Approaches to addressing occupational safety and health hazards in the future of work

P.A. Schulte

Disclaimer: The findings and conclusions in this report are those of the author and do not necessarily represent the views of the National Institute for Occupational Safety and Health.

Acknowledgements

Co-investigators
• J. Streit
• S. Tamers
• S. Felknor
• J. Grosch
• G. Delclos
• F. Sheriff
• S. Fendinger

With Support of
• A. Keenan
• J. Huff
• J. Batey

Why explosion of interest in the future of work?
• Exponential growth of technology
• Technological impact on jobs-concern about job displacement
• Rapidly changing nature of work, workforce, and workplace due to technology, globalization, urbanization, climate, resource limitations, and demographics
• Need to shape future before it is too late
Uncoupling production from the limitations of manual labor

Electricity—broad distribution of power

Optimization of production

Convergence to make every device "smart"

Fourth Industrial Revolution

- 4th major industrial era since the Industrial Revolution of the 18th century
- ...will fundamentally alter the way we live, work, and relate to one another (Schwab 2016)
- Unlike anything humankind has experienced before (Schwab 2016)
  - Potential new worker hazards
Why Study the Future of Work?

- Future is not predetermined and future outcomes can be influenced by our choices in the present (Hines & Bishop 2015).
- Engaging in strategic foresight can move us from being reactive to being proactive about the—
  - Design of job arrangements made possible by digitalization
  - Types of work that are performed using new technologies
  - Challenges to workforce health, safety and well-being

“The future cannot be predicted but preferred futures can and should be envisioned, invented, implemented, continuously evaluated, revised, and re-envisioned”

(Dator 1995)

The workplace is a mosaic of hazards

- Changes in work, the workforce, and the workplace bring new hazards and risks
- While we still face older deadly hazards and risks
- Climate-related effects could be significant
The world of work is changing

- **Work**
  - Mosaic of old and new hazards
  - Physical ➔ Mental
  - More Service Work
  - Work Intensification
  - Many jobs in a working lifetime

- **Workforce**
  - Older workers
  - More immigrants
  - More women
  - Less unionization
  - Chronic disease burden

- **Workplace**
  - More small business
  - More telecommuting
  - Contractors/temporary
  - New work arrangements
  - Decrease in social protection

---

Changing Nature of Work

"Full-Time Worker circa 2016"

(Adam Levey in Thompson 2015)

---

The working life continuum and dynamic nature of work

---
Growing concern

Emerging technologies such as:

• automation
• artificial intelligence (AI)
• robotics

Other determinants:

• Globalization
• Migration
• Demographics
• Climate

Displace human jobs
Diminish human labor as driver of economic growth; increase emphasis on capital
Create new types of hazards

Various estimates of job displacement

• 47% of US jobs at risk of automation
  (Frey and Osborne 2013)
• 30-40% of jobs in European Countries
  (Baert & Lendred 2015; Bauwens 2016; Noulard Berger 2016; Deloitte 2014)
• 9% of OECD jobs are automatable
  (Arntz et al 2017)

Timeframe for technological change

Literature divided

• Those who predict short-term
• Those who say it will occur gradually
  (Eurofound 2017)

Brief history of concern for technology and unemployment

1811 Ned Ludd
1930 Keynes
1952 Leontif
1996 Rifkin
2011 Clifton
2011 Brynjolfsson and McAfee “Race against the machines”
2013 Frey and Osborne “About 47% of total US jobs at risk of being automated

• Relatively soon
• Perhaps next decade
Current technological trends may:

- Erode middle-class jobs
- Lead to deepening job polarization
  (Balliesler and Elsheikh; 2018)
- Displace 400 million jobs globally
  (MGI 2017)
- Create a mismatch between technology and skills (capabilities)
- Skill gap controversy
- Proactive worker training and retraining urgently needed
- Life long learning

Assessment of 702 Occupations for Susceptibility to Computerization

 Possibly in the next decade or two
 40% of US jobs could be computerized
Past concerns about “end of work” have proved wrong

- New technology always had the feature that it reduces demand for some types of labor and increases demand for others
- However, there is no guarantee that the current impact of new technology will be as it was in the past (International Panel on Social Progress, 2016)
- Human imagination and ingenuity is a powerful factor
NIOSH Literature Review Study

- Mapping future of work scenarios to identify potential occupational hazards
- Search literature 1999-2019
- Use search terms such as: Future of work, Industry 4.0, 4th industrial revolution, advanced manufacturing, new employment arrangements, future of jobs, changing world of work, emerging occupational risks, emerging occupational hazards, innovation and work, technological change and work, and digitalization and work.
- Identify scenarios of future work
- Identify potential hazards in these scenarios
- Recommend interventions for hazards

Approach for mapping future-of-work surveillance

1. Search
2. Identify scenarios
3. Identify hazards
4. Make recommendations

Flow chart for inclusion of peer-reviewed future of work scenarios
Anticipated changes to job risks/hazards, by category and direction*

Next steps

- In-depth content analysis of scenarios
- Thematic groupings of scenario elements
- Recommendations for OSH

International Commission on Occupational Health (ICOH)
Approach to the Future of Work
A paradigm shift is needed to an expanded focus for occupational safety and health.

Broader view of burden vertically and horizontally
**Expanded Focus for Occupational Safety and Health**

- **Current**:
  - Traditional OSH

- **Broader horizontally and vertically**:
  - Well-being
  - TWBH

**Social & Economic Risk Factors**

**Personal Risk Factors**

Traditional

Traditional OSH

*Builds on Total Worker Health (TWBH)*

**Future of jobs and hazards**

<table>
<thead>
<tr>
<th>Types of Jobs</th>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional Jobs</td>
<td>Utilize the body of knowledge from safety, industrial hygiene, and occupational medicine to identify where old hazards are not being addressed adequately. How do we apply what we already know to re-engage or re-deployed workforce?</td>
<td>Develop research agenda and planning. Evaluate ongoing assessment of guidelines and regulations. How do we (quickly) adapt research, disseminate results, and transfer to practice?</td>
</tr>
<tr>
<td>Future Jobs</td>
<td>Determine the extent to which old hazards will be manifest in future jobs. Determine how to adapt old guidance to new jobs. How do we identify and apply &quot;old&quot; knowledge to newer jobs? Be alert for sentinel events. Consider leading indicators. Identify scenarios. Use forecasting.</td>
<td></td>
</tr>
</tbody>
</table>

(Adapted from Schulte 2009)

**Conclusion**

Need a comprehensive view of future of work

- Globalization
- Technology
- Demographics
- Urbanization
- Climate
- Economic Conditions
Thank You

pas4@cdc.gov