skills could enable workers to better demonstrate their abilities to potential employers, as well as reduce the risks of making bad hires. Good workers could benefit under such a system. However, workers whose skills fall short—including soft skills, such as online communication with potential employers—could be increasingly penalized. Some kinds of marginal workers could be excluded more thoroughly than they are now. It will be important to develop new interventions to retrain these workers, and devise policy interventions to counter socioeconomic drivers of disadvantage.
- **Support structures needed.** With more workers shifting into flexible/contract work, there will be a growing need for support services that provide at least some of the institutional support associated with traditional full-time employment. This could include tax withholding, allocation for paid time off, health insurance, and retirement savings.

Monitoring morality in China



Although the project has received little public attention, China is developing a social scoring system for its entire population. The scores will integrate information like creditworthiness, criminal record, and even online behavior. The Social Credit System will be design to measure relative performance in four primary areas: politics, business, society, and justice. According to the Chinese Academy of Social Sciences, the system is needed to cope with the social challenges brought about by rapid development, since China has transformed “from a society of acquaintances into a society of strangers. When people’s behavior isn’t bound by their morality, a system must be used to restrict their actions.” The Social Credit System is expected to go into effect in 2020.²⁵

Image: Ilya (Flickr)

Although all such benefits would come out of their compensation, flexible workers using such arrangements could enjoy a more conventional and familiar work experience. Such services would also clarify for workers the true costs of non-wage employment benefits, and give them a more accurate view of the relative value of wages paid to an independent contractor versus those paid to conventional employees.

- **New training and skill development.** Current educational systems are oriented toward full-time students, and offer fewer routes for partial or incremental learning short of a full degree. Growing workforce flexibility will require more flexible systems for acquiring and retraining new skills. Free online training and remote education could provide an infrastructure to deliver modular training or continuing education. Periodic evaluations to deliver “badges” for learning milestones could be part of this approach, and make it easier for workers to adapt to the changing skillsets required by employers. New approaches that enable inexpensive job training could make it easier for the poor and vulnerable to enter or re-enter the workforce, or upgrade their skills into better-paid employment. Subsidies to enable the poor and vulnerable to access training programs could be an important means to move more people from long-term unemployment to participation in the workforce.
- **Updating the application system.** The résumé-based system for hiring and job searching is broken. Employers overstate job requirements, unintentionally screening out relevant candidates. Job seekers have their résumés rejected due to lack of proper keywords or errors in OCR scanning. Increasingly, job searches are becoming an exercise in search-engine optimization, rather than a system for matching qualified candidates to employers. This particularly affects the disadvantaged, who often lack the knowledge to properly “game” the system. New systems could rationalize job categories and worker skill descriptions, benefiting both workers and employers. However, to meet the needs of disadvantaged workers, governments and charitable NGOs will need to expand training in résumé writing as a form of job assistance. Such training could also help workers who lack access to computer resources, as well as older workers who lack Internet skills.

Using social media to investigate candidates



Under US anti-discrimination laws, using social media to do background research on prospective employees can expose employers to protected information like race, religion, and sexual orientation. The startup Social Intelligence addresses this problem by performing social media research on prospects, but scrubbing the legally protected information from its reports to employers. The social media activity that remains visible could still include evidence of illicit drug production, racist comments, sexually graphic selfies, or other questionable background information. While the Federal Trade Commission has ruled that Social Intelligence’s approach is legal under the Fair Credit Reporting Act, the service raises questions about when “unsavory” online behaviors cross the line into being relevant for evaluating potential job performance.²⁶

Image: Niek Spraeckl (Flickr)

- **Fighting algorithmic discrimination.** Anti-discrimination and affirmative action initiatives are going to face new challenges from the workforce-analytics revolution. Workforce analytics will enable employers to “discriminate” among workers using “objective” measures ostensibly unrelated to illegal factors like race, gender, sexual orientation, or religion. The existing legal framework for ensuring a fair and equitable workplace will need to be overhauled to address these new worker-analytics technologies. “Algorithmic discrimination” will likely prove a thorny issue, pitting the business necessity of identifying qualified and hardworking candidates against the social value of ensuring non-discriminatory hiring practices.
 - **Countering today’s underprivilege.** In some cases, however, workforce analytics may work to the benefit of the poor and vulnerable. In an increasingly multicultural, diverse, and feminist society, metrics like race and gender may be less accurate measures of underprivilege than in the past. In this light, policies to correct workplace discrimination can be reoriented to focus on more tangible metrics of poverty and vulnerability, such as class, lack of access to education, and deficits in social capital.
 - **Room to experiment.** Workforce flexibility can provide an opportunity for developing economies with rigid labor laws to experiment with contract, temporary, and flexible work. This could be especially relevant for creating economic opportunities for poor and vulnerable workers. By lowering the overall costs of hiring relatively low-skill workers, flexible and contract work could open up new employment opportunities for such workers. Flexible work—if implemented with care—could help boost national productivity and avoid direct confrontation with the vested interests that stand opposed to large-scale reform of labor laws. India has developed a strong and growing temporary workforce, despite having extremely rigid labor laws.
 - **Tech empowering workers.** Technology innovations may help level the playing field by bringing attention to unfair work practices. Websites like Glassdoor.com and Indeed.com empower employees to publicly evaluate and comment on the practices of current and past employers—opening up new dimensions of transparency and making employers accountable for their practices.²⁷ Online reputation mechanisms may take this trend further, giving workers new abilities to name and shame unfair employers and expose their practices.
 - **The persistence of flexibility.** While present trends persist, however, entry-level jobs are likely to be increasingly structured as contractor positions, given the competitive pressures driving employers to cut costs. Young workers and economically displaced older workers are more likely to get stuck on the bottom rungs of the employment ladder, with diminished future opportunities to transition to permanent, full-time employment. It will be difficult for lawmakers to curb these flexible work patterns and compel a more full-time workforce, since the ongoing spread of automation may undercut such policies. (See **Chapter 2. Automated Work.**)
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Scenario Group 2. The Gig Economy

Forecasters agree that the gig economy, generally described as contract work, freelance work, and work sourced from online marketplaces, is on a trajectory to grow substantially in both the short and long term. In the United States alone, some forecasters say it will eventually encompass half the workforce. It will include both white-collar knowledge work and blue-collar work—though it may not extend to positions that require deep, embedded knowledge of an organization or an overview of what is going on in a firm.

At the same time, key practices upon which the gig economy is built—crowdsourcing and reputation measurement and tracking—are also evolving and scaling up, as described in **Scenario 1: Rise of crowdsourcing** and **Scenario 2: Importance of reputation**, below.

While the gig economy in its modern form is spearheaded largely by higher-income economies, workers all over the world will participate in it, willingly or not.

Unless it encounters a serious disruption, the overall trajectory for the gig economy is one of growth and expansion into the medium term in many higher-income economies. In the United States, forecasts suggest that by 2017, “1099 workers” (contract workers who file 1099 tax forms) will number 23 million, up from 17 million in 2014.²⁸ Some forecasters see even broader potential for the gig economy, with estimates of 40–50% of American workers, or about 60 million people, doing gig work as soon as 2020.²⁹

While much of the current discussion about the gig economy concerns its rise in high-income countries, some aspects of this trend are beginning to emerge in lower-income economies.

Scenario 3: Growth of the freelance world implies a number of positive aspects for developing-world workers, if they have globally sellable skills. For example, it is already globalizing some kinds of work opportunities. As crowdsourced job marketplaces and reputation systems spread, it may not matter if a worker bidding on a job is from Accra or Atlanta as long as she has the qualifications and reputation to land the gig. Martin Ford, author of *The Lights in the Tunnel*, suggests that “big data” algorithms will increasingly enable international workers in lower-cost regions to compete against workers in higher-income countries:

I think that in the future, you may see even younger, more inexperienced but very smart offshore workers that can be combined with these technologies and then may be able to threaten all kinds of knowledge workers in the United States who have a lot more experience.³⁰

The Wild West nature of crowdsourcing

As the gig economy emerges and takes form, the online marketplaces where work is offered and sought are in a phase of active experimentation. Gig platforms are using a variety of approaches to structure task boundaries, bidding systems, compensation, and worker policies. The companies behind these platforms are moving on “Internet time,” so the only certainty is that change will be rapid as these marketplaces evolve, consolidate, and are confronted by other kinds of Internet and social media companies.

This could make the job market tougher for better-paid workers around the world, and also would tend not to benefit those lacking the skills and resources to navigate these globalized HR systems, as illustrated in **Scenario 4: Rise of precarious work**.³¹

Scenarios for The Gig Economy

As touched on above, there are four scenarios prominent in discussions of the gig economy. All are already visible to some degree; they are not mutually exclusive and aspects are likely to unfold simultaneously.

- **Scenario 1: Rise of crowdsourcing.** Job acquisition and allocation will increasingly occur through online services that assign or allow workers to bid on work.
- **Scenario 2: Importance of reputation.** The growth of personal rating and reputation systems will play a key role in determining which workers—and employers—are seen as desirable.
- **Scenario 3: Growth of the freelance world.** This is a highly optimistic view of the emerging gig economy that forecasts that workers will happily trade in full-time jobs for a freelance lifestyle that enables them to build secure livelihoods while taking only the jobs they wish to take, without being chained to an employer or schedule.
- **Scenario 4: Rise of precarious work.** This is the dark flipside to “freelance world”—a future in which workers can no longer obtain full-time jobs and are forced to patch together a series of temporary jobs or tasks in order to make a (likely precarious) living.

This scenario group is dominated by two overarching ideas: first, growth of the freelance world and second, emergence of “the precariat,” or those made more vulnerable by the gig economy. All of the futures explored in this section—and in the overall chapter—are viewed through the lens of these two ideas.

Finally, it’s important to note that there is an inclination to look at the freelance world and precariat futures as mutually exclusive. But at this stage there is no indication that either will win out, and in fact it is more likely that both will unfold, with the distinction being a matter of degrees. However, current trends indicate that the precariat future will characterize the situation of more workers than freelance world. The crowdsourcing and reputation scenarios serve almost as drivers to the other two scenarios.

Scenario 1: Rise of crowdsourcing

Crowdsourced work, through freelance marketplaces or services, will emerge as a dominant paradigm for work/job allocation.

Scenario summary: Rise of crowdsourcing

Scenario type	Present trends intensify
Scenario position	Mainstream
Key proponents	Mainstream economists, labor analysts, HR professionals, technologists
Impacts on poor and vulnerable	Offers new opportunities to work, but also spearheads move from employment to gigs
Strength	Medium to high
Key drivers	Automation, ubiquitous connectivity, globalization, HR analytics
Timing	Continued intensification over next 10 years
Geography	Global, more concentrated in higher-income countries, but emerging in lower-income countries

Many experts believe that the main source of jobs and employment in coming years will be not companies seeking full-time hires, but rather an expanding freelance workplace driven by crowdsourced work. In this future, most people will work for a wide variety of employers, who will find and hire them via crowdsourcing marketplaces such as TaskRabbit or Upwork (formerly oDesk). Josh Breinlinger, a Silicon Valley venture capitalist (and former employee of oDesk), states:

If software is eating the world, then marketplaces are one of the agents of destruction. Marketplaces are eating every type of firm on the planet.³³

Early indicators appear to bear out Breinlinger's view. The economy of independent workers, and of the companies who hire them, is fast-growing.

- **More people are freelancing.** In 2014, according to an MBO Partners workforce study, there were 17.9 million “solopreneur” independent workers in the United States, a 12.5% increase over 2011—which represents much faster growth than the rest of the American job market.³⁴
- **More employers are using part-time or contract workers.** In the 1980s, contract work accounted for 0.5% of employment, compared to 2.3% of employment in 2014. From 2009

Be your own boss!

“Yes, the comfort of a regular paycheck is gone, but it’s replaced by other, arguably greater comforts: a flexible schedule, the sense of ownership and pride that comes with being one’s own boss, the ability to prioritize health and wellness in ways that are incompatible with traditional employment structures.”³²

—Sara Horowitz, Freelancers Union

to 2014, 10% of job growth came from temp jobs.³⁵ These numbers may be underestimates, as much part-time work does not involve a 1099.³⁶

- **Global boom, economic boon.** According to McKinsey, online talent marketplaces could add \$2.7 trillion to global GDP by 2025.³⁷
- **A global issue.** The World Bank reports that use of part-time and contract work is increasing globally, specifically noting the sharp rise in labor brokers and temp work services in India and South Africa.³⁸
- **Crowdsourcing in emerging markets.** In India, a local grocery-delivery startup is using contract drivers on motorbikes to make same-day deliveries.³⁹ And in early 2015, Uber began operating in Nigeria and South Africa.⁴⁰

Benefits of crowdsourcing for workers

Advocates of crowdsourcing point to its purported benefits for workers. These include:

- **New opportunities.** A cultural anthropologist who specializes in work, interviewed for this report, stated that crowdsourcing allows people to opt into work they want. Crowdsourced workers can put themselves forward as the best option and say, “choose me.”⁴² In theory, this openness to all qualified candidates makes it possible for workers to take on jobs they previously might not have known about or had access to—including workers from developing nations or in vulnerable populations. Economist Tyler Cowen, author of *Average Is Over*, affirms: “We’re [already] seeing an enormous amount of global upward mobility that’s quite rapid and quite sudden. Undiscovered individuals have a chance—using the Internet, using computers—to prove themselves very quickly.”⁴³
- **Control of schedule.** Another purported positive for workers in crowdsourcing is the potential for greater control over their time and tasks. Sociologist Juliet Schor interviewed gig workers at TaskRabbit, and found that for these workers, controlling the terms of their own work was highly important.⁴⁴ The importance of being able to control one’s schedule was revealed by the backlash TaskRabbit experienced in 2014 when it changed the system for bidding on tasks: instead of allowing workers to pick and choose among the full range of tasks on offer and bid on those of their choosing, TaskRabbit began presenting selected tasks one at a time for acceptance or rejection. Taskers successfully protested the changes.⁴⁵
- **Develop new skills.** The work anthropologist also noted that crowdsourcing allows workers to build their skills by



While consumer-facing marketplaces like Uber get most of the press and commentary about the gig economy, there are also gig marketplaces dedicated to business-to-business services.⁴¹

- The gig marketplace **Upwork** targets the traditional temp/outsourcing firm.
- **UpCounsel** is an online marketplace for small-business legal services.
- **RecruitLoop** targets the conventional recruiting firm but provides on-demand recruiting services at an hourly rate.
- **Rev** uses a distributed network of micro-freelancers to provide fast and cheap translation and transcription services.
- **Contently** offers a portal for freelancers to generate copy for content-based marketing, encroaching on the services provided by marketing and PR firms.

Image: Upwork (screenshot)

taking opportunities they would never have had access to before. By using crowdsourced gigs to learn new skills or advance their skills, workers may be able to move up to higher-quality opportunities and better pay.⁴⁶

Risks of crowdsourcing for lower-income workers

But there are also negative forecasts about what crowdsourcing will mean for workers.

- **Diminished power.** The work anthropologist interviewed for this project points out that crowdsourcing also reinforces separation among workers, which reduces their leverage in dealing with employers. Under crowdsourcing, work is organized as fragmented processes and there is no structure to advocate for collective interests. In addition, it tends to reinforce geographic isolation of workers since there is no centralized workplace.
- **Exploitation.** Crowdsourced work raises the risk of exploitation—whether in allocation of jobs, scheduling of work, or lack of payment.⁴⁷ Popular gig platforms like TaskRabbit and Uber have already been accused of exploitive practices.
- **More “jobs.”** Because jobs are being broken into smaller tasks, crowdsourcing can seem to provide more jobs—but in actuality this may be the same amount of work, just apportioned in smaller amounts.

Scenario 2: Importance of reputation

As more workers shift into freelance work, and online services make past performance easily searchable to potential employers, workers will need to continuously build their reputations for knowledge, skills, and trustworthiness.

Scenario summary: Importance of reputation

Scenario type	Present trends intensify
Scenario position	Mainstream but secondary
Key proponents	HR professionals, workforce experts, technologists
Impacts on poor and vulnerable	Can reinforce disadvantage; can also make employers more transparent
Strength	Medium-high
Key drivers	HR analytics, big data, ubiquitous connectivity
Timing	Continued intensification over next 10 years
Geography	In modern forms, concentrated in higher-income countries

The online services at the heart of the gig economy seamlessly blend mobiles, the Internet, and digital marketplaces for personal and professional services. At the core of many of these services are reputation and ratings systems that can effectively replace human oversight and administration with collective feedback and reviews gathered from users.

For some workers, such as those without the soft skills to actively manage their reputations or fine-tune their résumés for available jobs, these reputation systems might create the same kind of barriers to hiring that already exist within current HR practices. (See “[Prejudice and reputation](#)” sidebar below for more on this.)

These ratings systems are a critical innovation for the gig economy. They help hirers dispel the inherent uncertainty of relying on strangers to provide services in their homes or businesses. Michael Fertik, CEO of Reputation.com and author of *The Reputation Economy*, believes that “Reputation is becoming more valuable than money or power.”⁴⁹

What makes reputation important (and different) in the gig economy is that it is:

Reputation cuts both ways

In today’s gig economy, gig workers largely work solo and have few options for institutional support. In lieu of such support, they are developing their own online commentary and ratings systems to push back against unsavory or unwanted practices.

For instance, when TaskRabbit workers who complained about new bidding practices found that their complaints were being suppressed in TaskRabbit’s official worker forum, they quickly moved their discussions to Facebook and other online venues—where the discussions gained wide play and eventually compelled TaskRabbit to change its policies.⁴⁸

- More salient, both within and outside companies
- More central to being able to get work at all, or get it at a good rate of pay
- “Stickier”—more likely to follow a worker over time
- Created from more diverse inputs, potentially including extensive data and monitoring

For workers in the freelance and gig economy, being able to build a reputation will be a critical skill. A cultural anthropologist interviewed for this report stated that soft skills—such as knowing how to submit a job bid, or paying close attention to detail—will be paramount for freelance and gig workers. And chief among these will be the ability to build and maintain a reputation. According to her, reputation is the key to success.⁵¹

Trust, another aspect of the reputation economy, is also being used to start businesses. In Bangalore, India, the ride-sharing service Poolcircle is based on the circle of friends, associates, or online contacts that the user designates.⁵² Just as online tasking platforms such as TaskRabbit and Uber are growing, so are reputation aggregators. Currently, a lot of trust or reputation information about a user/worker is siloed: AirBnB has ratings on home renters, eBay and Amazon on the trustworthiness of sellers, Yelp on service quality, etc. But new companies are taking up the task of collecting all this information and compiling a single reputation profile that can follow a worker through life. As AirTasker co-founder Tim Fung writes,

It won't be long before there are tools to aggregate all these reviews in one place and as a result, our behavior across these social platforms becomes even more valuable. Our Airbnb, eBay, LinkedIn, and Yelp ratings for example—our reputations—are becoming valuable commodities that are increasingly visible in our everyday transactions.⁵³

Some of these platforms will offer reputation-building as a secondary service. For example, Stack Overflow is a site where computer coders can post questions about problems they are having with a piece of software code, or provide solutions to the problems. As a user answers questions and provides help, her knowledge ranking increases. This gives users of the site an idea of how qualified and knowledgeable other users are.⁵⁴

Other sites, such as TrustCloud or Respect Network, are more straightforward reputation aggregators and verifiers. One indicator of the emerging importance of reputation and trust is Facebook's acquisition of early category-leader Legit.⁵⁵

Rachel Botsman, who writes extensively on the sharing economy, states:

Prejudice and reputation

Even as backers of reputation systems talk about how users' work history will be their ticket to employment, there are still barriers to entry for those from the wrong side of the socio-economic tracks. A study by researchers at New York University found that when trying to sell an iPhone online, the mention of the seller coming from a poor neighborhood resulted in fewer offers and interest in the phone than a seller from a well-known “nicer” neighborhood. The authors of the study point out that the potential buyers may not be discriminating against the supposed poor buyers intentionally. But as co-author Peter Rich states, “That raises to me an interesting dilemma about how rational actors in a marketplace can reproduce a social inequality.”⁵⁰

New trust networks and the reputation capital they generate will reinvent the way we think about wealth, markets, power, and personal identity in ways we can't yet even imagine.⁵⁶

Reputation services and rankings cut both ways. Just as customers can rate workers, workers can rate the people hiring them for jobs. Workers at Amazon's Mechanical Turk service have developed a "Turkopticon" website that enables Mechanical Turk workers to rate and avoid unscrupulous taskers.⁵⁷ The Mechanical Turk community has also developed Dynamo, an online platform that enables Turkers to air potential concerns or remedies for the community to up-vote. The platform gives these workers a collective voice that can effect real-world change: e.g., the community has already generated a treatise on the do's and don'ts of hiring Turks for academic or social research.⁵⁸

Scenario 3: Growth of the freelance world

Gig work structures will reengineer employment and the economy, creating abundant work, schedule flexibility, and empowered workers.

Scenario summary: Growth of the freelance world

Scenario type	Aspirational
Scenario position	Optimistic mainstream
Key proponents	HR consultants, technologists
Impacts on poor and vulnerable	Improves work flexibility and work-life balance
Strength	Alternative outcome of strong trends
Key drivers	Middle-class growth, globalization, ubiquitous connectivity
Timing	Continued intensification over next 10 years
Geography	Concentrated in higher-income countries, emerging in middle-income countries

The future in this scenario is one of abundant work, flexible schedules, and empowered workers. Advocates of this future believe wholeheartedly that a shift to contract/freelance/gig work is the optimal way to reengineer the labor force and the overall economy. Their vision is one of workers doing the work they want for the clients they want, while making good livings. Sara Horowitz, founder of Freelancers Union (which provides support services for freelancers), says:

For much of the past century, the Era of Big Work—the 40-hour workweek and its employer-provided benefits—were the foundation of our economy. That was then. Now, independent work is the new normal.⁵⁹

And Venky Ganesan, a partner in the venture capital firm Menlo Ventures, states,

We are going toward becoming a freelance nation. The \$40-an-hour manufacturing job is not going to come back, but the \$25 local services job [represents a viable alternative].⁶⁰

The expectation is that workers will choose the highest-paying jobs at times that are right for them. But for proponents of Freelance World, monetary compensation is not the chief reason for doing gig work. Again, Horowitz:

For the past century, in other words, remuneration defined success. For many workers, it still does. However, among the growing ranks of independent workers, labor itself is increasingly its own reward, as is the opportunity to establish a work-life balance that was unthinkable during the Era of Big Work.

Millions of freelancers are working when they want and how they want. They're building gratifying careers but also happy lives. And they're helping build a support system so they can live the lives they want.⁶¹

Indeed, a survey of Freelancers Union members found 90% saying that if given the choice, they would not go back to a regular job.⁶²

An important driver of this future is younger workforces. The freedom of freelancing appeals to the largest demographic moving into global workplaces: Millennials. Millennials now entering the workforce will be a key demographic who shape work for decades.⁶⁴ Some forecast that many Millennials will change careers 10 times by the time they reach the age of 40.⁶⁵ Millennials could promote the concepts at the heart of "freelance world."

Gig workers tend to make less

Even the previously cited "happy" workers in Freelancers Union are not making significant salaries: 29% of Freelancers Union members earn less than \$25,000 annually, and a survey in 2010 found that 12% of members received some kind of welfare aid.⁶³

Scenario 4: Rise of precarious work

The growth of the gig economy could lead to deteriorating conditions for workers.

Scenario summary: Rise of precarious work

Scenario type	Present trends continue
Scenario position	Pessimistic mainstream
Key proponents	Labor leaders, academics, mainstream-liberal economists
Impacts on poor and vulnerable	Spreads and intensifies vulnerability
Strength	Alternative outcome of strong trends
Key drivers	Middle-class growth, globalization, HR analytics
Timing	Continued intensification over next 10 years
Geography	Increasing in higher-income countries, especially the United States; common in lower-income countries

This scenario is far less rosy than that envisioned in “freelance world.” Those who are less enamored of a gig-based economy see a future that leaves workers at the mercy of employers, without any control over wages or schedule, and with few of the benefits (healthcare, sick leave, paid vacation, and retirement plans) that were hallmarks of 9-to-5, 40-hour employment. Guy Standing, a professor at the University of Bath, calls the workers of this forecast “the precariat.” Standing explains:

The global precariat... consists not just of everybody in insecure jobs—though many are temps, part-timers, in call centers, or in outsourced arrangements. The precariat consists of those who feel their lives and identities are made up of disjointed bits, in which they cannot construct a desirable narrative or build a career, combining forms of work and labor, play and leisure in a sustainable way.⁶⁷

The assumptions behind this forecast are far bleaker than those of other gig-economy analysis. Because gig workers are constantly competing with each other for jobs—either in person or via online marketplaces such as TaskRabbit, Zaarly, or Uber—the fear is that this intense worker competition will drive

Automation: downgrading the quality of gigs?



Those opposed to gig work also see automation “eating” more good jobs, leaving behind lower-paying, less dignified work.⁶⁶ (For more on this theme see **Scenario Group 2. Machines Take Over in Chapter 2. Automated Work.**)

Image: Kitmondo.com (Flickr)

down wages for both gig workers and traditional employees. Some early research into gig and freelance work suggests that most workers are unable to earn even minimum wage working serial gig jobs.⁶⁸

Forecasters also see gig work undercutting full-time employment. Tech writer Farhad Manjoo writes:

Uber, and more broadly the app-driven labor market it represents, is at the center of what could be a sea change in work, and in how people think about their jobs. You may not be contemplating becoming an Uber driver any time soon, but the Uberization of work may soon be coming to your chosen profession.⁶⁹

Those opposing a move to gig work point out that it can depress not only gig worker earnings; it can also depress full-time worker wages.⁷¹ For example, in auto parts manufacturing, overtime work that once went to full-time employees at time-and-a-half is now being served up to temp and gig workers at minimum-wage rates.⁷² The gig economy cuts into full-time hours as well. Previously, employers would hire enough staff to cover peak demand, accepting the low productivity of off-peak slack as a price of doing business. But new startups are eliminating the need to carry full-time employees by offering on-demand staffing that in some cases is available the same day.⁷³

Is the precariat trend long-term?

Analysts disagree on whether the rise in the contingent employment of the precariat is a permanent structural shift or a cyclical one bred by a weak economy.

Heidi Shierholz, an economist at the Economic Policy Institute, does not see the growth in part-time employment as permanent. She attributes the high rates of part-time employment in the United States to continuing weakness in the job market, which gives employers an edge in imposing flexible and part-time schedules. “I don’t think we’re becoming a nation of part-time workers,” Shierholz says. Once the economy recovers and something like “full employment” is reached, she expects workers to regain leverage in the job market and employers to reduce their reliance on part-time workers. However, given the slow rate of job growth, full employment levels in the United States may not be reached until 2022, by some forecasts.⁷⁴

Similarities between flexible/ “gig” work and informal work

New kinds of flexible and “gig” work arrangements, while usually part of the formal economy, nevertheless have many characteristics of work in the informal economy.⁷⁰ (For more on the informal economy see [“The futures of the informal economy”](#) sidebar in the **Rural Work** section of **Chapter 3. Emerging Work.**)

- Working hours, income, and length of work engagements are flexible or uncertain.
- Ongoing worker-employer relationships may be eliminated.
- Workers are organized in continuously morphing networks, often in small work units.
- Reputation and trust are key professional currencies.
- Workers often have reduced access to social protections and benefits, e.g., as part-time workers or contractors in the United States.

For some workers these new patterns may offer flexibility and control over their work arrangements. Many other flexible/gig workers may be trapped in low-income, uncertain livelihoods. The informal economy creates a similar division: while it may offer middle-class income for some, the great majority of workers accept uncertain livelihoods because they have no other option.

On the other side of the fence, many observers believe contingent work is here to stay. Ardent Partners, a supply-management research firm, forecasts that US employers will boost their use of contingent, freelance, and temporary workers by 30% from 2014 to 2017.⁷⁵ Christopher Dwyer of Ardent writes:

Is this ‘flex economy’ for real? Will we continue to use non-traditional labor for years to come? The answer is a simple ‘yes.’ While most business fads die out or fade away, the realm of contingent labor isn’t going away anytime soon and is only projected to grow significantly over the next half-decade.⁷⁶

The Gig Economy: Implications for the poor and vulnerable

- **Accelerated race to the bottom.** The shift to gig work and crowdsourcing is potentially accelerating a race to the bottom vis-à-vis wages, working hours, and schedules. Study after study shows that after factoring in taxes and overhead expenses, many gig workers make low hourly rates, often below minimum wage.
- **Rising vulnerability.** For vulnerable workers, the trajectory of the “precariat” scenario could further diminish options and aspirations, as it knocks out more rungs of the already rickety upward-mobility ladder. The perimeter line of vulnerability would likely move higher into the current middle class.
- **Freelancers losing their edge.** Many current white-collar freelancers will be replaced by automation, or have their work chopped up or devalued due to automation. As the gig economy eliminates opportunities, this could drive formerly middle-income workers into insecure, lower-income temp jobs. The end result could be a harder stratification of elite (freelance world) and everyone else (precariat) job classes.
- **Software biases.** Software will increasingly track and filter reputations, run crowdsourced job-market boards, and, in the case of some automated systems, run HR departments. Increasingly, software is restructuring job marketplaces to be driven not by worker preferences, but by system-generated priorities. Some workers may never have a chance to bid for higher-paying jobs because they are never shown those jobs by the system. And yet, as reputation systems improve, they could be a means to overcome hiring bias: the best worker should get the job regardless of age, sex, race, etc. This is particularly true in online work for workers with physical or mental disabilities. Reputation hiring could remove the stigma that such disabilities might evoke in real-world workplaces, opening up opportunities for previously marginalized workers. Reputation systems will need to allow users to carry their own information from system to system or platform to platform, lest workers get “captured” by the reputation platform(s) they use.
- **Formalizing the informal.** In lower-income markets, the tools of the gig economy could be used to move jobs from the informal to the formal sector—or vice versa. Employers could post work to crowdsourced job marketplaces for local workers to bid on, and payments could be made via the rapidly expanding network of mobile payment systems.

- **A pathway out.** Currently the gig economy does not offer clear paths for vulnerable populations to work their way out of poverty. However, in specific cases it may offer new opportunities to these groups. For workers with limited skills and limited access to training, work in the gig economy could be the foundation for building marketable job skills, at the same time offering traditional employers proof of diligence and competence. For example, a worker transitioning from manufacturing-line work to freelance work could gain needed (re)training while also building reputation equity.
- **Structural barriers.** Not all workers relying on crowdsourcing have the same advantages or wherewithal when it comes to bidding on jobs. Poorer workers may lack a computer at home to allow them to bid on the best gigs when these are first posted; or they may not have steady access to childcare, preventing them from bidding on jobs that fit their schedule. Workers without a car have to rely on public transportation, reducing the number of jobs they can take and reducing the number of hours in a day they can earn. This highlights that effective job centers might increasingly be a hybrid of daycare center and Internet café. Globally, access to online services is low due to low Internet penetration. For example, in India, less than 20% of population is online and in China this rate is still under 50%.⁷⁷
- **Reforming the safety net.** As the gig economy expands, governments will need to reexamine policies around income when the structure of work is not steady. This might need to go beyond issues of unemployment insurance and health insurance, to look at sick leave or paid time off. For instance, policies could support workers getting traditional benefits—healthcare, time off, disability—from a pool of firms, not just one company. For workers left vulnerable by gig work, this would allow the work and schedule flexibility of freelance or gig work, with the security of a social safety net.
- **New labor, new unions.** The nature of gig economy work means that workers may not fit into traditional labor-sector definitions of driver, stocker, admin assistant, etc. The emergence of Freelancers Union and self-organized workers groups like those created by TaskRabbit taskers or Mechanical Turk turkers shows that groups dedicated to helping gig workers are and will need to be structured differently than unions founded in the 19th century. As Sarah Jaffe, writing in *The Guardian*, points out, workers' organizations "will need to be as flexible, streamlined, and quick as the tech companies they target—but the basics won't change."⁷⁸ In the near future, workers trying to organize will need help understanding and learning best practices and policies to establish new worker-protection organizations.
- **A flexible life is a happy life.** While evidence is mounting of the negative effects of gig economics, it is not without benefits. The Netherlands is consistently rated among the happiest countries in the world, and labor experts say this is due in part to the fact that

Cui bono?

In a gig economy, there are economic benefits in maximizing efficiency and cutting overhead—potentially for both employers and workers. The question of who reaps these benefits is as divisive as the forecasts explored here. For those who favor the “freelance world” future, benefits accrue to workers, who can command higher rates from clients that don’t have to carry permanent staff or provide employee benefits. But those who warn against the shift to gig work see businesses and gigging platforms appropriating these benefits at the expense of the growing “precariat.”

many of its citizens—27% of men, 77% of women—work part-time. Crucially, most of this work is voluntary, not involuntary, part-time employment.⁷⁹ The Dutch example suggests that the work–life balance trumpeted by “freelance world” supporters can be genuine, at least when supported by adequate social insurance and business policies. Going forward, there could be opportunities to replicate versions of this model in other countries through a mix of guaranteed basic income, reduced working hours, and shifts in cultural ideas of work.

Flexible Work, Freelance Workers: Conclusion

This chapter has explored two concepts that are critical to shaping the future of work and the global workforce:

- **Scenario Group 1. Workforce Flexibility:** Competitive pressures and labor costs are pushing employers to reduce overhead and explore new ways to further increase the flexibility of their workforces.
- **Scenario Group 2. The Gig Economy:** Employers are increasingly relying on workforces composed of contract, freelance, and crowdsourced workers.

In the short and medium term, these forecasts signify tremendous disruption for workers, particularly for those workers already in a vulnerable economic position. Companies are shedding workers who entail expensive benefits, and replacing them with cheaper workers. This not only creates a race to the bottom in terms of wages, but also leaves workers less secure as the benefits they once depended on—sick leave, retirement plans, etc.—are eliminated. As infotech-enabled globalization proceeds, workers will compete intensively for every job that can be done remotely or that produces tradable goods.

These two scenario clusters are not mutually exclusive. Some aspects of a “freelance world” will exist side by side with the less hopeful futures of work flexibility and the rise of precarious work. It is unlikely that the benefits of “freelance world” will be widely shared without concerted interventions to bring this about. Ultimately, suitable policies could give workers the benefit of less dependence on institutions for a secure livelihood.

It is possible that workers will be able to gain the job-market leverage needed to enjoy the full benefits of flexibility. These benefits could include the opportunity to continually learn new skills, to choose one’s employment conditions, and to leapfrog over a disadvantaged background and build a merit-based reputation that attracts hirers (as is already occurring for some workers). But within present economic systems, this is a likely outcome for only a minority of workers.

Key findings: Flexible Work

Some other implications arise from these futures:

- **For vulnerable workers, the trajectory of the “precariat” scenario could further diminish options and aspirations,** as it knocks out more rungs of the already rickety upward-mobility ladder. The perimeter line of vulnerability would likely move higher into the current middle class.
- **New support structures for workers will be needed.** With more workers shifting into flexible/contract work, there will be growing need for support services that provide at least some of the institutional support that workers have received with traditional full-time

employment. This could include tax withholding, allocation for paid time off, health insurance, and retirement savings. Although all such benefits would come out of their compensation, flexible workers using such arrangements could enjoy a more conventional and familiar work experience.

- **Workforce analytics can provide better metrics of underprivilege.** Workforce analytics may benefit the poor and vulnerable. In an increasingly multicultural, diverse, and feminist society, metrics like race and gender may be less accurate measures of underprivilege than in the past. In this light, **policies** to correct workplace discrimination can be reoriented to focus on more tangible metrics of poverty and vulnerability, such as class, lack of access to education, and deficits in social capital.
 - **Gig economy methods could include formalizing the informal.** In emerging markets, the tools of the gig economy could be used to move jobs from the informal to the formal sector—or vice versa. (For more on the informal economy, see the sidebar “Similarities between Flexible/’Gig’ Work and Informal Work,” above.)
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Chapter 2. Automated Work

Cooperation and Competition

Introduction

Automation has sparked fears of worker displacement as far back as the early 19th century, when weavers attacked the weaving machines that threatened their livelihoods. In actuality, the historical pattern has been that automation and mechanization reduce labor needs, but that over time they change demand and spawn new opportunities in other sectors, gradually absorbing the displaced workers. The Luddites displaced by the weaving machines may have lost their jobs, but cheaper and more sophisticated textiles boosted the overall need for textile workers.

Now a massive new wave of economic disruption is being driven by a trifecta of machine intelligence, ubiquitous connectivity, and advanced robotics. This rising digital revolution, which is only beginning to show its scale and impact, is enabling the automation of routine and rule-based cognitive and physical work.

Although the technologies have changed, the debate over automation is following much the same lines as it did two centuries ago. Will automation unleash entirely new industries that can absorb the displaced workers? Or has technology advanced to a point where significant numbers of human workers simply won't be needed—permanently?

Both sides of this issue are explored in the two future topics in this chapter, along with their implications for workers:

- **Scenario Group 1. Human–Machine Cooperation.** The premise of this scenario group is that while automation will be disruptive, ultimately it will unleash innovation and change that generate new industries and jobs at all levels of employment. Four scenarios explore a future where the collaboration of humans and automated systems brings more benefits than problems.
- **Scenario Group 2. Machines Take Over.** This scenario group is based on the idea that automation will increasingly supplant workers in a wide variety of professions. It is divided into three scenarios that lay out the reasons these forecasters believe automation will lead to a sustained contraction in the need for human labor.

Automated Work: Key implications for the poor and vulnerable

- The displacement of workers through automation is a near certainty over the next two decades.
- Automation will require displaced workers to develop new job skills.
- New policies may be needed to support the human workforce.
- Automation will provide benefits that can improve quality of life across societies.

Scenario Group 1. Human–Machine Cooperation

The central premise of these scenarios is that ever more work will be done by humans and automated systems (including software and robots) working together. This human–machine collaboration is expected to lead to highly positive outcomes for the economy and the workforce at large: (1) Work that is more meaningful and rewarding for human workers, as they are freed from lower-skill, more menial jobs and move up the skills ladder, and (2) new levels of effectiveness as both the creativity of humans and the efficiency of automation are harnessed, allowing for results that go beyond what either human or machine could achieve singly.

The key takeaway is that human–machine cooperation *will not reduce the amount of work available to humans, but rather will reorder or reallocate work.*

However, while more meaningful work is the ultimate outcome of this forecast for workers, in the short and even medium term it could generate job churn and economic pain for those workers who are displaced by automated systems. Vulnerable populations, in particular, could be severely affected; first, because lower-skill jobs are likely to be hit first and hardest; and second, because these workers may have missed out on educational and attendant opportunities needed to prepare for this shift and to “upskill” in the face of acute disruption.

Scenarios for Human–Machine Cooperation

Forecasters suggest four key scenarios within human–machine cooperation, all pointing toward the idea of a future where the collaboration of humans and automation generally brings more benefits than problems.

- **Scenario 1: Job churn will increase.** Human and machine cooperation will result in job churn, with automation pushing some workers into higher-skill, better paid jobs and some into lower-wage, lower-skilled work.
- **Scenario 2: Human–automation workplace collaboration will grow.** Humans will increasingly be assisted by automation in the workplace, boosting productivity and spawning new outcomes.
- **Scenario 3: New skills will rise.** As human–machine cooperation grows, humans in the workplace will need to develop new skills and ways of thinking in order to collaborate with automated systems.
- **Scenario 4: New jobs and work will be created.** Human–machine cooperation will lead to the creation of new kinds of jobs.

This set of scenarios is dominated by the first two scenarios—ideas that have already begun to emerge in the public view, and are already creating a degree of anxiety among workers and economists as to their potential impacts on workers.

Scenario 1: Job churn will increase

Human–machine cooperation will result in job churn, with some workers moving to higher-skill jobs and some to lower-wage, lower-skilled work.

Scenario summary: Job churn will increase

Scenario type	Present trends accelerate
Scenario position	Mainstream
Key proponents	Mainstream economists and analysts
Impacts on poor and vulnerable	Harsher than average, with potential downgrading of work quality
Strength	Based on strong trend with high-likelihood drivers
Key drivers	Automation, machine learning, robotics
Timing	Continued intensification over next 20 years
Geography	Higher-income countries, with growing effects in middle-income countries

Forecasters in the human–machine cooperation camp believe that as automation moves further into the work world, employment levels will remain steady but workers will not. An economist interviewed for this project maintains that workforces have faced this before, when the rise of office computers displaced secretaries, stenographers, and filing clerks.⁸⁰

In this new wave of automation, artificial intelligence (AI) will mature in effectiveness and capacity, enabling it to eat into higher-skilled jobs than in the past and displacing knowledge workers and other professionals. Reid Hoffman, co-founder of LinkedIn, estimates that 40% of the US workforce could be displaced.⁸¹ But Hoffman believes that these workers can remain in the workforce. He says:

What happens with that 40% of the population? Well, they go on to other jobs. Now, the reason this topic is urgent is whether exponentiating Moore’s law changes the rule or not. There’s always painful dislocation. Can we make that pain a lot less? Can we make the time cycle shorter?⁸²

New generation of bellhops



Early deployments of robots at hotels and hospitals are taking on menial tasks, freeing up humans for other work. At the Aloft hotel in Silicon Valley, the Botlr “bellhop” robot (pictured) is being tested as a way to bring guests small items they request from the front desk, such as a razor or newspaper.⁸³ Meanwhile, at Garfield Innovation Center, Kaiser Permanente’s test hospital, robots are being tested as orderlies for tasks such as bringing clean bed-linens to patients’ rooms.⁸⁴

Image: Savioke (screenshot)

JP Gownder, an analyst with the Forrester Group, shares the view that automation will impact the mix of human jobs in the future, with minimal net job losses. According to Gownder’s forecast, only 9.1 million jobs will be lost to new automation technologies through 2025.⁸⁵ And he views the expansion of automation as a driver of demand for new types of work:

While these technologies are both real and important, and some jobs will disappear because of them, the future of jobs overall isn’t nearly as gloomy as many prognosticators believe. In reality, automation will spur the growth of many new jobs—including some entirely new job categories.⁸⁶

MIT economist David Autor shares this view, hinting at what sorts of job skills will still be required in the decades to come:

A significant stratum of middle skill, non-college jobs combining specific vocational skills with foundational middle skills—literacy, numeracy, adaptability, problem-solving and common sense—will persist in coming decades.⁸⁷

However, others see a more dire future for working populations, with jobs being eliminated, not shifted. (See **Scenario Group 2. Machines Take Over**, next in this chapter, for detailed coverage of this concept.) Oxford University researchers Carl Benedikt Frey and Michael

Delinking employment and productivity

Proponents of automation in the workplace point out that historically, automation has brought increases in both productivity and employment (albeit, often with a difficult transitional period). But as Brynjolfsson and McAfee point out in their bestseller *The Second Machine Age*, since 2000 productivity has increased while employment has stayed flat. They posit this as an indicator that this time, automation could take a lasting toll on the workforce.⁹⁰

Osborne have laid out this future in stark terms, projecting that 47% of all US employment is at risk of being automated over the next two decades.⁸⁸ The potential cause is not difficult to see, for example, in manufacturing: Guy Ryder, director-general of the International Labor Organization, observes that 200,000 new industrial robots come online every year, and estimates that in 2015 some 1.5 million of these robots are in use.⁸⁹

Driving this trend is the falling price of automated systems. A Baxter factory robot, for example, retailed for about \$25,000 in 2015, which works out to only around \$4/hour over the course of its working life.⁹¹ And the amount of work that robots and automation can handle is increasing, from around 10% of all work tasks in 2015 to a projected 25% by 2025.⁹² The cost of robots will likely continue to drop, and the amount of work they can do will increase as new designs and production facilities come online.

This future indicates, at the least, the potential for a fundamental realignment of work. Even if absolute job numbers remain stable, some doubt the transition will be handled in a way that helps vulnerable workers over the hump. Technology entrepreneur Vivek Wadhwa observes that just because growing numbers of displaced workers might need retraining, there is a clear lack of evidence that this retraining will actually be available to them:

Manufacturers who want to bring production back already complain that they can't find enough skilled workers in the United States for their automated factories. Technology companies that write the software also complain about shortages of workers with the skills they need. We won't be able to retrain the majority of the workforce fast enough to take the new jobs in emerging industries. During the industrial revolution, it was the younger generations who were trained—not the older workers.⁹³

Like Autor, technologist and PayPal founder Peter Thiel sees automation displacing workers and creating job churn, but he does not necessarily view this as a bad thing. In Thiel's vision, automation will strike at low-skill jobs, allowing humans to move into higher-skill (and thus higher-paying) jobs.⁹⁴ Thiel writes:

The alternative to working with computers in the new businesses they make possible is not a placid world where all the old jobs stay the same. It is one in which wages decline and prices rise as the whole world competes both to work and to spend.⁹⁵

Scenario 2: Human–machine workplace collaboration will grow

Humans will increasingly be assisted by automation in the workplace, boosting productivity and creating new synergies.

Scenario summary: Human-machine workplace collaboration will grow

Scenario type	Present trends accelerate
Scenario position	Mainstream
Key proponents	Mainstream economists, IT experts, labor force experts
Impacts on poor and vulnerable	Potential for skill deficits; could assist marginalized communities such as the disabled
Strength	Based on strong trend with high-likelihood drivers
Key drivers	Robotics, machine learning, datafication and sensing, big data
Timing	Continued intensification over next 20 years
Geography	Global, in high- and middle-income countries

Many foresee areas of work where automation will complement or extend human capabilities. PayPal founder Peter Thiel notes how the use of computers and humans together helped PayPal evolve past a critical problem of credit fraud:

We tried to solve the problem by writing software that would automatically identify bogus transactions and cancel them in real time. But it quickly became clear that this approach would not work: after an hour or two, the thieves would catch on and change their tactics to fool our algorithms. Human analysts, however, were not easily fooled... So we rewrote the software to take a hybrid approach: the computer would flag the most suspicious transactions, and human operators would make the final judgment.⁹⁶

AI is advancing in its capability to provide expert advice for more efficient—and intelligent—decision-making. Early efforts in software-aided decision-making can be seen in the growing use of smart software systems as the first-line filters for résumé reviews and talent analytics.⁹⁷ As human resources expert Meghan Biro states:

Advanced software algorithms can identify talent and match it to an organization's needs, pinpointing team players based on core traits and personality matching, making it an effective method for taking care of costly and time-consuming preliminary screening.⁹⁸

Moving beyond simple filtering, smart software will provide self-generated research, analysis and insights beyond what human can provide. This work will be guided and applied by human workers or operators.

Early uses of automation for decision-making are proving the concept. In Hong Kong, an algorithm appointed to the board of directors of Deep Knowledge Ventures—an investment firm—has already approved two investment decisions.¹⁰⁰ And IBM has begun deploying its Watson system for use in medical research, drug discovery, and diagnosis; early results have prompted users to state that Watson is better than human doctors at diagnosing lung cancer.¹⁰¹

Machines managing humans

Human–machine cooperation is not restricted to certain kinds of work. Researchers at the Institute for the Future (ITF) created a software program called iCEO, which can perform tasks that are normally the purview of management. iCEO can execute a project’s entire workflow (in ITF’s prototype, a research report), from hiring freelancers via oDesk, to assigning them research tasks, reviewing and sorting research results, and then sending the research to freelancers to write up as a report. At least in theory, iCEO could automate a broader variety of management responsibilities. Writing about the program, ITF’s Devin Fidler commented:

We asked, “Is it possible to sit down at a laptop, launch iCEO, and ‘code’ the preparation of a project worthy of a Fortune 50 company into existence—without needing anyone to act as the project’s manager?” And somewhat surprisingly, that answer is yes.¹⁰²

In medicine, automation and AI could combine to reshape the responsibilities of medical professionals. At the University of California–San Francisco Medical Center, early trials of automated prescription dispensing freed pharmacists from the mundane work of literal pill-counting. The pharmacists had more time to spend with patients and doctors, allowing them to better understand patient issues and deliver better pharmacological solutions.¹⁰³

Apple’s Siri points to the development of another manifestation of human–machine cooperation: virtual assistants. AI capabilities will grow to the point that they can act as virtual digital experts, providing their users with knowledge instantly, or even preemptively. This is being facilitated by advances in machine learning. For instance, via machine learning, intelligent systems have learned how to identify objects in photographs, understand video images, and play videogames.¹⁰⁴

Better. Stronger. Faster. More.

Automation is not about just doing things faster and cheaper. It is often about doing things faster and better, in a continual cycle of improvement.

For example, WorkFusion is software that doesn’t only automate clerical work; it learns how to break down jobs and tasks into discrete parts, performs the parts it can, and farms out what it can’t to humans. But as it monitors its human partners, WorkFusion learns how to do those tasks it couldn’t at first—eventually enabling it to replace the human element.⁹⁹

Amazon's new robots

Amazon now has 15,000 Kiva robots (pictured) at work across 10 distribution centers.¹⁰⁵

Image: Kiva Systems (screenshot)

As machines learn more, they will be able to provide a host of services—homework instruction for students, planting and harvesting expertise for farmers, ingredient advice for cooks, clues or insight into crimes for law enforcement and security services, etc.

New robots and automated services will support workers in new venues. Amazon's Kiva robots now do all the work of collecting Amazon's goods for shipment and depositing them with a human worker to pack and ship.¹⁰⁶ Agricultural workers, too, will soon have robotic co-workers in the form of drones and farm robots that can prune grapevines or determine the amount of watering needed.¹⁰⁷

And while workers may fear losing their jobs to robots, some studies have found that companies that deployed robots in warehouses or factories increased—rather than cut—their hiring.¹⁰⁸

Scenario 3: New skills will rise

As human–machine cooperation grows, humans in the workplace will need to develop new skills and ways of thinking in order to collaborate with automated systems.

Scenario summary: New skills will rise

Scenario type	Aspirational based on current trends
Scenario position	Positive mainstream
Key proponents	Mainstream economists, IT experts, business analysts
Impacts on poor and vulnerable	Could provide “better” jobs; danger of new skill deficits
Strength	Moderate
Key drivers	Robotics, machine learning, datafication and sensing
Timing	Possible expansion over next 20 years
Geography	Global, beginning with higher-income countries

Futurist Kevin Kelly sums up the need for new job skills succinctly: “You’ll be paid in the future based on how well you work with robots.”¹⁰⁹ An economist interviewed for this report supported Kelly’s idea, stating that in looking at the future of human and machine cooperation, we should focus on where machines complement human work—not on where machines substitute for workers.¹¹⁰

Being able to work side-by-side, literally and figuratively, with AI machines and other automated systems will be a key job skill of the future. For many jobs, workers will not merely operate a computer, they will collaborate with a computer. In some cases workers will need new skills for dealing with and processing the work of automated systems; in others, they will need new technical knowledge for managing automation systems.

An emerging core competency for cooperating with AI will be mental flexibility—allowing a worker to trust in the machine system while always verifying that that system is working correctly.¹¹² McKinsey business analysts Martin Dewhurst and Paul Willmott sum this up by stating:

Smart machines should get better and better at telling

The robot that learns from kids



A Swiss school has created a robot that helps children learn by making students the teacher. Children interacting with the CoWriter robot are charged with showing the robot how to write correctly. When the robot (purposely) does a poor job, the children demonstrate the correct or better way to write. By teaching the robot, the students learn the proper techniques.¹¹¹

Image: CHILL, Ecole Polytechnique, Federale de Lausanne (screenshot)

managers when they have a problem. Early evidence of this development is coming in data-intensive areas, such as pricing or credit departments or call centers—and the same thing will probably happen in more strategic areas.¹¹³

Dewhurst and Willmott state that workers of the future will need to be able to judge which data are important, which are not, and how to prioritize.¹¹⁴ It is this blending of automated data analysis with human data review that will bring about better decision-making.

Reid Hoffman, LinkedIn's founder, says adaptability will be key factor to continued human employment, in that it is easier and cheaper to re-train or move human workers to new tasks than it would be to retool a robot or an automated assembly line.¹¹⁵

In many cases, human workers may need to take direction from a machine. Thus, being able to accept that the system may know better will also be a critical human skill. Fortunately for workers, early research is showing that in some contexts workers seem to be happier taking direction from machines than from people.¹¹⁶

Scenario 4: New jobs and work will be created

Human–machine cooperation will lead to the creation of new kinds of jobs.

Scenario summary: New jobs and work will be created

Scenario type	Cyclical/historical
Scenario position	Mainstream
Key proponents	Mainstream economists, IT experts, business analysts
Impacts on poor and vulnerable	Could provide “better” jobs if scenario plays out as stated
Strength	Moderate
Key drivers	Robotics, machine learning, datafication and sensing, big data
Timing	Possible expansion over next 20 years
Geography	Higher-income countries

As automation and AI move into the workplace they will displace workers, but many experts looking at the future of work argue that human–machine cooperation will also create jobs. In a 2014 poll conducted by Pew Research Center, a (slim) majority of expert respondents (52%) agreed that “Technology will not displace more jobs than it creates by 2025.”¹¹⁷

Marc Andreessen, Netscape inventor and Silicon Valley venture capitalist, echoes this optimism, saying: “Just as most of us today have jobs that weren’t even invented 100 years ago, the same will be true 100 years from now.”¹¹⁹

David Autor of MIT posits that technology and automation may eliminate humans from certain jobs, but not from the workforce.¹²⁰ And in his view, the jobs that remain will be better, higher-skill jobs that resist the encroachment of automation. According to Autor, this will give rise to broader classes of paraprofessional work that require interpersonal and problem-solving skills that automation cannot (yet) provide.¹²¹ But while some workers will be able to retrain or “upskill” to these higher-level jobs, Autor also acknowledges that some displaced workers will be compelled to find work lower on the skill/compensation chain.¹²²

However, Autor sees automation bringing new opportunities for middle-skill work:

AR: an early example

Augmented reality (AR) systems are emerging as an early example of intelligent system–human cooperation. Lockheed Martin has developed an AR repair system for its F-35 fighter jet program. Workers on the F-35 assembly line look at the section they are building through special AR glasses, which project a holographic overlay onto their field of view. This overlay shows the worker where every part should go, or how the parts come together, so there are fewer errors in assembly. Not only does this speed up production, it reduces the need for worker training. It is hoped that the AR system will cut down on mechanical failures (dangerous for pilots) as well as reduce the need for costly repairs.¹¹⁸

The outlook for workers who haven't finished college is uncertain, but not devoid of hope. There will be job opportunities in middle-skill jobs, but not in the traditional blue-collar production and white-collar office jobs of the past. Rather, we expect to see growing employment among the ranks of the “new artisans”: licensed practical nurses and medical assistants; teachers, tutors and learning guides at all educational levels; kitchen designers, construction supervisors, and skilled tradespeople of every variety; expert repair and support technicians; and the many people who offer personal training and assistance, like physical therapists, personal trainers, coaches, and guides. These workers will adeptly combine technical skills with interpersonal interaction, flexibility, and adaptability to offer services that are uniquely human.¹²³

From this perspective, automation could prove a long-term benefit to poor and vulnerable workers by creating new paths to skills acquisition that are an alternative to four years of higher education.

Human–Machine Cooperation: Implications for the poor and vulnerable

- **Underrated labor disruption?** Forecasters in this group expect some employment disruption, but generally believe that—as has occurred in the past—automation will lead to more and better jobs for human workers.¹²⁴ However, this is a long-term view that ignores serious short-term disruption and attendant problems for displaced workers. Even many jobs that today are being billed as alternatives to traditional low-skill work are facing elimination; a prime example is Uber drivers, since both Uber and Google are working to develop automated taxi fleets. Historically, new technologies have often displaced workers during a chaotic interim period, creating loss of income and even livelihoods, until the job market adapts and new training and roles can be developed for human workers.¹²⁵
- **Suppressing wages.** Forecasters in the human–machine cooperation camp, even when highly optimistic about this future, often express real concern that wages could drop for workers anywhere on the skills spectrum. (For more on the negative aspects of machines and work, see **Scenario Group 2. Machines Take Over**, next.)
- **A bridge across the gaps.** As job churn and displacement upset the labor market, there will be a need for social programs or institutions that serve to bridge the period of disruption with what comes after it, whether this is a new equilibrium in job markets or something else. (See **Chapter 4. Transforming Work**.)
- **New opportunities for people with disabilities.** For people with disabilities, machine–human cooperation could open up new options for employment. For example, Arizona State University's Center for Cognitive Ubiquitous Computing is developing technology to facilitate better social interactions for visually impaired people, by providing information about nonverbal social cues and gestures.¹²⁶

- **Retraining.** There will likely be a huge need for retraining programs for re/displaced workers in the near and medium term. Combined with repurposed vocational training, this could create a more socially acceptable skills-training path, away from the binary choice of college or no college.
 - **New education priorities.** In addition to retraining, a human–machine cooperation future would require some reordering of educational priorities. Early efforts at this are underway, with the recent emphasis on teaching kids to code, but it is not clear whether this is actually relevant to the problem. Creating new curricula, and making it available widely, will be essential.
 - **Protecting against machine bias.** As people increasingly rely on programs and algorithms, the danger of algorithmic discrimination will rise. In some cases, this will be due to these systems being created by people who choose to import their biases or prejudices into algorithms. In other cases, machines will “learn” bias by observing human behavior. Inadvertence may be the chief problem with creators, as they often overlook the needs and circumstances of vulnerable populations.¹²⁷ Efforts will be needed to ensure sure these systems are not used as a tool or driver of exclusion or to reinforce social inequities, either through how they are created or how they are used.
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Scenario Group 2. Machines Take Over

The “machines take over” perspective raises concerns that automation will make the labor of a growing number of workers unnecessary—permanently.

Automation greatly reduced the need for physical labor over the course of the Industrial Revolution and agricultural mechanization. The proponents of the Machines Take Over perspective forecast that a similar process will occur in the 21st century for ever-more physical tasks, as well as for many kinds of mental labor. Both the observers who see the newest wave of automation technology as positive trend and those who see it pessimistically largely agree on its potential near-term impacts: millions of workers from all sectors will be displaced from the workforce over the next two decades and beyond. The more pessimistic perspective expressed in this forecast group further maintains that many workers will never find work in new industries, because new industries and old will increasingly prefer automation.

Pattern recognition is key

The new wave of automation does not, and need not, involve “artificial intelligence” in the science fiction sense. Instead it combines cheap and powerful computers, large digital datasets, sophisticated machine-learning systems, and robotics. While these systems can in no way “think,” the sheer quantity of computation can take on a quality all its own, enabling these systems to identify and act on patterns in a wide variety of routine cognitive tasks.

Thus, this wave of automation is potentially massive because so much of human work relies on conscious and unconscious pattern recognition. Not only is the act of driving subject to automation: anything from medical monitoring, legal work, or journalism, to creative efforts like drawing or music writing, are equally exposed. In any situation with underlying patterns, new automation technologies are becoming able to recognize and act on those patterns with increasing sophistication.

Focusing tightly on the clear and tangible consequences of automation—without also considering the potential for new consumer demands and new jobs—is what some conventional economists term the “Luddite fallacy”: the belief that automation will be a net destroyer of labor demand and employment.¹²⁸ To conventional economists, growth in productivity has historically always fed long-term job growth. The “machines take over” school of thought counters that, since automation and robotics are going to be able to target so many types of work, new industries will be founded on the use of automation, not on human workers.

Scenarios for Machines Take Over

The essence of this scenario group is that job disruption from automation will not be temporary—rather, automation will permanently supplant workers in a wide variety of professions, and new kinds of work will not emerge on a sufficient scale to replace what has been lost. This perspective is divided into three scenarios, which lay out the reasons these

forecasters believe automation will lead to a sustained contraction in the need for human workers.

- **Scenario 1: Technology-driven unemployment looms.** The growing sophistication of automation will reduce demand for human labor, leading to a shrinking human workforce.
- **Scenario 2: Automation will threaten a wider range of jobs.** Automation will continue to move up the skill ladder, displacing a growing range of middle- and high-skill/high-wage jobs
- **Scenario 3: Work will be taskified.** Human work will increasingly be restructured into discrete tasks in order to facilitate automation, and will be parceled out to either humans or machines at the discretion of employers.

Scenario 1: Technological unemployment looms

The growing sophistication of automation will reduce demand for human labor, leading to persistent technological unemployment.

Scenario summary: Technological unemployment looms

Scenario type	Present trends accelerate
Scenario position	Dissenting mainstream
Key proponents	Dissenting mainstream economists, IT experts, technology writers and journalists
Impacts on poor and vulnerable	Potentially permanent loss of economically viable work
Strength	Strong
Key drivers	Robotics, big data
Timing	Gradual but growing intensification over the next 20 years
Geography	Global, in higher-income countries but accelerating in middle- and lower-income countries

In their book *The Second Machine Age*, Erik Brynjolfsson and Andrew McAfee lay out the argument that continuing innovation in automation and digitization will drive down demand for human labor:

Rapid and accelerating digitization is likely to bring economic rather than environmental disruption, stemming from the fact that as computers get more powerful, companies have less need for some kinds of workers. Technological progress is going to leave behind some people, perhaps even a lot of people, as it races ahead.¹²⁹

Brynjolfsson and McAfee are currently the most prominent academic thinkers analyzing how advances in robotics and analytics could impact future labor markets. According to their line of argument, digital automation technologies will increasingly shift the economic playing field away from both capital and labor. Innovation and people with ideas will become the critical resource in the 21st century, as Brynjolfsson and McAfee see it:

Digital technologies increasingly make both ordinary labor and ordinary capital [into] commodities, and so a greater share of the rewards from ideas will go to the creators, innovators, and entrepreneurs. People with ideas, not workers or investors, will be the scarcest resource.¹³⁰

For workers with unique and useful training, skills, and ideas, therefore, they believe this will be one of the best times to be a worker.

However, other observers are concerned that many current workers do not have the skills required to thrive in an increasingly automated economy. According to Tom Standage, digital editor of *The Economist*, the rapid rate of change could be harmful for many workers:

Previous technological revolutions happened much more slowly, so people had longer to retrain, and [also] moved people from one kind of unskilled work to another. Robots and AI threaten to make even some kinds of skilled work obsolete (e.g., legal clerks). This will displace people into service roles, and the income gap between skilled workers whose jobs cannot be automated and everyone else will widen. This is a recipe for instability.¹³¹

While some displaced workers may be able to move into other growing industries, or retrain successfully there are concerns that the net effect of automation will be to destroy jobs faster than new jobs are created. This is because automation will increasingly be able to deliver superior productivity, reduced labor costs, and lower management overhead. The consequences of this trajectory of automation could be devastating for many middle-class and lower-income workers. Justin Reich, a fellow at Harvard University's Berkman Center for Internet & Society, puts it succinctly:

I'm not sure that jobs will disappear altogether, though that seems possible, but the jobs that are left will be lower paying and less secure than those that exist now. The middle is moving to the bottom.¹³³

Skilled, meaningful, low-paid

Although automation may create a shortage of jobs in the future, this does not necessarily mean that there is any shortage of meaningful and useful work that can be performed by humans. However, such work may not be well-paid. According to some analysts, systemic problems in the labor market cause many high-value jobs to be undercompensated. This is clearly seen in creative professions like art, drama, and music, where a few top performers command high salaries, but average compensation is very low.

One sector that could absorb many displaced workers is the "emotional work" sector, according to sociologist Zeynep Tufekci: "Consider that emotional labor is all that's left to escape to as human workers, after manual and mental labor have been already been mostly taken over by machines."¹³⁴ While the need for work in the emotional sector is great (e.g., caretaking, childcare, teaching, mentoring, health support), compensation in this sector is systematically

Coming your way



The first non-experimental automated truck started running on Nevada highways in May 2015. Automated driving systems are expected to reach technological and commercial feasibility and become widely available between 2020 and 2030.

Trucking is unique in providing a middle-class income to workers with only a high school education. In the United States alone, there are currently 3.5 million workers in the trucking industry, and many others in the foodservice and hospitality industries who cater to truckers.¹³² Long-haul truckers face obsolescence from automation, as well as growing competition from automation if they try to shift to other forms of delivery or transportation work.

Image: Scania Group (Flickr)

diminished by the fact that it is based purely on the economic value of the work performed. Tufekci argues that these current arrangements will need to be transformed. “The country—and the world—is awash in underemployment and unemployment, and many people find caregiving to be a fulfilling and desirable profession,” she says. “The only problem is that we—as a society—don’t want to pay caregivers well and don’t value their labor.”¹³⁵

Scenario 2: Automation will threaten a wider range of jobs

Automation will continue to move up the skill ladder, displacing a growing range of middle- and high-skill/high-wage jobs.

Scenario summary: Automation will threaten a wider range of jobs

Scenario type	Present trends accelerate
Scenario position	Mainstream
Key proponents	Technologists, mainstream economists, employment scholars
Impacts on poor and vulnerable	Accelerating loss of available work
Strength	Strong
Key drivers	Machine learning, robotics, big data, automation
Timing	Gradual but growing intensification over the next 20 years
Geography	Global, in higher-income countries but accelerating in middle- and lower-income countries

Several researchers have attempted to quantify the potential employment impacts of the rising wave of automation. McKinsey Global Institute's report *Disruptive Technologies: Advances That Will Transform Life, Business, and the Global Economy* took a global approach to assessing the impacts of workforce automation. Their research forecasts that by 2025, hundreds of millions of global workers will be impacted by automation. In high-income economies, they found, it is knowledge workers rather than manufacturing workers who will face the greatest disruption:

The content and scope of work of 110 million to 140 million knowledge workers around the world may change. The annual effect of automation ranges from \$35,000 to \$65,000 per worker [i.e., in salary savings], depending on the occupation. Yet the lion's share of the total economic impact, which could reach \$6.7 trillion a year, will be captured by developed rather than developing countries [due to their concentration of knowledge workers].¹³⁶

However, manufacturing workers may not be spared disruption from automation. Falling costs for industrial robotics are anticipated to make significant impacts on the global

A skyscraper built in a month?

China's Broad Group has developed a modular system of skyscraper construction that allows skyscrapers to be built at a pace of three stories per day. The approach relies on standard interlocking modules that are factory-constructed offsite. The modules can be pre-plumbed and pre-wired, with even final finishes installed while they are still in the factory. Onsite, the modules need only to be placed and interconnected, making assembly extremely fast.¹³⁷ Broad's approach to modular construction hints at how construction jobs may be automated in the future: with construction broken down into repetitive tasks in a controlled factory environment, making automation more efficient than human laborers.

manufacturing workforce:

By 2025, the average price of complex, high-precision robots used in production operations may fall below \$75,000. Today prices are falling by more than 10% annually, and the number of these robots is growing even more rapidly—by 40% worldwide in 2011. As a result, researchers estimate that by 2025, robots may jeopardize from 25 million to 40 million jobs in developed countries and from 15 million to 35 million in developing ones.¹³⁸

Professors Carl Benedikt Frey and Michael Osborne at the Oxford Martin School have mapped out a bottom-up model for how automation could impact the workforce over the next ten to 20 years. Using job category descriptions from the US Department of Labor, they developed a statistical model to evaluate the risks of automation in each category based on whether the necessary job skills could be performed by state-of-the-art or emerging automation and robotics technologies. They conclude that nearly half of the US workforce faces significant threats from automation in the next two decades:

According to our estimate, 47% of total US employment is in the high risk category, meaning that associated occupations are potentially automatable over some unspecified number of years, perhaps a decade or two. It shall be noted that the probability axis can be seen as a rough timeline, where high probability occupations are likely to be substituted by computer capital relatively soon.¹⁴⁰

A two-phase process

Frey and Osborne forecast that automation will proceed in a two-phase process. Early advances in automation will be implemented in a variety of white-collar and blue-collar professions:

The authors believe this takeover will happen in two stages. First, computers will start replacing people in especially vulnerable fields like transportation/logistics, production labor, and administrative support. Jobs in services, sales, and construction may also be lost in this first stage.¹⁴¹

These jobs will be in the earliest categories subject to widespread automation. For example, improvements in driverless vehicle technologies could quickly decimate employment in trucking, delivery, and driving professions. While the forecasted declines in sales jobs may seem counterintuitive, given the perceived “high-touch” nature of sales, in fact there are many sales

Creative judgment from an algorithm



Flickr, the image-sharing site, has developed a CrowdBeauty algorithm that can automate the identification of “beautiful” images. Flickr crowdsourced human evaluation of 10,000 images in four categories as a baseline which the CrowdBeauty algorithm can use to find new images that rank highly in criteria such as contrast, composition, or color pattern.¹³⁹ In the future, such technologies could use calculated aesthetic criteria to generate entirely new “beautiful” images. Creative human activities that have underlying patterns that can be modeled and analyzed will increasingly be subject to automation.

Image: Clotee Allochuku (Flickr)

jobs such as telemarketer, cashier, or counter representative that are easy targets for automation. Construction jobs, too, may look like a surprising addition at first glance, but trends in modular construction processes mean that more construction work is performed in factory environments where automation and robotics prevail.

Low-skill and low-wage jobs are likely to be hit first and hardest, according to the researchers:

As robot costs decline and technological capabilities expand, robots can be expected to gradually substitute for labor in a wide range of low-wage service occupations, where most US job growth has occurred over the past decades. This means that many low-wage manual jobs that have been previously protected from computerization could diminish over time.¹⁴²

In the second phase, high-skill and high-wage professions will be slower to be automated, according to Frey and Osborne. Significant advances in AI will be required before professions like management and engineering can be subject to full automation.

If Frey and Osborne are correct, automation would ultimately bring an end to today's "U-shaped" economy in which strong job growth occurs mainly in the low-skill and high-skill extremes of the workforce. Instead, what could be emerging is a "J-shaped" economy in which automation eliminates jobs for low-skill and medium-skill workers, and only limited job growth occurs among the professions that involve high skills and high complexity.

Scenario 3: Work will be taskified

Routine cognitive and physical work activities will be broken down into discrete tasks, with automation systems growing increasingly capable of automating these simplified work tasks.

Scenario summary: Work will be taskified

Scenario type	Present trends accelerate
Scenario position	Specialized mainstream
Key proponents	Technologists, mainstream economists, technology analysts
Impacts on poor and vulnerable	Low-skill workers potentially left with performing repetitive tasks to train machine-learning systems
Strength	Moderate
Key drivers	Machine learning, robotics, big data, automation, robotics, datafication, sensing
Timing	Gradual but growing intensification over next 20 years
Geography	Global, in higher-income countries but accelerating in middle- and lower-income countries

Another group of forecasts focuses on how the rise in automation is not only affecting the kinds of work that will be available to humans, but also how that work will be done.

In this scenario, workers wind up supporting the automated systems that are poised to replace them. For them, the future of work is a perpetual migration along the edge of automation, in which taskification allows their work output to be used as the raw data that enables automated bots to learn, and eventually take over, their positions.

For most businesses, the route to automation will be to break down the jobs currently performed by humans into multiple, discrete tasks. This task-centric approach will facilitate assigning some roles to humans and others to automated systems, as appropriate. Martin Ford, author of *The Lights in the Tunnel*, argues that taskification will accelerate the advance of automation:

Robots aren't just in factories threatening blue-collar workers. It is really now anyone who sits in front of a desk doing any kind of job that involves manipulating information—especially if it is more routine and formulaic.¹⁴³

As an example Ford cites Work Fusion, a startup whose software can automate business projects currently performed by human workers. Work Fusion analyzes existing jobs, then divides them into micro-tasks. Repetitive tasks are automated—while those that require human input are outsourced to crowdsourcing platforms, where inexpensive freelance workers can

provide the necessary human inputs to train automated expert systems. Ford sums up: “As the freelance workers do their jobs they are, in effect, training the system to replace them. That’s a pretty good preview of what the future looks like.”¹⁴⁴

These issues are explored in greater depth in the scenario titled **Rise of crowdsourcing**, in **Chapter 1. Flexible Work, Freelance Workers—Scenario Group 2. The Gig Economy**.

From turks to bots

Systems disruption analyst and author John Robb takes this model of taskification one step further. Robb forecasts the emergence in the next 20–30 years of a “bot economy” in which large numbers of crowdsourced workers perform the work that cannot yet be done by automated systems. These workers provide automated systems with rich streams of data, enabling algorithmic systems to gradually model and develop the automated processes that can replace human labor:

As you can imagine, training bots to do everything a human mind can do is going to be a HUGE industry. An industry so big it is going to create some of the biggest companies in the world (Turk companies could employ hundreds of millions of people all over the world, making them 100x larger than the largest employers in the world today).¹⁴⁶

(By “Turk companies” Robb is referring to Amazon’s Mechanical Turk, the first online marketplace for crowdsourcing micro-tasks to human workers.)

Robb further elaborates a dystopian view of what taskification could mean for human workers. With learning systems able to autonomously develop algorithms that mimic human decision-making, he forecasts that a vicious cycle will emerge in which a crowdsourced workforce migrates to the bleeding edge of automation, providing expert systems with the data inputs these systems need to further automate crowdsourced work. Eventually the work is fully automated:

You can guess what this dynamic will look like. Micro-loan offered at extortionate interest rate to finance training for turking job. Turking job lasts a couple of months. Earnings are garnished to pay loan. Bot eats job. New loan required for more training. Cycle repeats.¹⁴⁷

Automated ordering



In the US, Panera Bread, Applebee’s, and Chili’s restaurant chains all have announced plans to replace some of their service staff with automated ordering kiosks or tabletop tablet devices. The devices will enable customers to order and pay for food without needing a server.¹⁴⁵

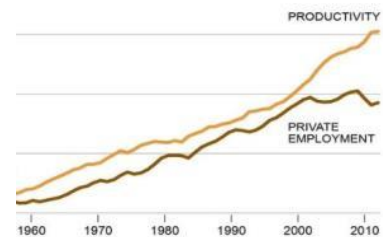
While the service component is more central in high-end restaurants, value-oriented segments like quick-service and fast-food restaurants may see automation accelerate. McDonald’s is developing smartphone apps that customers can use to order and pay on the go, then drive directly to the drive-thru window for pickup.

Image: Clotee Allochuku (Flickr)

Machines Take Over: Implications for the poor and vulnerable

- **Automation-induced poverty.** Automation will create new classes of vulnerable workers. In professions undergoing rapid automation, including those typically occupied by middle- and upper-income people, workers could find their skillsets rendered irrelevant by technology, forcing them to seek employment in low-skill service work. Negative consequences will fall hardest on those with limited social capital, such as single mothers, new immigrants, and new entrants to the workforce.
- **Automation targets high labor costs.** In terms of current jobs, automation will disproportionately threaten workers in high-income economies, as even low-wage jobs in these places are expensive compared to global labor costs. For lower-income economies, automation will likely shift the course of future job growth rather than causing widescale job losses. Mobile banking in Africa is an example—all the jobs for tellers and bank office workers will simply never exist, since in many countries their jobs will have always been done by software. An exception is manufacturing for export, where many workers face competition from robotics in the next decade and beyond. (See **Manufacturing Work** scenario group in **Chapter 3. Emerging Work.**)
- **Protecting workers from automation.** In countries with democratic systems, displaced workers are also voters. The growing ranks of the poor and vulnerable may increasingly demand that their governments enact job and wage protections. Robotics and automation systems could be penalized with targeted excise taxes, raising the costs of automation and partially defraying the costs of unemployment benefits for displaced workers. These punitive taxes could be waived by developing explicit quotas for keeping human employees on staff (e.g., backup driver for an automated truck)—thereby restricting the use of automation to tasks where significant productivity or quality gains justify the costs. However, this kind of protection might be offered more to middle-class and higher-income workers, based on political power.
- **Increasing support for social insurance.** Widespread unemployment would impact public attitudes toward the social safety net. According to Jim Pugh, director of analytics for the Obama reelection campaign, automation-induced unemployment could change the US political environment in the next two decades. In the short term, tools like the Earned Income Tax Credit or other kinds of income support could be used to assist the underemployed. In the longer term, interventions like a

Delinking productivity growth from job growth



In the US economy, the long-term trend over the 20th century was that productivity increases helped drive increases in employment. Since 2000, however, employment growth has failed to follow productivity growth.¹⁴⁸ This could be an indicator that automation is already beginning to reduce the demand for workers.

If automation is the reason why productivity and job growth are no longer linked, then the United States could prove to be a canary in a coalmine. Other economies around the world will follow in its footsteps—facing stagnant job growth as they too adopt automation.

Image: Bureau of Labor Statistics (screenshot)

universal basic income may gradually move toward the political mainstream.¹⁴⁹

- **Subsidizing job preservation.** Governments could change the business logic for replacing human workers with automated systems. Government could give businesses direct subsidies to retain or hire human workers—thereby making a human workforce cheaper than automated systems. These subsidies might be in the form of a per-worker tax credit that could be applied against corporate income taxes, or of tax subsidies for job sharing. Job subsidies could incentivize employers to perform on-the-job skills training. To fully change workforce economics, policymakers may also need to address existing laws mandating employee benefits, and eventually seek to shift the burden of these benefits from employers to direct provision by the government. (See **Chapter 4. Transforming Work** for more on related ideas.)
 - **Blurring of class barriers.** Expanding mass unemployment would reshape class barriers that are based on employment status and blue/pink/white-collar job perceptions. If full-time jobs and other mainstream employment models become the exception rather than the rule, the social stigma of unemployment would be substantially reduced. While many white-collar and middle-class workers will face considerable economic disruption, the poor and vulnerable could improve their relative social status, even if their absolute quality of life remains stable or declines.
 - **Closing the transport gap.** Driver services like Uber and Lyft and (eventually) automated vehicles could transform public access to private vehicles. While automated cab services would dramatically reduce employment in that sector, cab availability could expand, and automated driving systems and competition could drop per-ride costs dramatically. This could free the poor from reliance on public transit, and improve quality of life overall by reducing or eliminating the expenses of owning a car for many households.
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Automated Work: Conclusion

This chapter has explored two different scenario groups related to the future of work and automation: **Scenario 1: Human–Machine Cooperation** and **Scenario 2: Machines Take Over**. These two perspectives dominate the thinking around how automation will impact the future of both work and workers over the next two decades.

The divergence in these forecast perspectives is largely in their long-term outcomes. In the short and medium term, both views agree that there will be substantial job displacement for workers and an ongoing challenge to keep displaced workers from falling into poverty. Both see an increasingly pressing need to identify effective ways to manage automation's impacts on human livelihoods with meaningful interventions that mitigate and reverse the harmful effects.

The wave of disruption also holds an element of promise alluded to by many analysts: in the decades to come, it is possible that nearly half the workforce will no longer be needed to perform routine jobs that may be dangerous, repetitive, and low-paid. The upshot is that all of this human labor has the potential to be redirected into other forms of value creation. Perhaps this value creation will be in the form of new jobs, or perhaps new social and economic arrangements will enable this value to be expressed in new models for what it means to “work.” (These issues are explored in greater depth in **Chapter 5. Transforming Work**, in several of the scenarios for developing an “abundance economy.”) Possibly, there will be the potential to enjoy the benefits of automation and at the same time benefit from goods and services produced under these new frameworks of secure livelihoods. Determining what social, economic, and political changes need to occur to take advantage of this opportunity is a large challenge for society—but pursuing novel solutions may prove much more fruitful than lamenting the threats posed by automation.

Key findings: Automated Work

Despite the ultimate divergence of the two perspectives on automation, some common implications emerge.

- **The displacement of workers through automation is a near certainty over the next two decades**, even if the pace and extent is less clear. Workers, employers, educators, and policymakers all need to prepare for this displacement and to develop effective interventions to minimize the potential harms.
- **Automation will require displaced workers to develop new job skills**, as their old skillsets are made redundant by software and robotics. Developing new skills through higher education is slow and expensive, and particularly challenging for older workers. New forms of training that are fast and cheap need to be developed, with the aim of enabling workers to transition into new fields with only a few weeks or months of training. Online instruction or deep immersion “boot camp” trainings could be effective approaches to these goals.

- **New policies may be needed to support the human workforce.** Currently, many countries use employer mandates that target wages and benefits to enact public policy goals. These policies have the effect of raising the cost of human labor—which may be counterproductive in the face of growing automation. Leaders may need to shift their emphasis to public policies that support and even subsidize the human workforce, perhaps through direct provision of employee benefits (e.g., healthcare, pension, unemployment) via government subsidies.
 - **Automation will provide benefits that can improve quality of life across societies.** Automated systems will provide significant social benefits in the form of new capabilities and efficiencies, reduced risks of human accident, and higher product and service quality. All of society will share in these benefits through new services, new conveniences, and lower prices. While these benefits will be diffused throughout the economy, in aggregate they will provide significant options for improving quality of life. More significantly, as mentioned above, automation has the potential to free up human labor for more rewarding and socially valuable purposes.
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Chapter 3. Emerging Work

Changing Pathways to Sustainable Livelihoods

Introduction

A large number of workers in lower-income countries—often the majority—are employed in informal agricultural work. Many suffer with insecure livelihoods.

As the United States and other modern industrialized nations developed economically, many rural agricultural workers relocated to urban centers, often finding jobs in industry, and inspiring development models that became popular in the mid-to-late 20th century.¹⁵⁰

Today, workers in lower-income nations face a much different economic landscape and labor marketplace. Work is being restructured along global lines, distributed wherever manufacturing and services are available on the most attractive terms—and the cost of labor is but one among many such terms. Flexible and contingent work arrangements are on the rise, shifting the balance of power between workers and their employers. Manufacturing and, increasingly, knowledge work are becoming more automated and globally competitive. The agricultural workforce in lower-income countries is becoming older and more female. Over the next two decades, some observers believe that global demand for skilled and educated workers will outrun the supply of such workers (though others suspect the reverse will be true).

In the face of all these forces and trends, workers in lower-income nations will need additional, often novel, pathways to secure livelihoods. In the near and medium term, the disruptions produced by these forces will offer both risks and opportunities for the poor and vulnerable.

This chapter addresses two important aspects of work in lower-income countries, selected by the Rockefeller Foundation because of their current importance to the social sector. Both **agriculture** and **manufacturing** have historically offered livelihoods to lower-skilled workers, but this is changing rapidly and thus both are the focus of multiple—often contrasting—visions of possible futures. In each case the chapter considers how the situation will change over the next 10 to 20 years, with particular focus on the poor and vulnerable. Existing scenarios—explicit or implied—are summarized and analyzed below. It is important to note that these futures are not mutually exclusive and many elements of them could arise in parallel.

Emerging Work: Key implications for the poor and vulnerable

- Technology is on trend to displace more workers from manufacturing, with disproportionate impact on the poor and vulnerable.
- Changing demographics could make rural livelihoods less secure at the bottom of the pyramid.
- Rural work innovations could benefit the poor and vulnerable.
- Technology may create a divide within rural populations.
- Worker rights and social protections will continue to be problematic for vulnerable populations.

The two scenarios in this chapter are:

- **Scenario Group 1. Rural Work.** Rural work in lower-income countries is being dramatically reshaped by large forces, including shifts in demography, technology, and business structures. This is giving rise to both substantial threats and potential opportunities for rural workers.
- **Scenario Group 2. Manufacturing Work.** Globally, the number of manufacturing jobs will shrink due to automation, while manufacturing centers will continue to shift among both lower-income and higher-income countries, making the availability of manufacturing jobs less certain.

Scenario Group 1. Rural Work

Rural work in developing countries is being dramatically reshaped by large forces, including shifts in demography, technology, and business structures. This is giving rise to extensive analysis and prognosis from economists, the development community, and the business sphere—including indigenous stakeholders—about how to interpret the sweeping changes confronting rural work and how to facilitate positive outcomes.

Scenarios for Rural Work

From this substantial and varied body of forward-looking analysis, the **Futures of Work** project has gleaned five significant clusters of thought.

- **Scenario 1: Changing rural demography.** Rural workers in developing countries are increasingly female and older—and this could trigger positive changes in rural work, initiated both by these workers themselves and by the interventions they attract.
- **Scenario 2: Rural IT.** Infotech interventions could enable more secure livelihoods for both agricultural and non-agricultural rural workers.
- **Scenario 3: Inclusive agribusiness.** As global agribusiness expands its presence in developing countries, outcomes for rural workers could be highly positive wherever inclusive models are adopted.
- **Scenario 4: Agribusiness' long shadow.** Agribusinesses that use conventional business models will sideline rural workers in favor of mechanized value chains and vast land purchases.
- **Scenario 5: The end of smallholding.** Smallholder farming is being seen by many economists, governments, and elements of the development community as impossible to sustain, and thus better replaced by migration to cities and urban livelihoods. This forecast has positive and negative variants: on the positive side, that the pull of better, more secure livelihoods should and will continue to draw rural people to cities; on the negative side, that they will be pushed off their land by agribusiness incursions, climate change, and other coercive factors and be unable to find decent work in cities.

Rural workers: some background realities

- Most poor workers—78%, according to the World Bank—are rural.¹⁵¹
- Rural work still overwhelmingly consists of agriculture, which supports some 80% of Africans,¹⁵² half of Indians,¹⁵³ and 2.5 billion people globally.¹⁵⁴
- More women than men depend on smallhold or subsistence farming. Worldwide, 38% of working women work in agriculture, versus 33% of working men.¹⁵⁵

How rural work interacts with the larger world of work in lower-income nations

Rural work interacts intimately with manufacturing, as well as with the informal economy that is a prominent part of work in many lower-income nations.

Rural work and manufacturing

The shrinking of manufacturing employment, detailed in **Scenario Group 2. Manufacturing Work** below, means that millions of migrants will face increased risks of working in the informal economies of developing-country megacities, with the attendant insecurity. On the upside, if infrastructure is upgraded enough to enable factories to expand into rural areas, manufacturing could provide non-agricultural work options to rural people.

Rural work and the informal economy

The debate over how to address the vast informal economies of many developing countries — whether to formalize them or to find other, novel ways of providing worker protections and secure livelihoods within the informal context—is different for rural work than for urban work.

“Formalization” in the strict sense of full-time employment by a business entity doesn’t apply in the developing-world rural context. Most rural workers are self-employed in smallholder or subsistence agriculture, and many (especially women and elders) also juggle this work with family responsibilities or non-agricultural supplemental work. Their path out of poverty and vulnerability rarely leads toward conventional employment.

Instead, the positive scenarios in this section hint at ways that workers could choose only those aspects of formalization that serve their needs (such as collective bargaining, access to credit, or improved growing techniques) while avoiding those that don’t (such as long-term equipment contracts that disregard the sporadic nature of rural incomes). For example, **Scenario 2: Rural IT** centers on how smallholder farmers can use IT to connect to other farmers, suppliers, and markets; to collectivize for more efficient buying and selling; or to identify the best prices for their goods on a given day. Likewise, **Scenario 3: Inclusive agriculture** holds the promise of incorporating poor and vulnerable workers into commercial value chains in ways that work for them (e.g., by providing more stable part-time income to an older female farmer who cares for grandchildren whose parents have been lost to AIDS). In effect, these scenarios meld informal and formal work in ways uniquely suited to poor and vulnerable rural workers. (For more on this theme, see sidebar [“The futures of the informal economy”](#) on page 69.)

The futures of the informal economy

Globally, and especially in rural settings in lower-income countries, a large percentage of workers labor in the informal economy. Informal workers are employed outside formal legal arrangements. They often lack legal protections and social support; access to important resources—finance, land, technology, markets; and basic skills and training.¹⁵⁶ Estimates of the size of the informal economy vary; by one estimate 9 in 10 African workers work informally.¹⁵⁷ The great majority of workers participate because they have no other options. Currently, three views dominate discussion of the future of the informal economy in lower-income countries:

- **Informal work will persist or even grow.** Some observers argue that given the current global driving forces—globalization, a glut of young workers, poverty, inequality, and urbanization—the most likely future is that informal employment will persist or grow in many or all economies. In lower-income countries, for the foreseeable future large numbers of informal workers will suffer the consequences of lack of protective regulations and social welfare provisions. For most, incomes will remain low and livelihoods precarious. In some cases informal work may offer a middle-class income, but even middle-class informal workers typically lack social protections and their employment cannot be called “secure.”¹⁵⁸
- **Informal work should be formalized.** For many observers the preferred future is one in which workers in the less-productive informal economy transition to formal employment.¹⁵⁹ This transition can be facilitated by robust economic growth and government policies designed to provide resources to the informal sector and incentivize informal businesses to formalize (for example, encouraging foreign and domestic private investment, improving agricultural productivity, supporting regulatory reform, and prioritizing infrastructure and skills development).¹⁶⁰
- **Informal working conditions can be improved.** Finally, some who accept that informal employment is likely to continue—and to serve as an essential buffer against unemployment—believe that embracing the informal economy as a positive force can improve the lot of many informal workers and even create secure employment for some. This would require a substantial change in the social and legal status of informal workers, mechanisms to give informal workers a collective voice, and innovative policies and approaches from governments, private enterprise, and the development community. For instance, the government of Durban, South Africa, has adopted four priorities for the local informal economy: (1) specific trading zones with reasonable regulations and opportunities, (2) “graduation” of street traders to the formal economy, (3) business development and capacity-building for informal traders, and (4) synergies between street traders and formal businesses.¹⁶¹ A consultant familiar with the informal economy in sub-Saharan Africa pointed out that the informal economy is very diverse. Segmenting the informal economy will allow all interested parties to provide assistance and intervention appropriate to the circumstances of individuals.¹⁶²

Net, while formal work will grow and informal work will decline gradually over the coming decades in some lower-income countries, in the short to medium term informal work will remain an important part of the economy in many lower-income (and higher-income) nations.

Scenario 1: Changing rural demography

Rural workers in developing countries will be increasingly female and older — and this could trigger positive changes, initiated both by these workers themselves and by the interventions they attract.

Scenario summary: Changing rural demography

Scenario type	Normative/preferred
Scenario position	Mainstream normative
Key proponents	Development and philanthropic communities, sustainability proponents
Impacts on poor and vulnerable	Interventions essential to disrupt trend toward worsening prospects and to generate better opportunities
Strength	Medium—dependent on widespread, effective interventions
Key drivers	Urbanization, rising connectivity and information flows, women's empowerment
Timing	Gathering momentum over next 10 years
Geography	Widespread in South Asia, Southeast Asia, and sub-Saharan Africa

Trendsetter



Elderly rural workers in South Asia and sub-Saharan Africa are the most vulnerable group of workers across low-income countries, and their numbers are growing. In sub-Saharan Africa, although the overall population will be very young for decades to come, the absolute number of over-65s will rise to 100 million by 2050.¹⁶³

Image: CIMMYT (Flickr)

Current demographic trends point to a rural world that, globally, will be increasingly female and older over the 10–15 year time horizon. Because demographic forecasts tend to be reliable (the only plausible disruptor to this future would be large-scale interventions that attract youth back to rural livelihoods), this emerging demographic profile will be the context within which rural work evolves for the next decade.

Youth exodus

Since the early 2000s, one of the most powerful drivers of this trend has been the migration of rural workers to cities. Rural–urban migration has become “the major component of urban population growth” in developing economies, according to FAO.¹⁶⁴ By 2050 it is expected to help triple Africa’s urban population to over 1.2 billion (from 414 million in 2011), and expand Asia’s to 3.3 billion (from 1.9 billion).¹⁶⁵

Crucially, most rural–urban migrants are young and male. Research suggests that when a rural young man moves to a city he is unlikely to return to his home community.¹⁶⁶ Even though rural populations are continuing to grow in absolute

terms, which offsets the loss of young males to migration, women and elders are projected to be a larger share of rural workers for the foreseeable future.

This is especially visible among rural workers in Asia and sub-Saharan Africa.¹⁶⁷ In Thailand, rural/agricultural work has a higher median age (39) than any other Thai employment sector, and the “feminization of aging” is also accelerating.¹⁶⁸ In Africa, the average age of farmers’ union members in Mozambique and Zimbabwe exceeds 45.¹⁶⁹

Growing group of fragile workers

Rural elders and women are particularly susceptible to poverty. The vast majority derive most or all of their livelihood from smallholder or subsistence farming¹⁷⁰; in 2012, 75% of over-60 workers in Asia and 73% in Africa cited agriculture as their main source of income. Among those over-60 workers who are women, 62% in Asia and 59% in sub-Saharan Africa reported agriculture as their main source of income.¹⁷¹ As substantial research has shown, “people in developing countries who depend on agriculture for their living are typically much poorer than people who work in other sectors of the economy.”¹⁷²

Extrapolation of current trends, therefore, points to even greater deprivation and struggle for older and female rural workers—especially as younger men migrate to cities, leaving them with more responsibility but less support. Women will be “increasingly responsible for on- and off-farm tasks previously performed by men,” says Mark Gorman of HelpAge International.¹⁷⁴ And these burdens will encroach more and more upon the time and energy needed to make a living. Gorman notes:

Many older [women] are now caring for young dependents, as well as trying to manage farm production and other income-generating activities. As a result, older farmers in western Kenya, for instance, have reported that their harvest yields are much lower due to conflicting priorities with their role as carers.¹⁷⁵

Targeted interventions

To disrupt this trend, stakeholders are proposing a range of targeted interventions—especially new kinds of IT and innovative business models tailored for rural workers (see “Rural IT” scenario below). In some cases, such interventions are already underway, especially for rural women. Gender equality and the empowerment of rural women have become widely seen as vital to improving rural livelihoods. Among many initiatives in this behalf, the ILO’s Decent Work Agenda treats women’s equality as a cross-cutting goal across all of its strategic objectives,¹⁷⁶ and the US Agency for International Development has made smallholder farming (which is

Competing obligations



Due to both the burden of deaths from HIV/AIDS and the exodus of rural men to cities, more rural women are caring for young dependents—often hindering their productivity as farmers.¹⁷³

Image: Trust for Africa’s Orphans (Flickr)

increasingly dominated by women) its top priority.¹⁷⁷ Elsewhere, concerted efforts are being made by the development community, governments, and increasingly, corporations to link rural women to better agricultural information, training opportunities, loan programs, and other resources.¹⁷⁸

Advocates see the potential for profound ripple effects. FAO has projected that “If [women] had the same access to productive resources as men, they could increase yields on their farms by 20–30%.”¹⁷⁹ Moreover,

Increasing women’s access to land, livestock, education, financial services, extension, technology, and rural employment would boost their productivity and generate gains in terms of agricultural production, food security, economic growth, and social welfare.¹⁸¹

With better productivity and profits, this forecast suggests, women workers will gain legal rights, political recognition, economic agency, and secure livelihoods. And their communities will benefit too, since “when women control additional income, they spend more of it than men do on food, health, clothing, and education for their children.”¹⁸²

Older workers, as a group, currently receive much less attention than women as a group. But here, too, recognition of their issues is rising. NGOs like HelpAge International are advocating tailored agricultural subsidies, pensions, intergenerational skill-sharing, and recognition of older workers’ knowledge and difficulties as the best routes to transform their prospects.¹⁸³

Take me down to Moma’s Farm



“Moma’s Farm” is a reality TV show that follows a group of women farmers in Nigeria as they learn to use draught animals to boost productivity. Launched in 2014 with funding from the Gates Foundation, “Moma’s Farm” is intended to popularize the use of animal traction among smallholder farmers, especially women.¹⁸⁰

Image: Moma’s Farm

Recognition for rural elders

“Older farmers, both men and women, have much to offer. They have knowledge and experience of farming techniques that can increase production and reduce waste while minimizing environmental damage. Their years of knowledge of weather patterns can make a huge contribution to mitigating the impacts of changing, less predictable climate.... Action to support older women and men in continuing their traditional livelihoods would make a significant contribution to a sustainable future for us all.”

—Mark Gorman, HelpAge International¹⁸⁴

Scenario 2: Rural IT

Infotech (IT) interventions will enable secure livelihoods for both agricultural and non-agricultural rural workers.

Scenario summary: Rural IT

Scenario type	Aspirational based on present trends
Scenario position	Alternative-optimist
Key proponents	Technologists, development and philanthropic communities, sustainability proponents
Impacts on poor and vulnerable	Positive, enabling smallholders to professionalize and improve profits
Strength	Strong supporting trends
Key drivers	Rising connectivity and information flows
Timing	Rapid growth through 2025 and beyond
Geography	Widespread; innovation strong in East Africa and South Asia

One of the most prominent forecasts for rural work is that IT interventions will transform rural work for the better—connecting workers with the global economy, expanding their access to information and knowledge, and delivering tools to improve productivity and profitability. Some observers also believe that IT could create non-agricultural work options for rural people.

Building a work ecosystem

“No individual solution can solve the problems for rural farmers.... It’s an ecosystem that needs to be built.”

—Julio de Souza, chief operating officer of Farm Shop¹⁸⁵

In the best-case scenario, application of rural IT (that is, digital tools designed specifically for the needs of agricultural and other rural workers) is envisioned as allowing rural workers to create secure livelihoods on their own terms. Specifically, it will help them navigate between a Scylla and Charybdis of unsustainable futures: on one side, a fully formalized rural sector in which mechanization raises agricultural productivity and creates professional jobs, but also displaces millions of smallholder farms and workers (see

Scenario 4: Agribusiness’ long shadow). On the other side, a continuation of today’s rural-work landscape would keep workers trapped in a cross-generational cycle of poverty.

IT is seen as enabling a third way forward: one in which rural workers are empowered to raise their own productivity, develop profitable local and regional value chains comprised of small to medium-sized enterprises (SMEs), and collectivize for mutual benefit—ultimately achieving economic security in a rural lifestyle. This view is prominent in the development community, as well as among IT players from middle- and higher-income countries (many of whom hope to profit from this growing market) and indigenous IT developers and providers.

IT for agricultural work

Innovation in digital tools tailored to the needs of smallholder farmers is widespread and ongoing. Kenya is spawning an entirely new sector in mobile apps (sometimes dubbed the “Silicon Savannah”), in which Kenyan designers are focused mainly on creating solutions for regional issues. “In Kenya, everybody is building apps for Kenya,” comments Eric Hersman, founder of iHub, an innovation hub in Nairobi.¹⁸⁶

Apps that use simple text messaging (SMS) over basic cellphones are already enabling farmers to receive:

- **Real-time transparency into market pricing**, allowing farmers to align their prices with market norms and protect themselves from predatory middlemen
- Information about **demand trends**, enabling farmers to plant strategically and choose the best market for their wares on a given day
- **Weather** forecasts

Farmers can also use SMS to interact with other stakeholders:

- **Posting harvest reports** for buyers to see and purchase
- Connecting with nearby farmers to **make bulk purchases** of seeds, fertilizer, and equipment
- Joining with other farmers to **aggregate small batches of produce into large ones**, which are easier to sell¹⁸⁷

Going forward, digital platforms will offer much more sophisticated, multilayered applications. For example:

- **Tailored knowledge via mobiles.** Recognition is growing that mobiles, by themselves, are rarely a solution for rural workers: they need to be combined with relevant knowledge and offline resources. eMkambo, an interactive knowledge-sharing platform for Zimbabwe’s agricultural sector, has attracted more than 100,000 users since its launch in 2012.¹⁸⁹ Founder Charles Dhewa attributes eMkambo’s success to its innovative combination of IT, localized content, and a call center. “Though farmers had mobile phones, they did not know where to get information on agriculture to engage meaningfully,” he says. “There is value in bringing all this information together and creatively interpreting it for various users.”¹⁹⁰
- **Digital land rights.** As noted above, lack of title to land is a major impediment to secure livelihoods for vulnerable rural populations, especially women. Formal land rights would protect them from “land grabs” and create modest capital assets they could leverage to improve productivity. Medeem, a social-impact business operating in Ghana and Zambia, uses digital tools to secure land rights for smallholder farmers, women, and economically vulnerable groups. Medeem trains fieldworkers to use GPS surveying equipment to corroborate land claims, then applies other digital tools to record the evidence in national

Connecting to opportunity



Africa’s rapid mobile-phone penetration is encouraging the development of IT applications tailored for small-scale farmers, requiring only text messaging (SMS) to use. M-Farm, an SMS app developed by a team of 20-something women, allows Kenyan farmers to check market prices, find buyers, and get discounts on inputs. Digital tools like M-Farm are helping Kenyan farmers boost their profits by 25–35%, says Adrian Mukhebi, chairman of the Kenya Agricultural Commodities Exchange.¹⁸⁸

Image: Climate Change, Agriculture and Food Security (Flickr)

land-registry systems. A face-to-face network of service providers helps rural landholders communicate with formal land-ownership institutions.¹⁹¹

- **Remote extension services for women.** Exclusion from extension services is another widespread problem for rural women. In a solution funded by the Alliance for a Green Revolution in Africa (AGRA), a community group of 200 women farmers are using mobile phones to directly contact extension agents with their farming questions and receive personalized advice, in their own language. Violet Lodenyi, chairperson of the community group, says, “We are glad we no longer have to visit the agricultural office. When we have a problem or need clarification, we just send an SMS, and feedback is given instantly.”¹⁹² Mixing high-tech with low-tech, the AGRA program also schedules radio call-in programs during which women farmers can put their questions to an extension agent—usually female—on the air.¹⁹³

IT for non-agricultural rural work

Use of IT to enable non-agricultural rural work is a newer concept, one with few real-world examples to date, but with a growing number of advocates. As a leading Indian workforce consultant put it during an interview for this report, creating work options that rural workers can access locally should be the priority, rather than forcing rural people to migrate to jobs in cities.¹⁹⁵ There are various threads to this approach:

- **Expanding small enterprises linked to farming.** More stakeholders are talking about a “value chain” approach to smallholder farming, in which the entire chain of a food’s production is evaluated to identify opportunities for participation, efficiency, or innovation.¹⁹⁶ A value-chain workshop in Vietnam in 2014 identified marketing and rural credit services as non-agricultural work related to farming, for instance. Such services depend on IT for remote communication and service provision.¹⁹⁷
- **Providing online training.** Online training services for non-agricultural rural workers is a nascent concept with far-reaching implications. A senior executive for an NGO operating in South Asia, interviewed for this report, pointed out that online training can provide rapid learning while avoiding prohibitive travel costs to a training facility—an intervention that can create skill-based jobs in a rural economy, as his NGO is demonstrating with veterinary workers among others.¹⁹⁸
- **Connecting workers to remote buyers—and employers.** As exemplified by the fair-trade movement, rural artisans and specialty food producers can use IT to connect to distributors and buyers in urban or foreign markets. And as the South Asian NGO executive commented, IT might someday be used by rural workers to provide back-end work, such as data entry, for companies in the United States or Europe.¹⁹⁹ While this approach has yet to be applied

Non-farm entrepreneurship



So far, non-farm rural entrepreneurship makes a minor contribution to rural livelihoods.¹⁹⁴ But many see potential for IT to change that picture.

Image: IMs BILDARKIV (Flickr)

to any significant degree (and would require training), it offers the prospect of formal employment and/or gig work for rural workers.

Rural workers are diverging

Rural IT is one of the key forces contributing to “a growing divergence between subsistence and business-oriented small farms,” according to Peter B. R. Hazell and Atiqur Rahman, editors of the 2014 book *New Directions for Smallholder Agriculture*.²⁰⁰ While most rural workers continue to struggle on tiny low-yield plots, “many smallholders are successfully intensifying and succeeding as farm businesses, often in combination with diversification into off-farm sources of income.”²⁰¹

Scenario 3: Inclusive agribusiness

As global agribusiness expands its presence in developing countries, outcomes for rural workers could be highly positive if inclusive models are adopted.

Scenario summary: Inclusive agribusiness

Scenario type	Normative/ preferred future
Scenario position	Alternative-optimist
Key proponents	Development and philanthropic communities, some governments, sustainability proponents
Impacts on poor and vulnerable	Transformative, integrating smallholders and laborers into commercial agriculture value chains
Strength	Weak
Key drivers	Globalization, women's empowerment, automation
Timing	Potential gradual move toward mainstream over next 20 years; speed depends on early successes or lack thereof
Geography	Implementations with widely varying scale and approach in South and Southeast Asia and Africa, with largest successful implementation in Thailand

Agribusiness is advancing rapidly into the developing regions of Asia and Africa. The incursion of foreign-owned agribusinesses will substantially reshape rural livelihoods in the developing countries where they operate—but whether for good or ill remains unclear. An emerging positive view envisions agribusinesses pursuing an “inclusive growth” model as they set up shop in developing countries: purposefully integrating smallholders into their value chains and taking into account the well-being of local communities.

Authoritative sources including the World Bank maintain that if this model is pursued, agribusiness will be a positive gamechanger for developing countries. Africa, for example, has abundant water and an estimated 50% of the world's unused fertile land—but the world's lowest agricultural productivity, a key reason that the continent is a net food importer.²⁰³ Agribusinesses might be pivotal in providing the capital, knowledge, and jobs needed to develop Africa's abundant resources.

A win-win for small farmers and agribusinesses

“Kenya's informal dairy value chain... comprises smallholders and SMEs that provide 86% of Kenya's milk supply and delivers raw milk to lower-income consumers through small vendors. At the same time, larger dairy farms and processors provide pasteurized milk and processed dairy.”

—World Bank, “Growing Africa”²⁰²

This positive vision could be supported by the larger trend toward inclusive development. Briggs Bomba of TrustAfrica observes:

Promisingly, the thinking at many levels in Africa seems to be changing.... an unprecedented consensus [is forming] across the state/civil society divide and across national and regional boundaries, on maximizing local benefits from Africa's resources.... [This] goes beyond the old 'state ownership and control' talk to look at smart investment contracts, public-private partnerships, beneficiation, community ownership, [and] promoting linkages.²⁰⁴

Government buy-in is crucial

A key question is whether agribusinesses and governments will buy into the inclusive model. Governments play two roles when agribusinesses enter their countries: first, since much developing-country land is untitled²⁰⁵, governments often assume a right to sell this land to foreign companies, frequently on non-advantageous terms and with the profits going into government (or officials') coffers. (For details see **Scenario 4: Agribusiness' long shadow.**) Second, government regulations can define how agribusinesses compete with local smallholders. Thus, government buy-in is usually crucial if inclusive agribusiness is to be adopted as a prevailing model.

Wherever inclusive agribusiness is adopted, its benefits for the rural poor will be significant:

- **Secure livelihoods.** Inclusive agribusiness could create secure work for large numbers of smallholder farmers. The World Bank notes, "Africa has many good examples of successful contract farming" between global companies and local smallholders.²⁰⁷ Other potential win-win arrangements include smallholders exchanging their land for shares in agribusiness companies, rent payments, or investments in local schools and healthcare facilities.²⁰⁸
- **Skill building.** In another huge benefit for rural farmers, inclusive agribusiness would foster the skills needed to serve large, formal customers that require efficiency and consistent quality.
- **Boosting manufacturing.** Beyond farming, agribusiness will spur growth in manufacturing jobs—partly by developing infrastructure for production of agricultural commodities, but also by providing inputs for a wide range of other industries, such as food processing and textiles.

A model for Africa?



The value of Thailand's agricultural exports now exceeds that of all of sub-Saharan Africa, according to the World Bank. Thailand accomplished this outsized achievement by building "a vibrant agribusiness sector consisting of small and medium enterprises" (SMEs), which the government supported with a block on foreign investments in farming as well as with a national land-titling program, Southeast Asia's first.

Now Thailand hosts foreign agribusinesses, small and medium-sized family farms, and indigenous multinational agribusinesses. Starting with the same advantages Africa has—land and labor—Thailand has created an agriculture sector that the World Bank calls "a model for Africa."²⁰⁶

Image: Asian Development Bank (Flickr)

- **Mitigating the exodus of rural youth.** If agribusinesses bring stable work as well as the “glamour” of IT to rural farming, more youth may be motivated to stay and work in these areas rather than move to cities.

In light of these positive potentials, the World Bank has predicted that in sub-Saharan Africa alone, agriculture and agribusiness will grow from a \$313 billion industry in 2010 to a trillion-dollar industry by 2030.²⁰⁹ The Bank and other proponents of inclusive agribusiness believe the benefits will extend to enterprises of all sizes, from small farms to multinational corporations — and indeed, that they already do. (See box: “Inclusive agribusiness: a window of opportunity.”)

Inclusive agribusiness: a window of opportunity

“The conditions for taking advantage of the opportunities [presented by inclusive agribusiness] are very promising. A decade of experimentation has produced valuable lessons in how to integrate people at the base of the global economic pyramid into existing value chains, with a correspondingly better understanding of how to create better inclusive business models.... [And] political support for doing business with smallholders is high.”

—Endeva and Joyn-coop, “Growing Business with Smallholders”²¹⁰

Scenario 4: Agribusiness' long shadow

Agribusinesses that use conventional business models will sideline rural workers in favor of highly mechanized value chains and vast land purchases.

Scenario summary: Agribusiness' long shadow

Scenario type	Present trends continue
Scenario position	Conventional within development community
Key proponents	Development community, think tanks
Impacts on poor and vulnerable	Potentially widescale displacement from land holdings and disruption of livelihoods
Strength	High
Key drivers	Globalization, automation, skills gap
Timing	Ongoing from present
Geography	Lower-income countries in Asia and sub-Saharan Africa, especially those with weak land-titling and governments receptive to foreign land purchases

Agribusinesses' spread into developing regions also carries a significant risk of sidelining the rural poor and vulnerable, as has already occurred widely in parts of both Asia and sub-Saharan Africa.

So far, agribusinesses' incursion has proceeded mainly through acquisitions of large tracts of farmland in low-income countries. A 2014 study found that global farmland acquisitions now total 33–52 million hectares, or between 0.7% and 1.75% of the world's agricultural land, "an area bigger than Germany and France combined."²¹¹

Bigger than climate change

"Land grabbing is having more of an impact on the lives of poor people than climate change."

—Fred Pearce, author of the 2012 book *The Land Grabbers*²¹²

While in theory such deals can be mutually beneficial, in practice they have displaced millions of rural workers in Asia and Africa over the past 15 years. In the worst cases they have included quasi-legal expropriations of untitled land from low-income populations (often dubbed "land grabs"), often with the explicit support of the governments of the host countries. These deals are most often transacted with governments of developing countries with low agricultural

productivity and weak systems of land titling.

For instance, in Cambodia half a million people, mostly small-scale farmers, were displaced in such deals between 2000 and 2014. Overall, more than two-thirds of Cambodia's arable land has been sold by its government to foreign investors.²¹³ When villagers protest against these forced evictions they have often found themselves facing police or soldiers.²¹⁴

Significant risks to workers

Once in place, agribusinesses typically apply a conventional business model that focuses on producing cheap exports. The result is that poor and vulnerable rural workers face not only potential loss of farmland, but other major risks:

- **Minimal job creation.** Most agribusinesses operate big mechanized farms oriented to serving the processed food industry. Since the goal of such farms is to produce high-value export crops as efficiently and profitably as possible, their strategy relies on maximizing their technology infrastructure and minimizing human labor costs.
- **Disadvantaging women smallholders.** Many observers argue that agribusiness will hurt women farmers worst. The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD, the landmark report published in 2008 by the World Bank and UN), states:

The industrialization of agriculture falls mainly within typically male areas of decision-making, including the economic risks involved..... Men's forms of farming practice, geared toward national and international markets, often undermine female domains and competences.²¹⁵

Whether “competences” are so rigidly gendered may be debatable. But what is clear is that large global companies whose profits depend on delivering large volumes of consistent-quality goods want suppliers who can serve this need. Smallholders whose daily routines include caring for children or elders, or who must hand-carry water to their crops, face an uphill battle in supplying to agribusinesses.

- **Reduction in food availability.** When large agribusiness operations are intended solely for export, or produce only single crops or non-food crops, they have the potential to reduce the amount of food available in a region, in comparison to the smallholder production that was displaced.
- **Competing with smallholds.** Agribusinesses are far better positioned than smallholders to handle the numerous significant challenges—from lack of infrastructure to corrupt officials to climate change—that accompany farming in most lower-income regions. Unless small-scale local farmers undertake significant professionalization, agribusinesses are likely to outcompete them in any region where they set up shop.

Ultimately, Olivier De Schutter, UN Special Rapporteur on the Right to Food, has warned that agribusiness' incursion:

implies huge opportunity costs, as it will result in a type of farming that will have much less powerful poverty-reducing impacts than if access to land and water

“Everything goes to the company”



“In recent years Chhek Sambo [a woman farmer in Skuon, Cambodia] and her neighbors have earned extra cash by growing cassava for a company down the road. But no one likes this arrangement. At most, the villagers earn \$3 a day. ‘I just get money, but everything goes to the company,’ Sambo says.”²¹⁶

Image: World Bank Photo Collection (Flickr)

were improved for the local farming communities. There is a clear tension between ceding land to investors for the creation of large plantations, and the objective of redistributing land and ensuring more equitable access to land, something governments have repeatedly committed to.²¹⁷

Scenario 5: The end of smallholding

Smallholder farming will be impossible to sustain, and the focus of development will shift to helping rural workers create new lives in cities.

Scenario summary: The end of smallholding

Scenario type	Present trends continue
Scenario position	Mainstream among certain groups
Key proponents	Some mainstream economists, parts of development community, some governments
Impacts on poor and vulnerable	Positive variant: rural workers find more secure livelihoods in cities; negative variant: rural workers fall into insecure informal work in cities
Strength	Low to low-medium
Key drivers	Urbanization, globalization, automation, skills gap, aging
Timing	Beyond 15 years
Geography	Advancing in middle-income countries; early stages in sub-Saharan Africa and South Asia

A final prominent forecast holds that, for better or worse, rural workers will abandon smallholding as a livelihood and lifestyle, migrate to cities, and find urban work, leaving agriculture to professional farmers and agribusinesses.

This scenario has positive and negative variants. The positive version is framed by the pull of urban jobs promising more comfortable and secure livelihoods. The negative version sees rural migrants unable to find sufficient work in overcrowded cities, instead falling into the squalor and insecurity of urban informal economies. Typically, those promulgating this version advocate concerted efforts to build rural economies.

Both variants see smallholders being driven out by large forces identified earlier in this section: aging, youth migration to cities, the incursion of conventional agribusinesses, and automation.

The end of smallholding will help rural workers

Numerous analysts recommend urbanization as the best way forward for vulnerable rural workers. Jonathan Rigg, a professor at the University of Durham (UK), argues that trends have shifted in ways that no longer favor rural development—including a shift toward many rural workers no longer wanting to be rural:

No longer are the land-rich necessarily also the prosperous in rural areas.... No longer are agriculture and farming the desired, default position of rural households. No longer do parents desire a settled, farming life for their

children.... The best means of promoting pro-poor growth in the countryside may have less to do with supporting small-holder farming, whether through land redistribution or policies of agricultural development, and more to do with endowing poor people with the skills so that they can escape from farming and, perhaps, escape from the countryside.²¹⁸

This perspective applies to both African and Asian smallholders:

- **African smallholders.** Paul Collier, director of the Center for the Study of African Economies at Oxford University, argues that smallholders operate in “highly constrained situations” bound on every side by undesirable choices. Moreover, he says, this model of farming is ill-suited to the kinds of disruptive innovations that the rural IT or inclusive agribusiness futures say will revive smallholding. (Even the World Bank, a leading proponent of inclusive agribusiness, tacitly acknowledges this, saying, “Agribusiness investments that bring radically new technologies and organizational innovations can threaten existing SMEs that are unable to adapt quickly enough.”²¹⁹) Collier concludes, “Africa’s future is not as a continent of happy peasants.”²²⁰
- **Asian smallholders.** Similar arguments are made about Asian farmers. Economist Rupa Subramanya cites a survey of more than 5,000 Indian small-scale farmers in 2013–2014, which found that while 72% said they liked being farmers, just 10% of these said it provided a good livelihood and 60% said they were farmers only because it was a traditional occupation. Most tellingly, 62% of all the respondents said they would give up farming if they could find better work in the city.²²¹ These and similar data spell a “dubious future for Indian agriculture,” Subramanya has written. “To improve their lives, farmers need a way out of agriculture and into the manufacturing or services sector. In fact, polls show that most small-scale farmers would happily sell their land, if only they could.”²²²

Give up on farming?

“The children of smallholders should, and will, pour into cities. So it is vital that cities become engines of opportunity.... Millions of young people could be productively employed in Africa’s cities, so the key policy issue that governments and development agencies need to address is what has been impeding urban success—and it isn’t the low productivity of smallholders.”

—Paul Collier, director of the Center for the Study of African Economies at Oxford University²²³

A number of governments are adopting this view, primarily via focused efforts to boost urban job creation. The African Youth Decade, adopted in 2009 by African leaders, aims at the “creation of safe, decent and competitive employment opportunities for young people.”²²⁴ Kenya is successfully promoting Nairobi as a tech hub.²²⁵ Ghana has instituted youth empowerment programs to provide college graduates with skills and employment support, while Zambia has launched a national youth policy and enterprise fund.²²⁶

The private sector is also beginning to invest in this future. In 2012 Walmart invested more than \$2 billion in Massmart, South Africa’s largest retailer, with an eye toward generating jobs.²²⁷

The end of smallholding will harm rural workers

In the negative variant of this scenario, the end of smallholding is seen as an adverse outcome for rural workers because cities are unready to assimilate them. Peace Child International, a UK-based NGO, warns:

Because most countries have not yet embarked on the path of industrialization, urban centers are not able to create a large body of work. Therefore, in the short term, only rural activities can actually create jobs for most new entrants to the labor market.²²⁸

Some advocates of this perspective also point out that the focus of current urban-employment initiatives is overwhelmingly on youth employment—often, male youth unemployment—with negligible attention to other vulnerable populations. The African Development Bank has found that “Young women feel the sting of unemployment even more sharply,” yet at least so far, urban job-creation programs have so far failed to redress this gender gap.²²⁹ Older workers also are largely overlooked by urban employment programs.

Rural Work: Implications for the poor and vulnerable

- **Challenge—but also innovation.** The challenges facing rural workers in lower-income countries are large and entrenched. Forecasts that assume continuation of present trends typically include these challenges worsening over time. At the same time, however, more innovation is evident than in many decades. Concepts like inclusive agribusiness, rural IT, growing political support for creating secure rural livelihoods, farming innovations designed for women, new forms of credit and finance—these and other novel factors, while still mostly nascent, could snowball into disruptive forces for rural work.
- **Growing divergence.** The divergent scenarios for rural work described herein are not mutually exclusive. In fact, the most likely future is one in which rural workers will diverge along three paths:
 - Workers who become increasingly business-like (with or without interaction with agribusinesses)
 - Workers who continue to struggle at a subsistence level
 - Workers who transition to the non-farm economy or mix farm work with non-farm work²³⁰

Within these three broad avenues of differing capacity, poor and vulnerable rural workers will also increasingly differ by gender (more will be female); age (more will be elderly); level of government support, and exposure to negative externalities like land-grabbing or climate change. A development consultant interviewed for this project recommended viewing rural workers in segments according to their priorities and capabilities—much as consumers in high-income economies are segmented by the companies that sell to them.²³¹

- **Differing futures at the bottom of the pyramid.** Subsistence workers at the bottom of the pyramid (BOP) face major new sources of insecurity, from exodus of young family members

to expropriation of their land. A growing share will be elderly, with associated physical limitations, and/or female, with associated cultural barriers. Some of these vulnerable workers will prefer to remain on their land and to secure property rights and loans. Others will want to leave farming behind, via either non-farm rural work or migration to cities. Some will be able to graduate into the business/professional tier of smallholders, especially in places where inclusive agribusiness models prevail. In many cases, these BOP workers will themselves have the best answers for their situation.

- **Non-farm work.** Expanding non-agricultural rural work could be a growing focus of development efforts. It's possible to imagine a scenario a decade from now in which IT supports remote jobs and gigs, such as data entry, as well as training for this kind of work. But perhaps an even more important thrust will be to create or support *local* non-farm opportunities—services, retail, etc.—appropriate to each local context.
- **Professionalization for rural enterprises.** Entrepreneurially minded rural workers, while enjoying advantages in knowledge and resources, will still face risks as they seek to formalize their capacities and integrate into agricultural value chains. Speculative investments in IT or equipment may fail, or an innovation that succeeded elsewhere might turn out to be inappropriate for their context.
- **Crowdsourced rural innovation.** IT, IT-enabled crowdsourcing, and cloud-based services may help create mobile phone-based platforms for bringing forth indigenous answers.
- **Will smallholding diminish?** Rural IT, collectivization with other farmers, and related new tools and business models could enable many smallholder farmers to stay in place. However, a significant share will continue to migrate to cities. Government and development-community initiatives will be a key variable in their outcomes—either supporting them in staying in place, or helping them create new, secure urban livelihoods.
- **IT plus tailored content.** Recognition is rising among stakeholders that IT tools, such as mobile phones, by themselves cannot support sustained improvement in rural livelihoods. IT will increasingly be supplemented with low-tech resources—knowledge, as eMkambo and others have done; human advisors, as MEDEEM has done; radio and video content, as AGRA has done; and space for rural workers' own innovations.
- **IT carries its own risks.** Innovative IT will also create new challenges for workers and smallholders who can't adapt to it fast enough. A divide could form between IT haves and have-nots in the rural world, as entrepreneurially minded farmers and other workers use IT to gain knowledge, connections, and opportunities while their poorer or more traditionally

A holistic approach to resilience



"Agricultural research can no longer be viewed in isolation but needs to be viewed through a lens that looks at the various dimensions of resilience—including local, economic, and social dynamics, human and environmental health, and the general connectivity of communities—rural, urban, and global."

—Anita Regmi, agricultural economist and head of the Developmental Impact Unit at Bioversity International²³²

Image: World Bank Photo Collection (Flickr)

minded peers fall permanently behind. Many of today's most vulnerable workers could slide into destitution as a result.

Scenario Group 2. Manufacturing Work

The second aspect of work in lower-income countries that is of particular interest to the social sector is manufacturing. Manufacturing jobs were once seen as the desirable next step toward secure livelihoods for workers leaving agriculture, but they will no longer play the same role for workers in lower-income nations. The location of manufacturing work will be fluid and its ability to support secure livelihoods is likely to weaken in lower-income countries.

The course of economic development was long conceived as a path from an agriculture-based society to an industrialized society. More recently, higher-income economies have added a third step: a service- or knowledge-based economy. But the pattern of manufacturing work is shifting. The locations in which manufacturing is performed, the number of manufacturing jobs, and the skills required are all undergoing rapid change. These changes in the historic route to economic growth will significantly affect work prospects for workers in lower-income countries.

Scenarios for Manufacturing Work

Research on the future of manufacturing suggests two major scenarios moving forward, neither of which serve lower-income nations, or many of their workers, well.

- **Scenario 1: Manufacturing work will shrink.** Driven by automation and robotics, the number of workers, especially low-skilled workers, will be reduced.
- **Scenario 2: Manufacturing centers will be fluid.** Globalization, technology, and data analytics all have a role to play in the efficiency of manufacturing supply chains, allowing them to relocate based on changing factors and policies in their operating environments.

Though these two scenarios have not received equal attention, they are based on similar drivers and each will have significant impacts on policy. Shrinking manufacturing work receives substantial attention and aligns strongly with technology and globalization trends. The fluidity of manufacturing centers has so far escaped headlines, but efforts to secure manufacturing centers already drive many government policies and actions.

Robotics: the future of productivity in manufacturing



Boston Consulting Group projects that robotics for manufacturing is nearing a tipping point and will soon initiate the next productivity wave, which in turn will shift the cost-competitiveness advantage among major export economies. The rate of growth in global robotics investment is expected to rise from 2–3% annually in 2015 to around 10% through 2025. Productivity gains from robotics will vary by industry and country, but could reach 10–30% on top of those produced by other workplace changes.²³³ See Chapter 2. Automated Work for more on robotics.

Image: Steve Jurvetson (Flickr)

Scenario 1: Manufacturing work will shrink

The number of manufacturing jobs will shrink in lower-income nations, failing to provide the upward path these jobs offered in the past.

The very nature of manufacturing is evolving rapidly, reflecting changes in technology, product demand, and economics. As a result of these changes, the role of manufacturing in employment will shrink, offering fewer opportunities for employment, especially for those with limited skills and education.

Scenario summary: Manufacturing work will shrink

Scenario type	Present trends continue
Scenario position	Mainstream
Key proponents	Mainstream economists
Impacts on poor and vulnerable	Broadly negative on vulnerable and low-skilled populations
Strength	Strong scenario based on present drivers and trends
Key drivers	HR analytics, inequality, drive for efficiency
Timing	Continued intensification over next 20 years
Geography	Global

Changes in manufacturing employment

Manufacturing growth has been an important step in the economic development of nations. However, a mounting body of evidence suggests this may no longer be possible. “Premature deindustrialization” describes a rising trend in which countries are reaching peak manufacturing employment and output earlier in the development process, and at levels of employment and output lower than those reached by nations that preceded them in economic development.

India is a case in point. Manufacturing employment peaked at just 13% of its population in 2002 and has been in decline since.²³⁴ Even in manufacturing powerhouse China, employment in the service sector has been growing faster than in manufacturing.²³⁵

In the past, industrialization allowed today’s developed countries to reach high levels of employment in the industrial sector before beginning the transition to a service economy. Going forward, manufacturing likely will not play the same role in the economic development of nations that are currently less developed.

Dani Rodrik, a leading labor economist and professor of social science at the Institute for Advance Study in Princeton, has done extensive research in this area (see sidebar below, “[The manufacturing workforce cycle in developed countries](#)”). Rodrik offers this explanation for the emergence of premature deindustrialization:

A plausible story would be the following. As developing countries opened up to trade, their manufacturing sectors were hit by a double whammy. Those without a strong comparative advantage in manufacturing became net importers of manufacturing, reversing a long process of import-substitution. In addition, developing countries “imported” deindustrialization from the advanced countries, because they became exposed to the relative price trends produced in the advanced economies. The decline in the relative price of manufacturing in the advanced countries put a squeeze on manufacturing everywhere, including the countries that may not have experienced much technological progress.²³⁶

In other words, the decline in the share of employment in the manufacturing sector in developing economies is primarily a result of globalization, rather than of improved domestic manufacturing productivity.

Robotics on the manufacturing line

Some of the most productive applications of robotics are in the manufacturing environment. Robots are ideal candidates to perform the repetitive actions that many low-skilled manufacturing jobs require. According to Boston Consulting Group (BCG), industrial robot sales grew 23% in 2014 and are projected to double to 400,000 a year by 2018.²³⁸ As the labor-cost savings chart below illustrates, adoption of advanced robots in the near future will save significant labor costs—as much as 33% in South Korea and an estimated average of 16% globally. In many middle-income countries, industrial robots are expected to be cheaper than human labor by 2025.²³⁹ In addition, some economists highlight that robots and automation provide improved consistency and quality. Lower-income countries compete in this global manufacturing environment, in which costs are steadily dropping as quality standards rise.

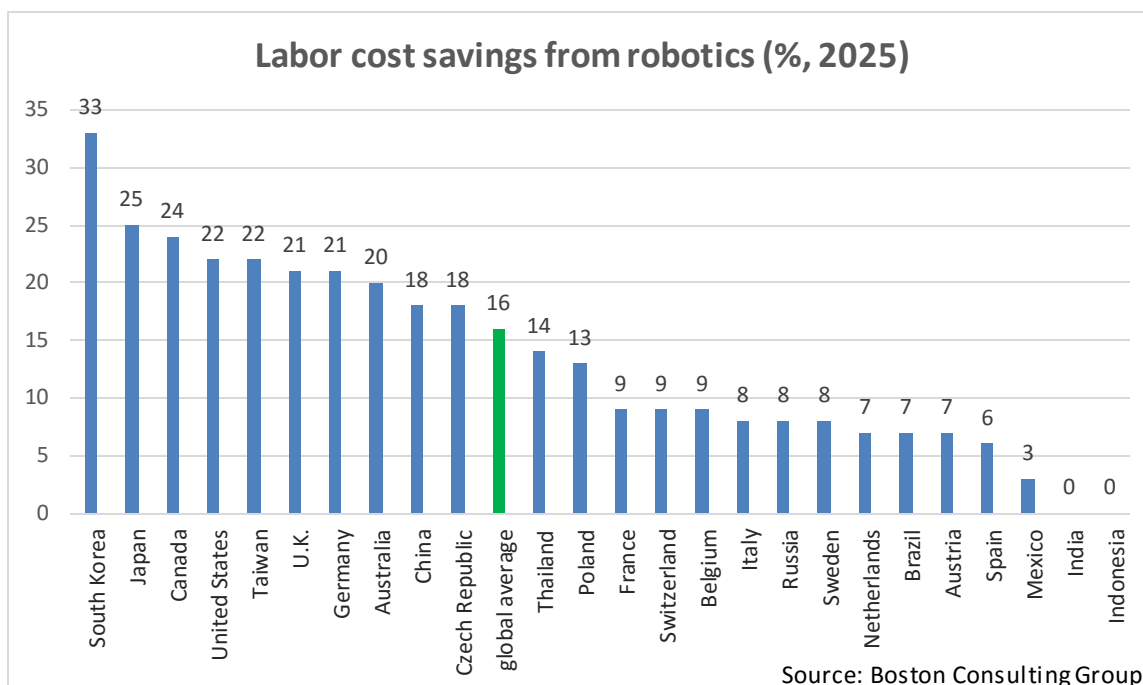
The manufacturing workforce cycle in developed countries

“Over time, manufacturing ceded its place to services. In Britain, the birthplace of the Industrial Revolution, manufacturing’s share of employment peaked at around 45% before World War I and then fell to just above 30%, where it hovered until the early 1970s, when it began a precipitous decline. Manufacturing now accounts for slightly less than 10% of the workforce.

“All other rich economies have gone through a similar cycle of industrialization followed by deindustrialization. In the United States, manufacturing employed less than 3% of the labor force in the early 19th century. After reaching 25–27% in the middle third of the 20th century, deindustrialization set in, with manufacturing absorbing less than 10% of the labor force in recent years.

“In Sweden, employment in manufacturing peaked at 33% in the mid-1960s, before falling to the low teens. Even in Germany, often regarded as the strongest manufacturing economy in the developed world, manufacturing employment peaked around 1970, at close to 40%, and has been steadily declining ever since.”

—Dani Rodrik, an economist at the Institute for Advanced Study in Princeton²³⁷



Automated manufacturing also requires a more skilled workforce, putting additional pressure on lower-skilled populations. To compete, workers will need to acquire and maintain more advanced skills. A recent Talent Shortage Survey from Manpower showed that 51% of employers in the Asia-Pacific (including 61% in India) and 68% of employers in Brazil had difficulty attracting the right workforce. In Europe, the Middle East, and South Africa the vacancies most difficult to fill are for skilled trade workers; the reasons cited were lack of specific technical skills and experience.²⁴⁰

While the majority of the research highlights the decreasing need for workers, there is still a minority school of thought that doubts that robots are actually “job killers” for manufacturing. A recent report from the Brookings Institution showed that robots are boosting productivity in factories, but found no clear relationship between robotics use and change in factory employment. The Brookings report further noted that “many experts worry that automation and robotics is at a tipping point and will soon start eliminating jobs faster and in a broader swath of the economy. Others insist all this fretting is misplaced. Automation will free workers to do other kinds of tasks, they say, and fuel more prosperity.”²⁴¹ For a more detailed analysis of this debate, see **Chapter 2. Automated Work**.

Growth in consumption is not enough

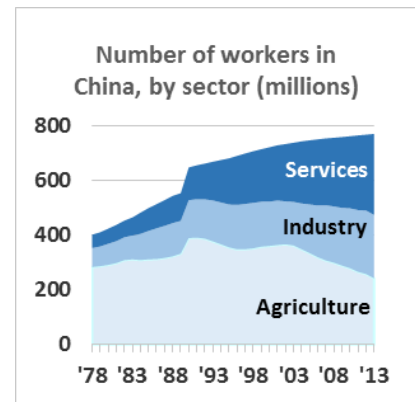
As more people move into the middle class, it should be expected that the global demand for manufactured goods would increase and thereby drive up manufacturing. McKinsey has projected that in the period from 2012 to 2027, “1.8 billion people will enter the consuming class and worldwide consumption will nearly double.”²⁴² How will the growth curve of increased product demand intersect with the declining demand for workers to produce these goods? According to McKinsey:

Globally, manufacturing continues to grow. It now accounts for approximately 16% of global GDP and 14% of employment. But the manufacturing sector's relative size in an economy varies with its stage of development. We find that when economies industrialize, manufacturing employment and output both rise rapidly, but once manufacturing's share of GDP peaks—at 20–35% of GDP—it falls in an inverted U pattern, along with its share of employment. The reason is that as wages rise, consumers have more money to spend on services, and that sector's growth accelerates, making it more important than manufacturing as a source of growth and employment.²⁴³

So while manufacturing does continue to grow, its relative size in the economy varies based on development phase. Eventually service jobs will be needed to make up for the drop in manufacturing jobs—especially in regions with a growing workforce. China is a good example of this dynamic: its middle class has grown, as has domestic demand for consumer goods, yet domestic manufacturing jobs continue to decline while service employment is accelerating.²⁴⁴

Thus, growth in demand for manufactured goods is not enough to maintain manufacturing employment over the long term in today's developing economies.

Workforce change in China



Source: ILOSTAT Database²⁴⁵

Scenario 2: Manufacturing centers will be fluid

Global patterns of manufacturing will continue to shift, impacting the availability of manufacturing jobs.

Scenario summary: Manufacturing centers will be fluid

Scenario type	Present trends continue
Scenario position	Mainstream
Key proponents	Economists and manufacturing analysts
Impacts on poor and vulnerable	Does not serve lower-income nations whose primary means of attracting manufacturing jobs is cheap labor, or poor rural workers seeking a pathway out of agriculture
Strength	Strong
Key drivers	Automation, globalization, robotics, ubiquitous connectivity, drive for efficiency
Timing	Continued intensification over next 20 years
Geography	Global

“China+1”

China has been the world’s top manufacturing stronghold in recent decades. But China’s cost advantages are being threatened by rising wages, currency costs, and cheaper manufacturing in other countries. The growth in China’s middle class is also shifting domestic production away from exports and toward internal consumption.

Analysts have predicted that this will begin to open the way for other, lower-wage countries to build their manufacturing sectors. As Justin Yifu Lin, former chief economist at the World Bank, has noted:

China is on the verge of graduating from low-skilled manufacturing jobs and becoming a ‘leading dragon’ [instead of a ‘follower goose’]. That will free up nearly 100 million labor-intensive manufacturing jobs, enough to more than double manufacturing employment in low-income countries.²⁴⁷

World manufacturing output

Industrialized economies (67.7% of the global total):

- Europe 24.7%
- North America 22.4%
- East Asia 17.2%

Developing and emerging economies (32.3% of the global total):

- Asia 21.7%
- Latin America 5.8%
- Africa 1.5%
- Other 3.3%²⁴⁶

Corporations are showing rising interest in diversifying their operations away from China, as reflected in a ‘China+1’ strategy whereby they do a majority of their manufacturing work in

China but are active in at least one other country as a backup and potential alternative. Often, the second country is in Southeast Asia.²⁴⁸

For perspective, it should be noted that while China continues to be the focus of many manufacturing discussions, Europe and North America were responsible for over 47% of world manufacturing as of 2010.²⁴⁹ (See sidebar, “World manufacturing output.”)

India’s high aspirations for manufacturing growth

India is seeking to become a manufacturing power, leveraging its inexpensive labor force, an advantage China will increasingly lack. In 2012, McKinsey noted that:

India’s total labor force will continue to grow relatively quickly—at about 1.5% annually—with about 174 million net additions by 2030. We project the total labor force will reach 550 million by 2020 and 640 million in 2030.²⁵⁰

India’s hourly labor cost in manufacturing is only \$0.92, compared with \$3.52 in China.²⁵¹ But obstacles are substantial. Unlike China, India doesn’t have the infrastructure (e.g., roads, ports, power networks) or the manufacturing ecosystem, including secondary manufacturers and parts markets, that would support a robust manufacturing sector.

Still, India’s “Make in India” campaign is seeking to build up domestic and foreign investment in its manufacturing sector. Changes include easing foreign investment restrictions and overhauling the railway system. In 2015 Prime Minister Narendra Modi won pledges of billions in investments from both China and Japan to help build an industrial corridor between Delhi and Mumbai.²⁵³

Is it Africa’s turn?

As of 2010 Africa was responsible for just 1.5% of world manufacturing output.²⁵⁴ But factors in play could enable African manufacturing to take off in the next 10–15 years:

- Abundant labor at low wages
- Growing investment in manufacturing by both domestic and foreign companies
- Investment in transport and energy infrastructures
- Rising educational attainment
- Rising middle-class consumption²⁵⁵

A 2012 McKinsey report on job creation in Africa found that “Africa has the potential to create between 54 million and 72 million more stable wage-paying jobs by 2020, with much of the job growth coming from manufacturing, agriculture, retail and hospitality.”²⁵⁶ But a 2014 World Bank study found that manufacturing may actually be on the decline in Africa. Countries are finding more success in bypassing

Ethiopia: China’s China



“African nations such as Ethiopia, Kenya, Lesotho, Rwanda, Senegal, and Tanzania” are vying for “the 80 million manufacturing jobs that China is expected to export.” Wages in these countries can be less than 10% of what Chinese workers are paid. The owner of a shoe factory outside Addis Ababa, however, is frustrated with productivity and profits: transportation and logistics are costly and difficult. His comment: “Ethiopia is exactly like China 30 years ago.”²⁵²

Image: DFID – UK Department for International Development (Flickr)

industrialization and focusing instead on natural resource extractive industries and services.²⁵⁷

Infrastructure issues are a major constraint in building and supplying manufacturing plants in Africa. China's investments on the continent have been perceived as a key driver of Africa's manufacturing capacity. Though not the dominant source of foreign investment in Africa, China has been willing to back more high-risk and aspirational projects. It has supported manufacturing sectors ranging from shoes to food. Chinese firms have also invested in African infrastructure such as "telecommunications, transport, construction, power plants, waste disposal, and port refurbishment."²⁵⁸

However, for the African manufacturing workforce to grow significantly, productivity would need to improve. Africa has the lowest productivity of any region in the world; in fact, in half of African countries effective labor costs are actually higher than in China because workers are so much less productive. Even when comparing countries at similar levels of income, African costs are nearly 80% higher.²⁶² Improving productivity will depend on building workers' skills, creating the physical environment and logistics that support manufacturing, and building internal organizational and labor-support systems.

Manufacturing workers will compete globally

Manufacturing is shifting locations, driven by labor cost, labor availability, supply-chain logistics, and demand. In the past, it

It's not always about cheap labor

Selection of a site for a manufacturing plant is extremely complex and the decision criteria differ by industry, type of operation, and timing. A KPMG study identified 26 different cost factors, including basic items such as labor, taxes, real estate, and utilities. Interestingly, however, the study found that non-cost factors often end up driving the decision. These include—but are not limited to—regulatory issues, innovation capacity, and quality of life.²⁶¹

was assumed that labor costs were the dominant factor. But that is no longer true. "Next-shoring" and "re-shoring" are redistributing manufacturing nearer to customers. In fact, according to Boston Consulting Group, as of 2014 "the US had become the second-most-competitive manufacturing location among the 25 largest manufacturing exporters worldwide."²⁶³ This means that workers in lower-income countries are now in competition with workers in high-income countries (and their robot colleagues) for manufacturing jobs.

Next-shoring and re-shoring

Trends including rising wages in Asia, higher shipping costs, automation, and accelerated time-to-market requirements have created the need or opportunity to move manufacturing and manufacturing jobs closer to the markets they serve.²⁵⁹ "Next-shoring," an emerging trend for manufacturing, emphasizes proximity to demand and innovation, helping, for example, countries like Mexico to serve the US market.

And as automation reduces the role of labor in production, manufacturing is often "re-shoring": returning to developed economies in the United States and Europe (though often without bringing significant numbers of jobs back with it). A 2014 report from BCG suggests that "years of steady change in wages, productivity, energy costs, currency values, and other factors are quietly but dramatically redrawing the map of global manufacturing cost-competitiveness," and postulates, "One implication is that global manufacturing could become increasingly regional. Because relatively low-cost manufacturing centers exist in all regions of the world, more goods consumed in Asia, Europe, and the Americas will be made closer to home."²⁶⁰

Manufacturing Work: Implications for the poor and vulnerable

- **Manufacturing jobs offer diminishing prospects for lower-income countries.** Competition for manufacturing centers will increase. Countries across the income scale will bring different competitive advantages including: automation, innovation capacity, labor costs and productivity, incentives, and trade structures and options.
- **Manufacturing will provide ever-fewer low-skill jobs.** The highly competitive environment of global manufacturing will make it increasingly difficult for unskilled workers to gain entry into manufacturing, even in lower-income countries.
- **Robotics will continue to replace low-skill jobs.** A number of trends will likely drive rapid growth in robotics on the manufacturing line. These include more advanced robotic technology, more experience in manufacturing applications and development of best robotic practices, the declining price of robotics, more stringent requirements for product quality, and the drive to reduce the price of manufactured goods. Accelerated use of automation will reduce the demand for workers—particularly those with low skills who are more easily replaceable.
- **Leapfrogging via service jobs.** Services provide a way for economies and their workers to leapfrog past industrialization. Premature deindustrialization and other factors noted above imply that manufacturing can no longer be counted on to provide jobs for large numbers of unskilled or even skilled workers. Low- and high-skill service jobs may offer the best opportunity to create jobs tied to global markets.
- **Different social role for the “working class.”** The growth of manufacturing in today’s middle-income and high-income economies provided an environment where workers could unite and demand rights. Social policies were instituted for all workers as a result. The smaller, more competitively challenged manufacturing environment may not serve this same role for today’s developing economies. Impetus for worker protections and benefits thus has to come from other sources than a large industrial workforce.

Still counting on manufacturing

Manufacturing expansion is still a goal in many places.

- An employment specialist in South Asia interviewed for this report noted the recent major expansion of Bangladesh’s garment industry (including its impact on employment for women), and posited that future job growth could come from expansion of manufacturing into other industrial sectors.²⁶⁴
- A human resources specialist in West Africa suggested that if the employment situation in Africa improves dramatically over the next 15 years, it will be in part because of the growth in manufacturing, especially textiles.²⁶⁵

Looking across the Emerging Work scenarios

The relationships among the scenario groups in this chapter can be examined in the cross-impact matrix below. Each cell describes the potential impacts of the scenario group in the row

on the scenario group in the column, along with the effects of the changing nature of informal work. (See sidebar, “[The futures of the informal economy](#)” in the **Rural Work** section of this chapter.)

Cross-impact matrix: Emerging Work

Scenario group	Rural work	Manufacturing	Informal economy
Rural work		<ul style="list-style-type: none"> Scenarios that make rural work less attractive drive more workers to move to cities, making manufacturing jobs more competitive and creating downward pressure on pay and worker rights. Scenarios that make rural work more attractive reduce the incentives for urban migration. 	<ul style="list-style-type: none"> Some rural scenarios improve the livelihoods of rural informal workers and reduce incentives for rural–urban migration that can feed the urban informal economy. Other scenarios make rural livelihoods less stable and increase the pressure on rural workers to migrate to urban areas.
Manufacturing	<ul style="list-style-type: none"> Scarce and uncertain manufacturing jobs may encourage vulnerable populations to remain in rural areas. 		<ul style="list-style-type: none"> Lack of/uncertainty in manufacturing jobs can force those who can’t get formal jobs in manufacturing toward more informal, entrepreneurial jobs.
Informal economy	<ul style="list-style-type: none"> Persistence with slow formalization will leave many rural workers struggling with low incomes and no social protections. Embracing the informal economy could work synergistically with scenarios that have the potential to improve the situation of rural workers, e.g., Scenario 2: Rural IT. 	<ul style="list-style-type: none"> Persistence with slow formalization will increase competition for manufacturing jobs, creating downward pressure on pay and worker rights. Embracing the informal economy will decrease pressure on all formal economy sectors to provide jobs, with the potential to offer a buffer against negative outcomes of unemployment. 	

Emerging Work: Conclusion

The nature of work is changing, across the globe. This chapter has explored the future evolution of two of the most central and fast-changing facets of work in developing countries:

- **Scenario Group 1. Rural Work.** Rural work is being dramatically reshaped by large forces, including shifts in demography, technology, and business structures. Challenges to vulnerable workers will intensify over time, though technology and other innovations could offer paths to more secure livelihoods.
- **Scenario Group 2. Manufacturing Work.** As lower-income countries shift from agriculture to manufacturing and service/knowledge work, the role and trajectory of manufacturing work will differ from what was previously experienced by workers in now-developed countries. Vulnerable workers will find fewer opportunities in the manufacturing sector.

These two aspects of work were chosen by the Rockefeller Foundation because they are particularly relevant to the work of the social sector—and both are undergoing substantial change, which in turn is provoking extensive explicit or implicit forecasting of their potential futures.

The key insight from this body of prognostication is that the paths to secure livelihoods that were available to workers who became the middle classes of today's higher-income nations do not provide replicable models for today's developing-economy workers. Lower-income nations today start from a different place, shaped by new and different drivers of change.

The clear implication is that over the next two decades, work environments will evolve along fundamentally new paths—paths that are unexpected and for which most workers, employers, and governments are underprepared. Policies or actions to support vulnerable populations will need to anticipate these new pathways if they are to be successful.

Evaluating the literature

Both of these scenario topics offered challenges when evaluating the literature. Rural livelihoods—especially agriculture—have been explored in detail, as have the prospects for improving them. But scenarios for the rural world vary sharply, and for that matter are usually implicit rather than systematically developed, making them enigmatic to tease out or compare. Meanwhile, manufacturing is of course a central focus of economic policy, with ongoing and detailed consideration of the economic and technological factors dictating its future. However, it is difficult to find research that looks holistically at the shifting nature and trajectory of manufacturing.

Key findings: Emerging Work

The aggregate scenario is that vulnerable populations in lower-income countries will continue to face substantial challenges in gaining work that provides a secure livelihood, although a variety of innovations offer hope of progress.

- **Technology is on trend to displace more workers from manufacturing, with disproportionate impacts on the poor and vulnerable.** Automation will impact vulnerable populations in lower-income countries in several ways. It will eliminate existing manufacturing jobs, reduce the number of new manufacturing jobs created to meet domestic demand, and reduce the demand for low-skilled work outsourced from higher-income countries.
 - **Changing demographics could make rural livelihoods less secure at the bottom of the pyramid.** Urban migration among working-age males will continue to make rural subsistence populations older and more female. Some workers will stay on the land (facing challenges including land tenure issues and access to capital), others will seek non-agricultural work (urban or rural), and still others could turn their smallholder farms into viable businesses.
 - **Rural work innovations could benefit the poor and vulnerable.** Innovations that could make a meaningful difference in the livelihoods of rural workers include inclusive agribusiness, rural IT, farming innovations designed for women, and new forms of credit and finance tailored to the needs of agricultural workers.
 - **Technology may create a divide within rural populations.** Technology will create new futures for some vulnerable rural workers. For example, a growing genre of tech innovation is focused on improving productivity and profitability for small-scale agricultural workers. But vulnerable workers without technology access will fall further behind their connected peers.
 - **Workers' rights and social protections will continue to be problematic for vulnerable populations.** Workers' rights have been widely recognized as an essential element of sustainable economic success. In the past, the sheer numbers of workers co-located in manufacturing centers enabled collective action for change, but premature deindustrialization has weakened that framework. The rise of decentralized work structures will add to this issue. Going forward, vulnerable populations will have to find alternative means to gain worker protections and rights.
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Chapter 4. Transforming Work

New Paradigms in Response to Change

Introduction

The forces and trends documented in previous chapters have the potential to catalyze a profound transformation of the economic system, potentially equivalent in scale to the rise of industrialism. Economists and analysts are devising new paradigms in the face of the effects of trade, the drive for efficiency, and the growing use of automation. Some have begun to acknowledge the possibility that these forces will reduce the amount of work available within current economic systems.

Countermeasures

The most politically prominent sign of troubling change is that in most high-income economies, wages have lagged behind rising productivity in recent decades.²⁶⁶ In the United States, the linkage between economic growth and the wages of the typical blue-collar/non-managerial worker has been broken since the 1970s. More recently, this disconnect has spread to average income of all workers.²⁶⁷

Faced with this stagnation, together with the evolving changes in work detailed in this report, policymakers and politicians are inclined to adapt existing policy solutions and take an incremental approach. Many of these efforts can be characterized as countermeasures: fixes that rely on existing methods and tools to tweak current economic and social frameworks. These include:

- **Retraining and education.** Policies and programs are intended to increase the relevance of education to work, prepare workers for jobs of the future, and retrain workers displaced from current professions.
- **Minimum wages.** In the United States there are widespread movements to raise the minimum allowed wages at local, state, and federal levels. In some places this is targeted at providing a “living wage”—the idea that work should, at minimum, lift a worker from poverty.

These kinds of programs have can have meaningful positive effects, improving workforce preparedness and raising incomes, especially for low-wage workers. However, because they do not take a structural approach, countermeasures such as these are in a sense stopgap measures, predicated on the idea that changes in the work world are short-term aberrations and that “normal” economic patterns will resume, along with job growth and income growth.

Transforming Work: Key implications for the poor and vulnerable

- New structures and policies are needed.
- New structures could pay for activities that society values.
- The “gray wave” provides opportunities.
- Abundance doesn’t end risks for the poor and vulnerable.

However—as the findings of this report strongly suggest—the probability of recent trends being reversed is diminishing. It seems increasingly likely that the “new normal” of work will be considerably different than anything in the past.

Inasmuch as countermeasure policies are ameliorative rather than transformational, they may do little for deeply disadvantaged groups that suffer from structural socioeconomic forces. Solutions delivered within the bounds of current public-policy assumptions are also likely to fall short of truly addressing future disparities that are likely to emerge.

Transformation

Hopeful possibilities are embedded in this accelerating wave of change. Analysts are beginning to consider how to shape its trajectory in beneficial ways. This chapter focuses on two primary approaches to transformation, both of which posit the need to experiment with structural solutions, and to ensure that the transformed world of work is more equitable and fair.

The two scenario groups are:

- **Scenario Group 1. An Inclusive Economy.** Structural shifts could allow workers to reengage with the economy in new ways, countering some of the destabilizing forces related to automation and to the flex/gig economy.
- **Scenario Group 2. The Abundance Economy.** Automation is a threat to many existing jobs, but it also offers opportunity, as both great wealth and new economic structures will be created in the years ahead. This scenario group is based on the idea that the gains from automation, information technology, and other innovations can provide a level of prosperity for all, e.g., in the form of a basic income. This would occur first in high-income economies, but has the potential to spread to other countries as their incomes and national productivity rise.

Scenario Group 1. An Inclusive Economy

In the face of the looming issues detailed in previous chapters, economists, policymakers, and politicians are looking for ways to counter these problems. As Michael Spence, a Nobel-prizewinning economist, commented in a World Economic Forum blog post:

It is possible that we are entering a period in which major adaptations in employment models, workweeks, contract labor, minimum wages, and the delivery of essential public services will be needed in order to maintain social cohesion and uphold the core values of equity and intergenerational mobility.²⁶⁸

Scenarios for An Inclusive Economy

This scenario group includes three scenarios:

- **Scenario 1: Restructuring jobs.** Jobs could usefully be restructured to make work better for both workers and the labor market.
- **Scenario 2: Re-linking growth and income.** Structural changes can help reconnect economic growth with workers' incomes.
- **Scenario 3: A decentralized economy.** Decentralized production and distribution could offer workers new options.

Because these scenarios arise from a search for new ways to structure work in a changing economy, they are divergent, yet still broadly compatible. They share the common assumption that serious change is needed, and that socioeconomic conditions are likely to worsen if change does not occur.

However, despite strong drivers, the normative or aspirational nature of these policy scenarios means that they are not highly likely outcomes, but are instead contingent on sociopolitical changes and decisions. For example, re-linking growth and income is receiving strong policy attention in high-income economies, but the policies contemplated at the mainstream policy level are typically cautious and conventional.

Scenario 1: Restructuring jobs

Jobs could usefully be restructured to make them fit better with evolving socioeconomic trends.

Scenario summary: Restructuring jobs

Scenario type	Policy-normative
Scenario position	Alternative, though mainstream among change advocates
Key proponents	Alternative economists and analysts
Impacts on poor and vulnerable	Seen as positive if properly enacted
Strength	One possible outcome of strong trend drivers
Key drivers	Ubiquitous connectivity, drive for efficiency
Timing	Increasing partial adoption likely in next 20 years
Geography	Applicable at all economic levels, though likely to be led by higher-income countries

The prevailing structure of the 9-to-5, 40-hour workweek is a fairly modern construct, developed in large part by manufacturers to better regulate their flow of labor. But as the changes in the labor force described in previous chapters take hold, this structure begins to make less sense. A host of new ideas are being proposed that seek to restructure the very ideas of “job” and “workweek.”

Shrinking the workweek

Technology futurist Vivek Wadhwa endorses shrinking the workweek from the standard 40 hours to something as radical as 10–20 hours.²⁶⁹ According to studies, the perception that most people work only 40 hours a week is an illusion; for instance, a Gallup survey found that the average American worker logged 47 hours a week, almost an extra work day.²⁷⁰

Not only would shrinking the workweek reduce unemployment (as work would be shared among more workers), but, according to Wadhwa, “we could also create the utopian future we have long dreamed of, with a large part of humanity focused on creativity and enlightenment.”²⁷¹ (For more on this idea see **Scenario Group 2. The Abundance Economy** in this chapter.)

Anna Coote, head of social policy at London’s New Economics Foundation, echoes Wadhwa’s sentiments. “Reducing the standard working week could bring a range of social, environmental, and economic benefits,” she says.²⁷² In Coote’s view, a 30-hour week (for all workers) would redistribute work more evenly to a broader pool of workers, and would allow more family time, vacation, etc.²⁷³

Job sharing

A related idea is job sharing, in which two or more workers are hired for the same job. The number of hours each job-sharer works per week is reduced, while the position overall is still considered a 40-hour-per-week job. A workforce expert interviewed for this report said that work sharing is a tool for reducing unemployment and that the United States, going forward, will need to use this and other ways to do more with existing jobs.²⁷⁴

Harvard economist Claudia Goldin has noted that when completion of a work role is “substitutable” (that is, anyone can finish a job even if someone else started it), both workplace flexibility and gender equity in the office increase.²⁷⁵

An Australian Department of Education report found that up to 30% of Australian workers are already working part-time or in job sharing arrangements.²⁷⁶ In Germany, the government subsidizes employment, including job-sharing programs. As Richard Dobbs of McKinsey explains:

This includes the mini-job program as well as the “Kurzarbeit” job-sharing system. Job sharing encourages companies to reduce working hours to adjust for falling demand during economic downturns, rather than laying off workers. For up to 24 months, the government pays up to two-thirds of the lost income per worker and 100% of social security payments.²⁷⁷

Gig economy and restructuring

Some of the ideas discussed in **Chapter 1. Flexible Work, Freelance Workers** are also relevant to restructuring work, particularly those discussed in the scenario dubbed “freelance world.” The “freelance world” scenario in many ways takes the idea of restructuring jobs to its ultimate, beneficial end, envisioning a workforce that can work when and where it wants for the wages it wants.

Both automation and work flexibility support expansion of jobs in segments of the service economy. Early signs of this expansion may already be reflected in the gig economy, where online platforms (e.g., Uber and TaskRabbit) have sought to reduce the risk and uncertainty of hiring strangers to perform personal services. This sector has the potential to expand rapidly in the years ahead, providing new employment at a variety of skill levels. Personal services that are currently purchased only by the wealthy may become more affordable and available to those at moderate income levels. For example, Uber is democratizing chauffeur services, while TaskRabbit is democratizing the use of maids and personal assistants.

(Note: More detailed exploration of how automation can lead to shorter workweeks can be found in **Chapter 2. Automated Work.**)

Scenario 2: Re-linking incomes to growth

Policy changes can help reconnect economic growth with workers' incomes.

Scenario summary: Re-linking incomes to growth

Scenario type	Normative, intended to interrupt present trends
Scenario position	Mainstream to alternative
Key proponents	Mainstream and alternative economists and politicians
Impacts on poor and vulnerable	Likely strong positive effects if implemented
Strength	Strong drivers but uncertain outcome
Key drivers	Inequality, productivity automation, drive for efficiency
Timing	Increasing experimentation likely over next 20 years
Geography	Likely in some high-income and some middle-income countries

Forecasters and economists of all political persuasions have ideas, many of them contradictory, for how to reconnect workers' earnings to overall economic growth. This debate is particularly acute in the United States, which has shown some of the strongest de-linking of growth from income.²⁷⁸ Both liberals and conservatives offer up prescriptions, with the ideas spanning both mainstream and alternative thought. Conservative ideas in this realm tend to be more cautious and less structural.

Policy disagreement—and agreement

As to be expected, conservative ideas on income-related policy differ substantially from liberal ones, though there are areas of overlap. Conservative writer Steven Hayward asserts that liberals and conservatives are not too far apart on the fundamental issue:

While liberals and conservatives may disagree on the very notion of equality, they can agree on certain points—for example, that stagnating incomes are problematic—and can achieve policy agreement in certain key areas.²⁷⁹

Leaning toward redistribution

“Increasingly I am of the view that even if we could level the domestic playing field, it still won’t solve our wage stagnation and inequality problems. Redistribution of income appears to be the only answer.”

—Mark Thoma, an economist at the University of Oregon²⁸⁰

For example, there is some conservative support for increasing the per-child tax credit to \$5,000, which by some estimates would counter current payroll taxes and put more money in the pockets of workers with children.²⁸¹ Republican presidential candidates in 2015 proposed replacing the earned income tax credit (EITC) with a federal wage subsidy for low-income jobs, and implementing a “flex plan” approach to streamlining social benefit payments.²⁸² The flex plan is inspired by a universal credit implemented by UK’s conservative party. The approach combines multiple income-based subsidies, such as food benefits, heating assistance, and

housing support, into a single stream of income support for poor and underprivileged workers. Overall social welfare spending could remain the same, but more benefits would come in the form of income support, with fewer in-kind subsidies.

Increase bargaining power

Many left-leaning economists believe that going forward, the best way to raise wages and incomes is to shift the scales of bargaining power. Jared Bernstein at the Center on Budget and Policy Priorities has argued that “the most reliable way to reconnect growth and incomes is to increase the bargaining power of the workers on the wrong side of the income divide.”²⁸³ He believes that strengthening unions and enforcing existing labor standards could be effective.²⁸⁴

This is seen as particularly relevant to the United States, where union power and membership have declined more drastically than in many other high-income economies.²⁸⁵

Distributed ownership

Another approach to re-linking incomes with economic growth is to focus on expanding access to the ownership of capital, instead of simply redistributing income. Such an approach would ensure that the productivity gains and profits from growing automation would accrue to a broad base of corporate shareholders throughout society. Recently, such an approach was promoted by Joseph Blasi, along with economists Richard Freeman and Douglas Kruse, in the book *The Citizen’s Share: Reducing Inequality in the 21st Century*. The authors propose that policymakers create new incentives for companies to create employee stock ownership plans (ESOPs), or to broaden worker access to acquiring stock options, which are currently only offered to top executives.²⁸⁶

The kind of broadening of the base of ownership could set the stage for aspects of the “abundance economy”—see the next scenario group.

Scenario 3: Decentralized work

Decentralized production and distribution could offer workers new options.

Scenario summary: Decentralized work

Scenario type	Aspirational based on present trends
Scenario position	Alternative
Key proponents	Alternative economists and analysts, technologists
Impacts on poor and vulnerable	Potential upsides if structures are inclusive
Strength	One potential outcome of strong drivers
Key drivers	Ubiquitous connectivity
Timing	Growing potential over next 20 years
Geography	Versions likely to occur at all economic development levels

An economist interviewed for this report pointed to the development of the decentralized economy—from 3D printing to online DIY marketplaces such as Etsy—as a way for today’s workers to earn livelihoods. This could mark a kind of return to a 19th century model of production, in which output and profits are more firmly in the hands of the worker/maker, rather than of capital owners.²⁸⁷

There are early emerging examples of decentralized production, the most successful and well-known being the online craft store Etsy. The Etsy site boasts nearly 1.5 million sellers and close to 20 million buyers, and features 26 million products for sale. The site generated almost \$2 billion in sales in 2014.²⁸⁸

An economist interviewed for this report stated that decentralized production has broad application for workers across the economic spectrum—but could be particularly helpful in bringing workers into the workforce in ways that are less exploitive than labor platforms such as Uber or TaskRabbit.²⁸⁹ (For more on “gig platforms” like these, see “The Gig Economy” scenario group in **Chapter 1. Flexible Work, Freelance Workers.**) Thus, Incite Focus’ fablab is intended to offer new technologies such as 3D printing and social networking as a means for disadvantaged workers and creators to connect to a larger network for their creations.²⁹⁰

Decentralizing work with “maker” technologies



A school of thought holds that decentralizing technologies can lead to a kind of post-capitalist economy. One of these technologies is 3D printing, which has received heavy attention from the “maker” community in the 2010s. However, while 3D printing is advancing, especially within large organizations, at the consumer level it is so far mostly employed for hobby and leisure activities, such as printing the mini-cathedral above.

Image: Foresight Alliance

The network effect that the Internet fosters allows workers to create new kinds of careers that are untethered from traditional ideas of work. On YouTube, for example, the highest-earning user (\$7 million in 2014) is a commenter on videogames.²⁹¹ Other high earners reaped millions of dollars reviewing toys or playing games.²⁹²

This vision finds its main support in alternative circles, but variants come out of the business community as well. A PwC report has a variant called “Small is Beautiful”:

Companies begin to break down into collaboration networks of smaller organisations; specialisation dominates the world economy... where big is bad, for business, for people, and for the environment. Global businesses fragment. Technology empowers a low-impact, high-tech business model. Networks prosper while large companies decline.²⁹³

An Inclusive Economy: Implications for the poor and vulnerable

- **Bargaining power vs. atomization.** The trends outlined in **Chapter 1. Flexible Work, Freelance Workers** tend to undermine a restoration of worker bargaining strength, especially in the United States, where these trends and the decline of unions are both furthest advanced. Increased worker bargaining power in this environment is likely to require new business and regulatory structures *and* new sociopolitical circumstances. Middle-class workers are more likely to be able to benefit from such changes than are lower-income, lower-skill workers.
- **Rewards for work.** In work-focused, individualistic societies such as the United States, policies meant to increase the payoff to those working (such as earned-income tax credits) have a better chance of implementation than purer social-insurance policies. However, such policies would tend to leave out those excluded or expelled from the workforce.
- **Job sharing.** Employers are increasing their use of flexible and part-time labor, and gaining growing facility with integrating these workers into their full-time workforces. This approach could be made more equitable with expanded social support for job sharing. Many workers would welcome a 20-hour workweek, if their compensation and benefits were adequate.
- **Employee elitism.** The shrinking number of workers who retain full-time employment may increasingly regard themselves as a social elite. Although they will work in a wide variety of intellectual, physical, and social fields, they could increasingly identify as a distinct class: the economically productive. As a class, they may view themselves as distinct from the “non-productive” elements of society, and support policies that benefit themselves.
- **Taxation changes.** Interventions in the evolution of work may need to shift the foundation of taxes from income taxes to taxes based on consumption and production. Income taxes on lower-income workers reduce net incomes and can exacerbate economic inequalities. Instead, taxes based on consumption and production might better capture the value added by rising productivity in a mixed human–automated workforce. Consumption taxes such as sales taxes could be modified to be more progressive, and escalate on luxury and high-value

purchases, while lessening the burden on lower-income people. Transitioning from broad-based income taxation to alternatives like these could lower the costs of labor, incentivizing employers to retain or even expand their workforces.

- **Challenges to policymaking.** Globalization and automation make it increasingly challenging for local and national governments to impose their will on employers. When employers have the option of outsourcing their work to flexible workers, or implementing wholesale automation, the power of governments to compel and mandate employers to bear the costs of social-policy mandates will become increasingly untenable. Societies that wish to reshape labor markets for social purposes may have to bear a greater proportion of the costs of such interventions. Mandates on employers may prove counterproductive, since such mandates typically raise the costs of labor. Instead, policy objectives might be better achieved by direct government subsidies to support and incentivize greater employment of human workers at equitable salaries.
-

Scenario Group 2. The Abundance Economy

The central concept behind the abundance economy is that wealthy and productive economies can afford to provide a degree of livelihood for every citizen, whatever his or her work situation.

Expanding automation may push human workers out of jobs, but it will give society the benefits of the goods and services that automated systems can provide. Addressing the question of how to distribute this wealth in a fair and equitable manner may prove to be one of the most significant challenges of the 21st century.

Proponents of this approach argue that a time is nearing when at least some societies have enough for everybody. Tim Wu, a professor at Columbia Law School, summarizes this view:

Humanity's fundamental problem comes down to scarcity—not having enough of what we need and want. We need food, water, new shoes, new gadgets, and so on, and we suffer when we do not have them. That problem can and will be solved by technology, or—at an individual level—by buying or otherwise gaining access to the objects of our desires.... We must imagine “a world where everyone's days are spent dreaming and doing, not scrapping and scraping.”²⁹⁴

Some see the possibility of universal “enoughness” as an aspiration; others as an essential step to dealing with the disruptions facing the current economic system.

Scenarios for The Abundance Economy

The ideas of the abundance economy are explored in four scenarios:

- **Scenario 1: A post-work society.** High-income economies will edge toward a post-work society in which jobs are not the central organizing principle.
- **Scenario 2: Abundance via automation.** Automation will be a primary driver of an abundance economy, creating wealth and substituting for labor.
- **Scenario 3: Universal income.** Everyone could receive a minimum level of income that meets basic needs.
- **Scenario 4: The problems of abundance.** An abundance economy will create its own downsides.

Abundance economy concepts are still peripheral ideas even in high-income economies, despite relatively strong drivers. They have little policy role thus far.

Discussions of facets of abundance are dominated by enthusiasts and skeptics, so the nuances and gray areas of outcomes may be underexplored.

The concept of an abundance economy is often seen as fantastically utopian. But proponents note that economic systems have become increasingly fluid in recent centuries. And the current economic paradigm in high-income societies—receiving pay for doing tasks for large organizations—is scarcely more than a century old, and is unlikely to be the final word in economic organization.

The four scenarios for forms of an abundance economy are generally compatible. There are of course counter-scenarios, based on arguments that this level of change is unworkable. Abundance theorists may generally agree that their ideas are partly normative, not some inevitable outcome of present trends.

Scenario 1: A post-work society

High-income economies will edge toward a post-work society.

Scenario summary: A post-work society

Scenario type	Discontinuous and partly aspirational
Scenario position	Traditional alternative forecast
Key proponents	Alternative economists, some technologists
Impacts on poor and vulnerable	Likely only after substantial suffering
Strength	Strong drivers but uncertain outcomes of them
Key drivers	Automation, productivity, aging
Timing	Partial realization at best in 20 years
Geography	High-income societies and possibly some resource-rich middle-income societies

This is a perennial forecast of recent decades, as technology seemed to promise enormous societal wealth produced by ever-less human labor. The concept is newly prominent again due to the confluence of two trends: first, that economic growth and collectively high societal wealth are no longer driving rising incomes for most people, at least in high-income economies; and second, that automation is reaching a tipping point of effectiveness and pervasiveness, which in the eyes of many forecasters is poised to make human labor obsolete on a large scale. (See **Chapter 2. Automated Work.**)

As a result, many observers argue, a post-work society may be in the offing. As Jon Evans, a journalist and software engineer, puts it:

The endgame, where we're going as a species... is some kind of post-scarcity society. Will people have jobs in a post-scarcity society? No. That's what post-scarcity means. They'll have things to do, authorities, responsibilities, ambitions, callings, etc., but not jobs as we understand them. So if the endgame is a world without jobs, how will we get there? All at once? No: by a slow and inexorable decline of the total number of jobs. Today's America is just at the edge, the very beginning, of that decline.²⁹⁵

An abundance transition would necessarily be a long-term development, requiring substantial political, social, and economic adjustments. It might happen more by degrees than via some kind of New Deal-style transformative moment. European countries could try to lead this movement, although Europe's aging populations and less-competitive economies might undercut the economics of abundance.

Enthusiastic proponents of this future see a jobless future not as a looming problem, but as a desirable and likely outcome. Peter Diamandis, founder of the X Prize Foundation and co-author of *Abundance: The Future Is Better than You Think*, has written:

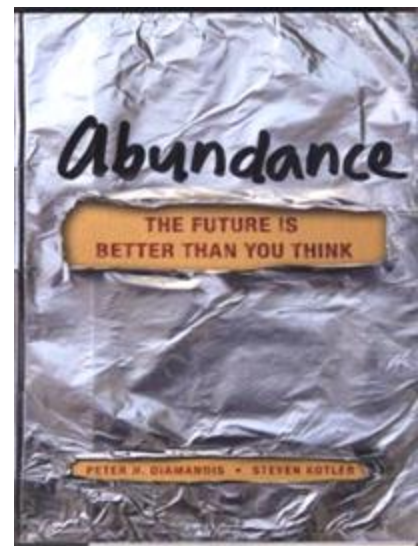
Humanity is now entering a period of radical transformation in which technology has the potential to significantly raise the basic standards of living for every man, woman, and child on the planet. Within a generation, we will be able to provide goods and services, once reserved for the wealthy few, to any and all who need them.²⁹⁶

A variant on this concept is the true “sharing economy,” beyond the limited sense in which that term is used today. Summarizing futurist Jeremy Rifkin's take on this idea in *The Zero Marginal Cost Society*, Seongwon Park of the Korean Science and Technology Policy Institute explains:

As we move from a capitalist economy to a sharing economy, the marginal costs of many products and services are being driven toward zero and concepts of ownership are giving way to new models of collaborating to share resources. Rifkin forecasts a similar development of people embracing leisure time because of less production requirements as more and more is shared and less is owned.²⁹⁷

While many thinkers characterize this as a “post-work” economy, this terminology is somewhat misleading. Even with automation there is a great deal of non-compensated human work that needs to be performed in the community. Instead, it may be more accurate to characterize this as a “post-jobs” economy, where formal employment is increasingly rare, and much of the economically productive work is handled by computers and robotic systems.

Techno-abundance



One school of “abundance” thinking comes out of American technology culture, and is driven more by visions of possibility than a sense of necessity. Often highly aspirational, this school's thinking sometimes falls short in connecting the potential for technological abundance with plausible or likely economic and social futures.

Image: Foresight Alliance

Scenario 2: Abundance via automation

Automation will be a primary driver of an abundance economy.

Scenario summary: Abundance via automation

Scenario type	Aspirational outcome of present trend
Scenario position	A primary forecast within the alternative abundance sphere
Key proponents	Alternative economists, and technologists
Impacts on poor and vulnerable	Rising harsh effects likely key driver of outcome
Strength	Strong trend but uncertain impact and outcomes
Key drivers	Automation, productivity, inequality
Timing	Intensifying driver with uncertain effects in next 20 years
Geography	Higher-income countries, with some possible manifestations in resource-rich middle-income countries

Many see automation as a central force in propelling an abundance economy, for two reasons. First, automated systems are taking jobs from humans, which may cause long-term or permanent job loss to the unemployed person, and may eventually begin to decrease the absolute amount of available work that can generate livelihoods. (See **Chapter 2. Automated Work.**) Writing in *The Atlantic*, Derek Thompson summarizes this problem:

Technology could exert a slow but continual downward pressure on the value and availability of work—that is, on wages and on the share of prime-age workers with full-time jobs. Eventually, by degrees, that could create a new normal, where the expectation that work will be a central feature of adult life dissipates for a significant portion of society.²⁹⁸

The second reason is that automated systems—software and robotics—provide a means to get more and more necessary work accomplished without paying humans to do it.

This results in an economic dilemma, however, which blogger Cory Doctorow sums up this way:

If we persist in the view that the dividends from robots' increased productivity should accrue to robot owners, we'll definitely come to a future where there aren't enough owners of robots to buy all the things that robots make.²⁹⁹

In a similar vein, sociologist James Hughes argues:

We are now entering the beginning of an era in which technology has started to destroy employment faster than it creates it. The advance of information technology, artificial intelligence, and robotics will eventually reduce the

demand for all forms of human labor, including those dependent on “human skills” like empathy and creativity.³⁰⁰

In sum, the sense that current systems of work and income are under increasing pressure has revived interest in moving toward something genuinely new.

Scenario 3: Universal income

Everyone could receive a base level of income that meets basic needs.

Scenario summary: Universal income

Scenario type	Largely normative/aspirational
Scenario position	Alternative and peripheral to most policy
Key proponents	Alternative economists and analysts, some US technologists
Impacts on poor and vulnerable	Can solve income poverty but not structural issues
Strength	Based on strong trend but outcome uncertain
Key drivers	Automation, productivity, inequality
Timing	Possible limited implementations next 20 years
Geography	Higher-income countries, with some possible manifestations in resource-rich middle-income countries

Detaching income from work—variously called a universal, basic, or guaranteed income—has been widely discussed in high-income economies for decades, finding support on both left and right. Liberals see it as a way to provide more comprehensive social insurance. Some conservatives find it appealing as a way to do away with intrusive government programs and bloated government bureaucracies.³⁰²

In the face of inequality and automation, however, universal income is increasingly being seen as an outright necessity:

Advocates argue that a basic income is essential to a comprehensive strategy for reducing poverty because it offers extra income with no strings attached. But looking ahead to the future, we may have little choice but to implement it. Given the ever-increasing concentration of wealth and the frightening prospect of technological unemployment, [basic income] will be required to prevent complete social and economic collapse. It's not a question of if, but how soon.³⁰³

In some US states, conservative advocates of nontraditional schooling are pushing for tax dollars to be used to support home schooling. Such a law has been passed in Nevada.³⁰⁴ This is essentially a kind of basic income provided outside the current economic system, in this case for a form of caring work. Sociologist Hughes sees other drivers too, such as rising longevity:

Basic income: not just pie in the sky

There are weak signals that a universal basic income may not be a totally utopian concept, even in the highly individualistic United States. Alaska—often viewed as the last frontier of rugged independence in the United States—has for decades distributed part of its revenue from oil production to each Alaskan citizen. While not at middle-class income levels, since 2008 the annual dividend to a family of four has been \$12,800.³⁰¹ These dividends have been important in helping Alaskans who still partially support themselves with subsistence hunting and fishing.

Alongside growing technological unemployment, we will also be living much longer, and will need to figure out an equitable solution to the growing ratio of retirees to workers and tax-payers. Basic income is the logical renegotiation of the social contract to ensure that we don't spiral into widespread poverty and inequality.³⁰⁵

High-income economies may thus edge toward an abundance economy as they support larger non-working populations, especially growing populations of retirees. Countries with very low birthrates might offer a level of basic income to families willing to have children. Russia and Singapore have already implemented such policies, with mixed results.³⁰⁶

An abundance economy will require substantial societal adjustments

For millennia, most humans have needed to work hard to survive, and most societies today are heavily structured around paid or subsistence work. Changing this paradigm would require significant changes not only to the global economic system but to many other parts of society. Cory Doctorow writes:

Some economists I've spoken to tell me that they think this will lead to more redistributive policies... as a way of salvaging capitalism. But... there's a real scarcity of economists willing to think about the possibility that abundance makes markets obsolete altogether. Property rights may be a way of allocating resources when there aren't enough of them to go around, but when automation replaces labor altogether and there's lots of everything, do we still need it?³⁰⁸

Current arrangements may be more mutable than they seem, sociologist James Hughes suggests:

It is very recent in human history that we learned to be motivated to work for pay, and were convinced that those who didn't work for pay should feel shame about it. For women that transition only occurred in the last two generations. And there have always been aristocrats who found motivation to get out of bed in seeking prestige or power or simply the intrinsic rewards of an activity, like scientific discovery. It will certainly require at least a generation to transition from a psychological and cultural assumption that self-worth requires work for pay to a society where we find self-worth in voluntary activities.³⁰⁹

UNICEF's basic-income experiment



As an experiment, UNICEF provided all the inhabitants in a village in India with a living income. "The result was not idleness, but improvements in almost every facet of life. People invested in themselves, their children, and the future. Productivity rose as did overall health. Problems that previously were not addressed became primary focuses."³⁰⁷

Image: Prem Kumar Marni (Flickr)

Scenario 4: The problems of abundance

Scenario: An abundance economy will have downsides that need to be dealt with.

Scenario summary: Problems of abundance

Scenario type	Contrarian take on discontinuous scenario
Scenario position	Outcome of or counter-scenario to other abundance scenarios
Key proponents	Pundits and alternative economists
Impacts on poor and vulnerable	Somewhat more likely to be negative for vulnerable
Strength	Only weak signals of this scenario outcome
Key drivers	Automation, inequality
Timing	Only preliminary indicators likely in next 20 years
Geography	Some high-income countries

The degree of change inherent in a shift to an abundance society would be disruptive and even harmful. Social structures would be upended, and people would have to make substantial psychological adjustments as their social and economic roles rapidly evolved.

This would be especially true in work-centric nations. Jon Evans observes, “Trouble is, America, more than any other nation, is built around the notion that all able-bodied adults should have jobs. That’s going to be a big problem.”³¹⁰

An additional challenge is that work can give humans a sense of accomplishment, purpose, and participation. Work is a means to generate value for others, and a way for people to demonstrate skill and competency. Even the least skilled worker can appreciate the camaraderie of being on a team or the satisfaction of a job well done. While wealth may be redistributed, there is no parallel system for redistributing the emotional benefits that work can provide.

For many people, higher levels of engagement in hobbies, the community, and family life could close this gap. But a portion of society would instead be likely to give in to the easy distractions of 21st century society—addictive videogames, low-grade entertainment, the narcissistic pleasures of social media, etc. Tim Wu writes:

We are starting to see just what happens when we reach surplus levels across many categories of human desire, and it isn’t pretty. The unfortunate fact is that

Unpopular jobs

A basic challenge in an abundance economy is how to get necessary but unloved work done. This would likely require paying for such tasks, in part based on the unpopularity of the task. This concept is already in play in areas of the economy, in reverse form: writer jobs often pay very little, as being a writer is a widespread aspiration that motivates many people to work for little or no pay.

extreme abundance—like extreme scarcity, but in different ways—can make humans miserable.³¹¹

Wu cites problems such as obesity, information overload, and videogame addiction that can occur when human needs—at least certain needs—are met easily.³¹²

The Abundance Economy: Implications for the poor and vulnerable

- **Dangerous transition.** A transition to abundance might hold perils for vulnerable populations. Should it occur, the process is likely to be slow and uneven, with a gradual decline of jobs. If this were to reach low-income workers first—as may in fact be the case—they might be economically worse off for an extended period, while more protected groups remain unaware and possibly unconcerned with their plight.
- **Income but no support.** A universal income might also serve as a license to “write off” vulnerable populations, based on a sense that they now have what they need—ignoring myriad structural, non-monetary issues that may persist. Some proponents of universal incomes seem to see the policy as a means to end many kinds of government “interference” in citizens’ lives.³¹³
- **Serving the “least” last.** In some societies, those most likely to be harmed or left behind by economic change will also be seen as undeserving by the majority or the decision-making elite. This will impede any move toward sharing societal wealth, even if abundance-style approaches become feasible.
- **Social value still underpaid?** An abundance economy does not necessarily solve the problem of which jobs are valued or undervalued. That is, money still might not flow to tasks such as family caregiving, eldercare, teaching, or skilled policing. A universal income would at least allow more people to devote their energies to tasks of their own choosing.
- **Supporting the gray wave.** In high-income economies, means of supporting the non-working will have to change, in ways that might open the door to kinds of universal income. As the ratio of working-age people to seniors grows ever worse in most higher-income economies, the current impulse is to make workers work harder to support social insurance schemes. At some point, this may become

Abundance’s elusive nature



The potential for an abundance economy depends on a high level of societal prosperity. There are many potential discontinuities (of varying levels of probability) that could prevent such prosperous futures, such as severe climate change, peak oil or other energy crises, or a great-power war.

If abundance requires boosting resource consumption, many forecasters doubt that such an increase is sustainable, due to energy and other constraints.

Even some of the key factors driving interest in abundance—inequality and social instability—might prove to be traps from which it could be more difficult to escape than is currently recognized.

Image: Takver (Flickr)

politically untenable.

- **No fix for inequality.** Some forms of an abundance economy would do little for social inequality, beyond removing its harsh edges. While everyone's "basic needs" would be met, a small elite could continue to amass ever-greater wealth, and the power likely to come with that wealth. Inequality might begin to be addressed by giving citizens shares in productive assets.
 - **Leapfrog to abundance?** In lower- and middle-income economies, the economics of abundance are more daunting—but the need in these economies may be more acute, as many will have to contend with either a youth bulge or widespread aging before they are truly wealthy. At the same time, these economies are in a position to leapfrog past the traditional work paradigm into automated physical and cognitive work. Providing basic support to growing segments of these populations may be urgent, to prevent destitution and social instability.
 - **A global minimum wage?** Migration crises and instability may expand support for a universal income across borders, as wealthy societies and corporations might see alternatives as unacceptably dangerous or costly.
 - **Getting work done.** The need to fill unpopular jobs could spur even more automation, as people come to understand that automation can take over the burden of unwanted work. Robotic solutions would likely need to be developed for more manual tasks that are shunned as unpleasant.
 - **More remote work.** More work will be offshored or done remotely, with people in other countries taking on tasks such as digital monitoring, or even physical tasks via remote robotics. Certain kinds of remote tasks might be available to low-skill workers, though they will face rising competition from automated systems.
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Transforming Work: Conclusion

This chapter has explored ways that the current framework of jobs, employers, and workers may be intentionally reconfigured in response to the widespread shifts described in earlier chapters of this report.

The **Inclusive Economy** section summarizes preferred futures in which economic structures are adjusted to counter the effects of these ongoing shifts. These preferred futures include redistributing work hours across a wider population of workers, policies to restore the link between economic growth and worker income, and decentralization that puts means of production and service in workers' hands. In these preferred futures, policy changes are used to drive the economic system toward a new equilibrium.

The **Abundance Economy** scenarios consider how the system itself might be transformed to one in which advanced means of producing goods and services provide an adequate livelihood for everyone. Universal income is one possible way to implement such a post-work society, for example, but would present its own new issues.

The disruptions to jobs, employers, and workers forecasted in earlier chapters are substantial, but may arrive slowly enough that the temptation to meet them with existing policy levers will be great. Because the degree of political, economic, and social change required to reach an abundance economy is large, it seems likely that there will be ongoing stepwise changes — changes that may or may not be cast as stepping stones to system-wide transformation. The difficulty will be to achieve a measure of change sufficient to meet the onrushing challenges in ways that mitigate, insofar as possible, the negative consequences for workers —especially the poor and vulnerable and those at risk of becoming poor and vulnerable.

Indeed, a significant challenge in reviewing and summarizing these forecasts has been the fact that on one side there are preferred futures involving the use of existing policy options, and on the other there are visions of entirely new economic realities—but the two seem seldom to meet. It's much more difficult to find global forecasts of how to transition as smoothly as possible from the current situation to a radically different future situation while protecting and enhancing livelihoods at each step along the way.

Key findings: Transforming Work

- **New structures and policies are needed.** Current forces tend to leave the poor and vulnerable with ever-more ragged versions of livelihoods and social protections, as old structures and policies become outdated but new ones are not enacted to replace them. Inclusive policies would enfold lower-paid and part-time workers (among other groups) into revamped systems, and be structured to encourage work and employment—for instance, via job-sharing policies and pro-work taxation.
- **New structures could pay for activities that society values.** Support structures that transcend market forces—including some ideas for inclusion and universal income—have the potential to support societal tasks such as family caregiving, eldercare, and teaching, in ways likely to aid the poor and vulnerable. This approach might also help bridge political divides over “welfare” and “dependence” in societies such as the United States.
- **The “gray wave” provides opportunities.** The rapidly growing ranks of seniors in high- and middle-income economies will require that societies adjust to accommodate larger non-working and partially working populations. Social insurance structures are precursors to universal incomes, and their expansion could open the door to social support for other vulnerable populations. On the other hand, paying for the retirement of vast boomer bubbles in higher-income economies is likely to strain budgets for some time to come.
- **Abundance doesn't end risks for the poor and vulnerable.** The long period of ramp-up to an abundance economy would present significant risks to the poor and vulnerable. Their situation could be more difficult in the short run, and their ranks could swell, because of inevitable turmoil in the transitioning economy. At the same time, once a basic income is guaranteed, some might be tempted to conclude that the poor and vulnerable need no additional support.

Chapter 5. Report Conclusions

The global world of work is entering a period of rapid change. A plethora of research papers, studies, blog posts, and articles have addressed the future of work globally and for the geographies and poor and vulnerable populations central to this report. This report's goal has been to understand the nature of available research from a futures perspective, and to synthesize findings across the many, often siloed, topics that make up the future-of-work map.

For workers in higher-income countries, important changes in the way work is structured, distributed, and carried out will cause substantial disruption in the short to medium term. Some workers will be made more vulnerable while others will find opportunities to improve their circumstances. In the long term, the ongoing drive for workforce flexibility, the emergence of the gig economy, and ever-expanding workplace automation have the potential to eliminate some jobs, complement human workers with machine intelligence in other jobs, and create

entirely new kinds of jobs. Globalization will ensure that the waves made in higher-income nations ripple through to lower-income countries in many ways.

For workers in lower-income countries, rural work is being dramatically reshaped, with potential positive and negative outcomes. Manufacturing jobs are not keeping up with workforce growth. And as the informal economy persists, its role in economic development and secure livelihoods is being reconsidered.

All of this will present both challenges and opportunities for the poor and vulnerable. Policymakers, politicians, economists, and others have begun to consider whether new economic models may better balance growth and economic inclusiveness, with potential benefits for worker wellbeing.

Key takeaways: New opportunities

- Workplace changes may open new opportunities for poor and vulnerable groups.
- Flexible institutions will be needed to respond to changes in the world of work.
- Higher- and lower-income countries can learn from one another.
- The focus of change may shift from large institutions to smaller ones.
- Access to resources and opportunities is a crucial, multidimensional issue.
- Flexible, tech-enabled education may serve vulnerable groups better than traditional options.
- Excluded groups will have new tools to express a collective voice.
- As traditional jobs grow scarcer, demand for new work models will grow.

Key takeaways: Coming disruption

- The next two decades will see substantial workforce displacements and disruptions.
- Present trends portend a (possibly temporary) shortage of high-skilled workers and a surplus of low-skilled ones.
- Vulnerable populations are at risk of bearing the worst of the coming workplace turmoil.
- Additional classes of workers may fall into vulnerable situations during a time of large-scale change.
- The freelance economy will provide opportunities for some vulnerable individuals but disadvantage others.
- Displaced workers could ultimately adopt other forms of value creation, redefining work.

Overarching themes

Several noteworthy themes emerge from this review of forecasts for the global future of work. In general, while the problems facing the world of work are real and usually highly visible, solutions to those problems, and the new structures needed to implement solutions, are mostly hidden or embryonic.

The next two decades will see workforce displacements and disruptions. Forecasts about the impacts of automation on jobs, the gig economy, and the informal economy share a common pattern: while the ultimate outcome remains highly uncertain, it is clear that in the short to medium term—10 to 20 years—there will be a period of flux and turbulence as the system seeks a new, as yet unknown, equilibrium. Forecasts often focus on the ultimate outcome, giving short shrift to the chaotic period that precedes it. Policies for social protections, education systems, migration regulations, and other important tools will need to be adjusted continuously to address the likely workforce displacements, the need for new jobs and training, worker shortages and surpluses, and other issues associated with the transition to the new equilibrium. The impacts of this turmoil are likely to be felt most by vulnerable populations, who have no reserves to withstand such acute disruption and are typically not present “at the table” when the course for navigating these kinds of changes is set.

Present trends portend a shortage of high-skilled workers and a surplus of low-skilled workers, albeit a possibly temporary one. Present-trends-continue forecasts suggest there will be a global shortage of highly skilled workers (in part because of the growing sophistication of industrial and service jobs) and a glut of low-skill workers (in part because of the “youth bulge” in many developing countries). However, in the face of ongoing automation, which will eliminate jobs of increasing complexity, it is not clear whether the shortage of highly skilled workers will continue—although the glut of low-skilled workers seems likely to persist. To be employable, vulnerable workers will need to acquire both the hard and soft skills required for available manufacturing and service jobs.

Flexible institutions will be needed to respond to changes in the world of work. As the world of work plunges deeper into this maelstrom of change, institutions that respond to the needs of workers, employers, and society—legal systems, educational systems, social protection programs, and so forth—will need to be as flexible as the world of work itself. There is a lack of boldness in current policy prescriptions.

The focus of change may shift from large institutions to smaller ones. In the 20th century, hopes for positive change for work and workers often focused on large institutions—global corporations, national governments, and international bodies. In the decades to come solutions may well arise from movements that are small, local, entrepreneurial, and decentralized, in both higher- and lower-income and countries. Whether this shift expresses a fundamental structural change remains to be proven. Whether it is adopted as a central value of younger generations will be one determinant.

Higher-income and lower-income countries will be able to learn from one another in many ways.

- **Leapfrogging to better policies.** Opportunities abound for lower-income nations to leapfrog past higher-income nations to create more effective programs and policies. For example, governments of lower-income countries can extend social protections, including unemployment protection and pensions, to informal workers. “Where social protection systems are in the process of being established, there is an opportunity to cover various forms of work from the outset.”³¹⁴ Poor and vulnerable workers can be primary beneficiaries of such leapfrogging.
- **Convergence of flexible and informal work.** As social protections are extended to informal workers in lower-income countries, and workers in higher-income countries shift to more flexible and temporary work arrangements, the spheres of formal and informal work may begin to converge. Globally, there is an opportunity and a need to apply gig economy structures and principles in non-exploitive, even empowering ways, so that the resilience of workers is increased and their vulnerability decreased. Not only can lower-income nations learn from the experience of higher-income countries in addressing flexible and informal work: workers in higher-income nations may also be able to learn from entrepreneurs in lower-income countries.
- **Lifelong learning.** Lifelong learning models are needed for both lower- and higher-income economies, and are likely to have strong opportunities to inform each other.

In the long run, displaced workers could be redirected to other forms of value creation, redefining what it means to work. This wave of disruption holds opportunity, not just risk, for workers: in the decades to come, some forecasts anticipate that automation will free a growing percentage of workers from performing lower-level, often tedious and repetitive jobs. Along with the youth bulge in developing economies, these “displaced” workers represent a substantial human resource. All of this human labor has the potential to be redirected into forms of value creation not supported by existing economic systems. Perhaps this value creation will be in the form of genuinely new jobs, or perhaps new social and economic arrangements will enable this value to be expressed in new models of what it means to work. Determining what social, economic, and political changes are needed in order to take advantage of this opportunity is a core challenge for societies to answer.

Implications of The Futures of Work for vulnerable populations

The focus of this report has been to better understand the implications of the changing nature of work and livelihoods, especially for the most vulnerable populations. For the purposes of this report, vulnerable populations may include women, individuals with little or no formal education or marketable job skills, ethnic and religious minorities, older workers, forced and child laborers, individuals who identify as LGBTQI, and individuals with physical disabilities and chronic illnesses. For each of these segments—and for each individual—the future of work is likely to be different. What follows are broad implications for vulnerable populations.

Vulnerable populations are at risk of bearing the worst of the coming workplace turmoil. As already noted, several core aspects of employment will undergo a shift to a new equilibrium which may or may not be reached in the next 20 years. The intervening period will be characterized by considerable turmoil. Vulnerable populations are most at risk of falling through the cracks during this chaotic period. As organizations and institutions strive to reorient themselves to a new environment, attention to the needs of vulnerable populations could falter.

Workplace changes may open new opportunities for poor and vulnerable groups. There are several ways in which the medium- to long-term turmoil that precedes a new equilibrium could benefit the poor and vulnerable. (1) To the extent that changes to jobs and income make the overall population feel less secure, public demand for social protections could increase, with positive implications for the poor and vulnerable. (2) As the proportion of the workforce engaged in freelance, gig, and part-time work increases, the stigma associated with unemployment and other vulnerable situations could decline. (3) As the pace of automation intensifies the need to retrain displaced workers, the availability and quality of vocational training programs may increase.

Additional classes of workers may fall into vulnerable situations during the large-scale change of the next two decades. Though the focus of discussion is often how to provide secure work for today's poor and vulnerable, it will be equally important in periods of large-scale change to prevent additional workers from falling into vulnerable situations. A number of the possible futures discussed in **The Futures of Work** threaten to destabilize existing work structures and move more workers into vulnerable positions.

The freelance economy will provide opportunities for some vulnerable individuals but disadvantage others. Vulnerable individuals may be more comfortable in the emerging freelance economy because, in many cases, they have been living it for some time—stringing together a living, moving from job to job, etc. Thus they may have developed some basic skills for this work paradigm. However, they may be ill-prepared to participate in more formal manifestations of this new economy. Many experts interviewed for this report commented that informal or low-income workers often lack soft skills, access to startup funds, and connections to useful networks. At the same time, vulnerable populations may find in the freelance economy the opportunity to learn marketable skills, build reputations, and compete anonymously for freelance work, potentially avoiding some forms of workplace discrimination.

Access to resources and opportunities is a crucial, multidimensional issue. Access has consistently been cited by interviewees as a key consideration for successful interventions to empower the poor and vulnerable. Access means not only physical access—training programs and jobs that are close enough to home, with usable and affordable transport available—but also access in terms of financial resources, freedom to participate, and even awareness of the opportunity. None of the opportunities described in this report can be realized unless there is a concerted focus on assuring access to the poor and vulnerable.

Flexible, technology-enabled education may serve vulnerable groups better than traditional education. Flexible and just-in-time education will significantly benefit vulnerable populations. Investment in multi-year training and education programs for jobs that may or may not exist in the future is often impractical or even impossible. Training that is focused, short-term, and designed to meet open job needs will be both motivating and productive.

Excluded groups will have new tools to express a collective voice. The emerging roles of crowdsourced and networked organizations could enable excluded groups to express a collective voice, creating new processes and structures to exert collective influence and gain greater visibility.

As traditional jobs grow scarcer, demand for new work models will grow. The future economy may not be able to supply formal jobs for everyone. A new model for establishing livelihoods may be needed. Approaches such as establishing a basic income could create a baseline level playing field for all members of the population and offer vulnerable groups a more equitable foundation on which to build productive futures.

The futurist perspective

This report seeks to take an explicitly foresight-oriented approach to the broad topic of futures for work. Foresight practitioners (futurists) look for weak signals of impending change, imagine possibilities and potential results, and seek to understand the broader, more holistic outcomes—taking a wider view in both scope and time than most researchers.

Thus, **The Futures of Work** does not view work from a purely economic, political, societal, or technological perspective. Rather it attempts to bring those perspectives together to develop a comprehensive, common understanding of possible futures, building from the ways that each interconnects with and influences the others.

In many cases the report presents several potential outcomes, some of which contradict one another. No one knows what the future will be—there are many possible routes to the future. Exploring the possible futures will help create meaningful dialogue and productive discussions around important and pivotal topics. Most important, understanding possible futures is a crucial step for those who want to develop interventions that will be robust and effective under a wide variety of possible future circumstances.

Moving forward

In light of all the very real, daunting obstacles and challenges facing vulnerable workers, there is a need for positive visions for the future of work. In closing, it seems useful to offer some thoughts on how foresight might be applied to advance this.

Continue scanning and monitoring. Continue to maintain the extensive research base established during this project by adding new research and data as it appears. Periodic review of accumulated new data will offer indicators of which of the potential futures described here may actually be coming to pass, and will help to guide ongoing interventions.

Fill the gaps. Continue to build a more robust, holistic perspective through substantive studies of the missing pieces and unstudied intersections among topics and forecasts. Begin focused discussions and dialogue with a cross-impact analysis of the various forecasts summarized in this report.

Create visions. Lewis Carroll's *Alice in Wonderland* is credited with a famous misquote, "If you don't know where you're going, any road will take you there." One of the main disciplines in foresight is visioning. From a foresight point of view, visioning helps to discover the most desirable future and to develop plans that could help actuate it. A good vision engages both the heart and mind. Creating such a vision is difficult and requires building an understanding among stakeholders with very divergent views. But a well-executed vision helps to define the path—the preferred future for the world of work.

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