MIT Work of the Future

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MIT Work of the Future Task Force Addressed Three Primary Questions

1.

How are emerging technologies transforming the nature of human work and the set of skills that enable humans to thrive in the digital economy?

2.

How can we shape and catalyze technological innovation to complement and augment human potential?

3.

How can our civic institutions ensure that the gains from the emerging innovations contribute to equality of opportunity, social inclusion, and shared prosperity?

MIT work OF THE FUTURE

The Work of the Future:

Building Better Jobs in an Age of Intelligent Machines

2020

The New York Times

Don't Fear the Robots, and Other Lessons From a Study of the Digital Economy

A task force assembled by M.I.T. examined how technology has changed, and will change, the work force.

Opportunity for Impact

- Our vision: “A labor market that, in concert with rapidly advancing automation and computation, offers dignity, opportunity, and economic security for workers.”

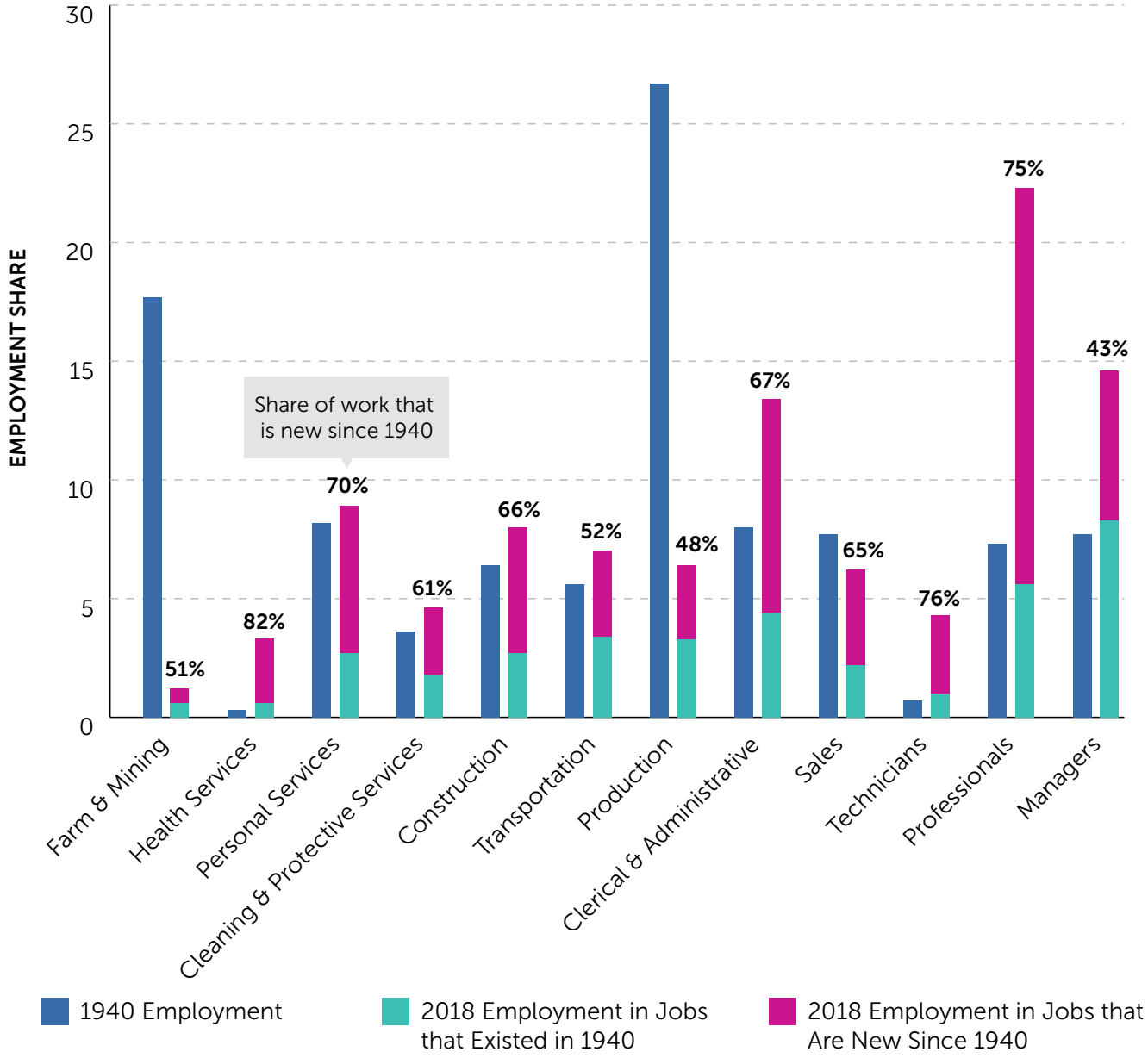
Three Findings from the Task Force

1. Technological change is replacing existing work and creating new work.
2. Rising labor productivity has not translated into broad increases in incomes
3. Momentous technological changes are unfolding gradually, demanding new knowledge

Focus Areas for an Initiative

1. **Shaping how new technologies are developed** with recognition of their impact on work
2. Identifying policies and organizational practices **to improve job quality**
3. **Innovating in training** to support workers, technologists, and managers adapt to change

More than 60 Percent of Work Performed in 2018 Had Not Yet Been 'Invented' as of 1940



Examples of New Occupations Added to the U.S. Census Between 1920 and 2018

YEAR	EXAMPLE TITLES ADDED	
1940	Automatic welding machine operator	Gambling dealer
1950	Airplane designer	Beautician
1960	Textile chemist	Pageants director
1970	Engineer computer application	Mental-health counselor
1980	Controller, remotely piloted vehicle	Hypnotherapist
1990	Certified medical technician	Conference planner
2000	Artificial intelligence specialist	Chat room host/monitor
2010	Wind turbine technician	Sommelier
2018	Pediatric vascular surgeon	Drama therapist

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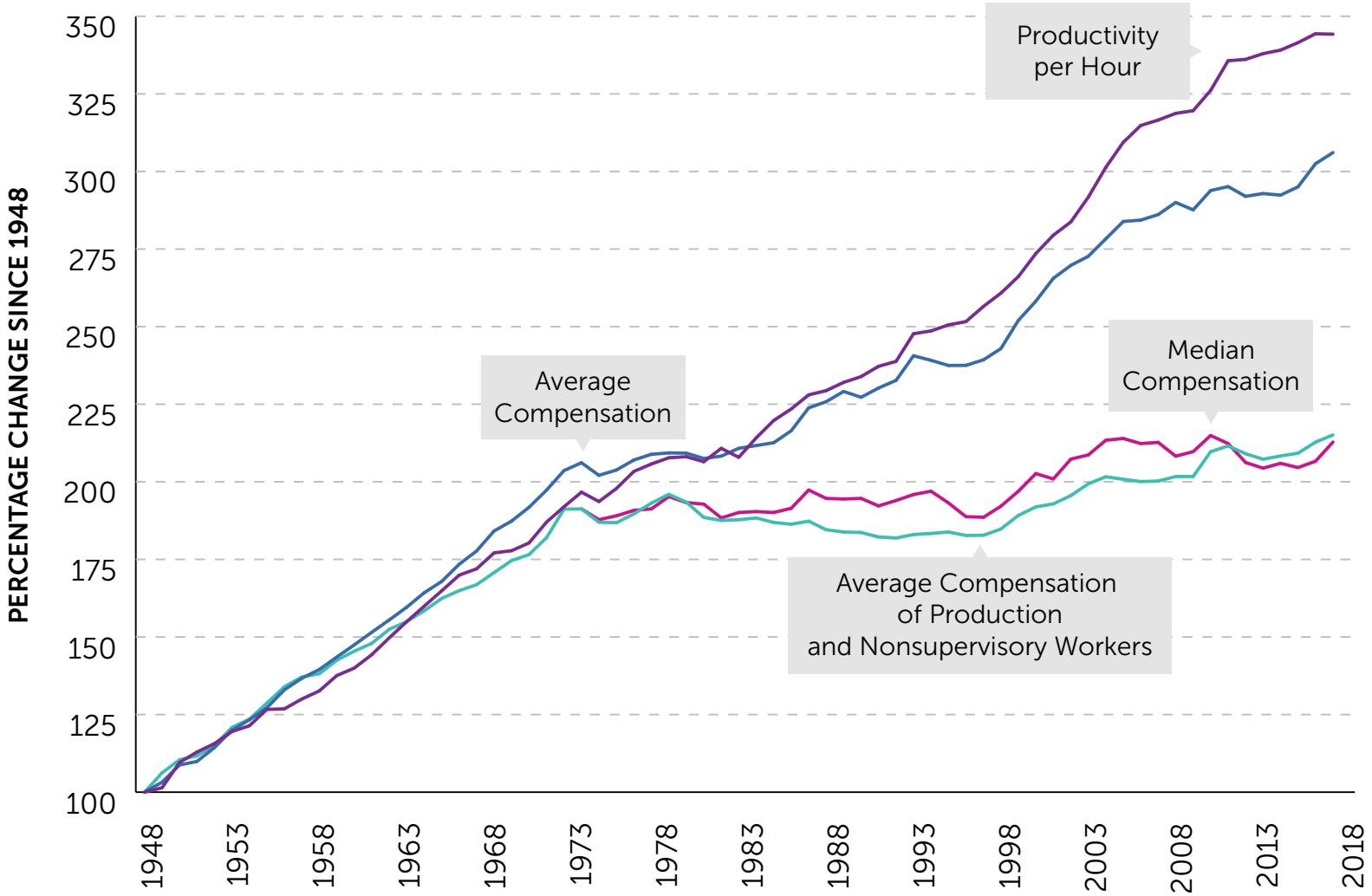
The U.S. Has Gotten Much More Productive since 1975, but Most Workers Have Benefited Little

U.S. Productivity and Compensation Growth, 1948 – 2018



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Related MIT Projects

Shaping Technology

Ethical Computing Protocol

Tools for engineers to assess the social and ethical impact of new technologies as they develop them.

PIs: Julie Shah, Dave Kaiser

Flexible, Digital Manufacturing

Multi-disciplinary research on the technology and training required for U.S. manufacturers to become more flexible in the technologies they use and products they produce.

PI: John Hart

Job Quality

New Frontiers: The Origins and Content of New Work

Economics research aiming to understand how technological change has affected the creation of new jobs over the past century

PI: David Autor

E-Commerce Warehouses and Low-Wage Workers

Experimental research with an industry partner to uncover strategies and regulatory approaches that improve outcomes for low-wage workers.

PI: Erin Kelly

Innovating in Training

MassBridge

Federally-funded initiative to create new training pathways to middle-skill production jobs in Massachusetts

PI: Lionel Kimerling

Worker Perspectives on Technology and Training

Nationally-representative panel survey of the American workforce capturing labor perspectives on automation and training opportunities

PI: Paul Osterman

BMW Spartanburg, SC

Current State of Industrial Robots

- The benefits of these new technologies are distributed unevenly
- Small and Medium enterprises (SMEs) are lagging in their use of industrial robots
  - Firms that employ fewer than 500 workers make up 60-70% of all manufacturing jobs in OECD countries
  - 98% of firms in the US qualify as SMEs, and represent 43% of the manufacturing workforce overall
- There is approximately one robot in the US for each manufacturing firm, but the stock is distributed unevenly
  - Larger firms are more likely to adopt robots
- There is a link between adoption of new technologies and improved firm-level performance, although these findings often depend on how the technology is implemented.
- There are social, organizational, and also technical that pose barriers for using robots in manufacturing

Current State of Industrial Robots

- **Collection of Interviews:** Manufacturers, Integrators, OEMs, and Applied Research Institutions within Germany, France, and Italy

- **Areas of Focus:** Emerging technologies in Industrial Robotics, and IoT-based connective systems

- **Interview Questions:** Semi-structured interviews focusing on
  - Extent to which technology has evolved,
  - Measures for improvements,
  - Assessing value of technology, and
  - Remaining challenges and next steps for technology in manufacturing

Current State of Industrial Robots

- Integration
  - Cost of technology is only a fraction of the total integration cost.
  - Integration is often performed by a third party: large costs for small changes (reintegration), and high barrier to entry.
  - High costs, requires technical expertise.

- Metrics
  - Labor displacement calculation is outdated
  - Benefits of collaborative robots is in augmenting/assisting rather than replacing
  - Simulation highlighted as a means to make the business case for improving productivity.
  - Deeper integration of human-robot work is a goal to realize but is hindered by integration challenges

Current State of Industrial Robots

- Standardization
  - Very little is standardized.
  - For example, between physical robots, typically only the flange is standardized
  - Lack of standardization is a hurdle to innovation.

- Leveraging domain expertise
  - Worker centered approaches resulted in “impressive and successful applications”
  - However, line workers with domain expertise do not have the technical skills to program robots.
  - Technology also provides hurdles to integration and leveraging domain expertise
  - Robots are programmed to be programmed by people that understand robots.
  - Lights out factories are ones that are not innovating. “Innovation stops with lights-out”
  - **Need to program the task, not the robot**

Current State of Industrial Robots

Many of these difficulties impact small to medium sized firms to a greater extent than larger organizations

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