MIT Task Force on the Work of the Future

MIT President Rafael Reif convened the MIT Task Force on the Work of the Future in the spring of 2018. Its goals are to understand the relationships between emerging technologies and work, and to explore strategies to enable a future of shared prosperity. The Task Force is co-chaired by Professors David Autor and David Mindell, with Dr. Elisabeth Reynolds as Executive Director; its members include more than twenty faculty drawn from twelve departments, as well as a dozen graduate students. The Task Force has also been advised by boards of key stakeholders from industry, academia, education, labor and philanthropy. For the past year, the Task Force has been working to bring grounded, empirical understanding and insight into the ongoing debate about what is occurring today and what we can expect in the next decade.

Alarmist rhetoric animates today’s public conversation about technology and work: Robots are taking our jobs. AI will mean the end of work. Three-fourths of all jobs will be automated. Prepare for mass unemployment. Robots can’t take your job if you’re retired.

These forecasts may be unduly grim, but they reflect valid underlying concerns. Technological and economic shifts have created social pain in wide swaths of industrialized economies. The last four decades of U.S. history showed that even if technological advances deliver rising productivity, there is no guarantee that the fruits of this bounty will reach the typical worker—and the uncertainty is greater still for women and minorities. These discouraging facts may help to explain why, despite the tightest U.S. labor market in decades, a substantial majority of people believe that emerging technologies will magnify inequality and make high paying jobs harder to find.

With these uncomfortable truths in mind, MIT’s Task Force on the Work of the Future aims to identify a constructive path forward—grounded in evidence of what is happening today, deploying deep expertise in technology and the social sciences, and applying reasonable assumptions and extrapolations to anticipate what might happen tomorrow.

This report will not provide definitive answers, but instead aims to enable decision-makers to ask the right questions. Due to the urgency of the topic, we offer preliminary insights that may help to frame public debate and public policy as Task Force members conduct deeper analyses and deliver a final report.
Alarmist rhetoric animates today’s public conversation about technology and work: *Three-fourths of all jobs will be automated. AI will mean the end of work. Robots can’t take your job if you’re retired.* These unduly grim forecasts reflect an uncomfortable truth: Technological and economic shifts have throughout history disrupted careers, communities, and ways of life, even as they have increased prosperity in net.

With an eye to this history, MIT’s Task Force on the Work of the Future aims to identify a constructive path forward—grounded in evidence of what is happening today, deploying deep expertise in technology and the social sciences, and applying reasonable assumptions and extrapolations to anticipate what might happen tomorrow. *The Work of the Future: Shaping Technology and Institutions Fall 2019 Report* does not provide definitive answers but aims to assist decision-makers to ask the right questions.

### The Paradox of the Present

- **The industrialized world is undergoing rapid employment growth but citizens are pessimistic about the future of work.** Economic history confirms that this sentiment is neither ill-informed nor misguided.
- **A firm foundation:** Rapid technological advances and well-functioning institutions in the United States delivered rising productivity and rapid, relatively evenly distributed wage gains to the vast majority of workers in the postwar decades between 1940 and 1980.
- **The case for concern:** This virtuous dynamic broke during the period 1980 to the present. While wage growth tracked productivity growth on average, the distribution of gains was so highly skewed that earnings for the typical (median) worker stagnated.
- **The case against fatalism:** The failure of the U.S. labor market to deliver broadly shared earnings gains was not an inevitable byproduct of current technologies or free markets. Industrialized countries with access to comparable technologies, skills, and trade as the U.S. distributed the gains from rising productivity far more equally than the U.S.
- **The case for investing in job quality not job quantity:** Industrialized countries will face more job openings than able-bodied adults to fill them during the next two decades due to slowing labor force growth, rising ratios of retirees to workers, and increasingly restrictive immigration policies.
- **The case for tempered optimism:** Better work and shared prosperity are not assured, but both are feasible. Technological advances make them more, and not less attainable. Countries that make targeted, forward-looking investments in education and skills training should be able to deliver jobs with favorable earnings and employment security to the majority of workers—not just those with elite educations.

### How this Time is Different

- **Employment Polarization:** In the digital era, technology has polarized the labor market—meaning, the simultaneous growth of high-education, high-wage and low-education, low-wage jobs at the expense of middle-skill jobs.
- **So-So Technologies:** Productivity growth has been remarkably sluggish in the U.S. and the European Union since the mid-2000s. One cause may be the prevalence of “so-so technologies” that reallocate tasks from workers to machines without generating much productivity improvement.
Recommendations

Workplaces of the Future: Automation, Robotics, and Artificial Intelligence

• *Industrial robots*, introduced decades ago, have had a relatively modest impact economy-wide, but have displaced production workers and reduced earnings and employment in local labor markets where large manufacturing plants are based. These impacts will likely grow as robotics advance. However, overall, the ‘China shock’ has had much larger and sweeping effects on manufacturing employment and firms.

• *Worker scarcity*: Nevertheless, today firms are struggling to find and retain production workers at current wages—that struggle is cited as a driver for investments in automation.

• *Robots can displace or collaborate or both*: Collaborative robots may serve to complement and augment production workers. These “augmented intelligence” robots are uncommon at present, but they are comparatively cheap, easy to program, and safe to work alongside.

• *Beyond the factory floor*: As they gain flexibility, robots will assume a larger role in warehouses, hospitals, and retail stores, substituting for humans in physically dexterous tasks such as cleaning, stocking, transporting, picking, harvesting, among others.

• *Artificial Intelligence* is a component of robotics but has broader reach in its software-only forms. True artificial human-like cognition (‘Artificial General Intelligence’) remains a topic of great research interest but an aspirational goal.

• *Machine Learning* performs tasks such as image classification, face recognition, and machine translation. As it becomes widely available, it will substitute for some cognitive tasks that require judgment and discretion: transcription and translation services, customer service, credit monitoring activities, and financial management, among others.

• *ML differs from previous waves of automation* in that it applies to high- as well as low-education jobs and can learn as it works. To harness the strengths and overcome the limitations of MLs, organizations will need to redesign workflow and rethink the tasks across workers and machines.

• *Autonomous vehicles*: Because more than three million commercial vehicle drivers currently work in the U.S., a rapid emergence of AVs would be highly disruptive for workers. But rapid and total transition to vehicle autonomy appears highly unlikely.

• *Automation that complements rather than entirely replaces human drivers* will be the norm for years to come outside of specialized settings (e.g., mines, non-public roadways).

Working for the Future: Investments, Incentives, and Institutions

• *Institutions matter*: Technologies and markets do not alone determine inequality or economic mobility. Educational institutions, regulations, collective bargaining regimes, financial markets, public investments, and tax and transfer policies all play critical roles.
The Skills of the Future

- **Who’s at risk:** Current and impending waves of automation will disproportionately displace workers who lack strong technical or vocational training, associates degree level certification in a credentialed field, or traditional four-year college or graduate degrees.

- **Middle skills:** Although employment in middle-skill production, operative, technical, and administrative positions is declining, we should not forgo further investments in these jobs. The need for replacement hiring, the coming shortfall of labor market entrants, and the growth of middle-skill healthcare jobs, all mean that these jobs will be in demand.

- **Community colleges:** Given their scale, ability to adapt offerings to local market needs, and ongoing engagement with non-baccalaureate adults at all career stages, community colleges could play an even more central role in providing skills and training to U.S. workers.

- **Work-based learning:** Experiments with traditional apprenticeships and apprenticeship-like sectoral training programs have proven quite promising.

- **Online learning:** Evidence on the efficacy of online learning is so far mixed. But innovation in online education and training tools will ultimately lower cost, boost efficiency, and broaden accessibility of educational offerings directed at all age and skill levels.

Rebalancing Capital and Labor

- **Rebalancing fiscal policy.** Currently, the tax code favors capital investment over investments in labor, offering low marginal rates on capital income, rapid rates of depreciation on plant and equipment investments, and directly subsidizing capital expenditure. The higher effective tax rate on human capital, as opposed to physical capital investments, provides firms with an incentive to replace workers with tax-subsidized machinery where possible. Rebalancing the tax code to reduce these distortions would provide firms with stronger incentives to invest in skills, management, and organizational innovations.

- **Recognizing workers as stakeholders.** In the U.S. shareholder capitalism model, firms have little incentive to recognize the external costs they impose on workers or communities. Simultaneously, the U.S. legal framework for worker representation restricts opportunities for cooperative bargaining between worker and employer representatives. Though there may be no one optimal system of worker representation, the model that the nation has embraced over the last four decades is out of balance and out of date.

Reinvigorating Technological Leadership: Complementing Workers, Fostering Innovation

- **Fostering technological and organizational innovation to complement workers.** Firms benefit from using new technologies only after making substantial investments in experimentation, training, and standardizing to integrate these tools into their workflow and build complementary skills in their workforce. Tax policy and government extension programs can help to support these investments.

- **Reinvigorating U.S. leadership position in technology and innovation.** While we are only beginning to understand the societal implications of AI, machine learning, and robotics, the U.S. has an opportunity to lead in their development and application. Investments should not solely support universities, national labs, and private-sector innovation but also assist public- and private-sector actors to create and adopt technologies that augment human work. Public investments can nudge innovation towards complementing workers, accelerating productivity growth, and providing a foundation for shared prosperity.