Technology, Innovation & Jobs

Yvonne Stevens, LL.B, LL.M.
ystevens@asu.edu

CENTER FOR
Law, Science & Innovation

ASU Sandra Day O'Connor College of Law
ARIZONA STATE UNIVERSITY

Innovating law, policy and ethics for science & technology

Not a Novel Concern…

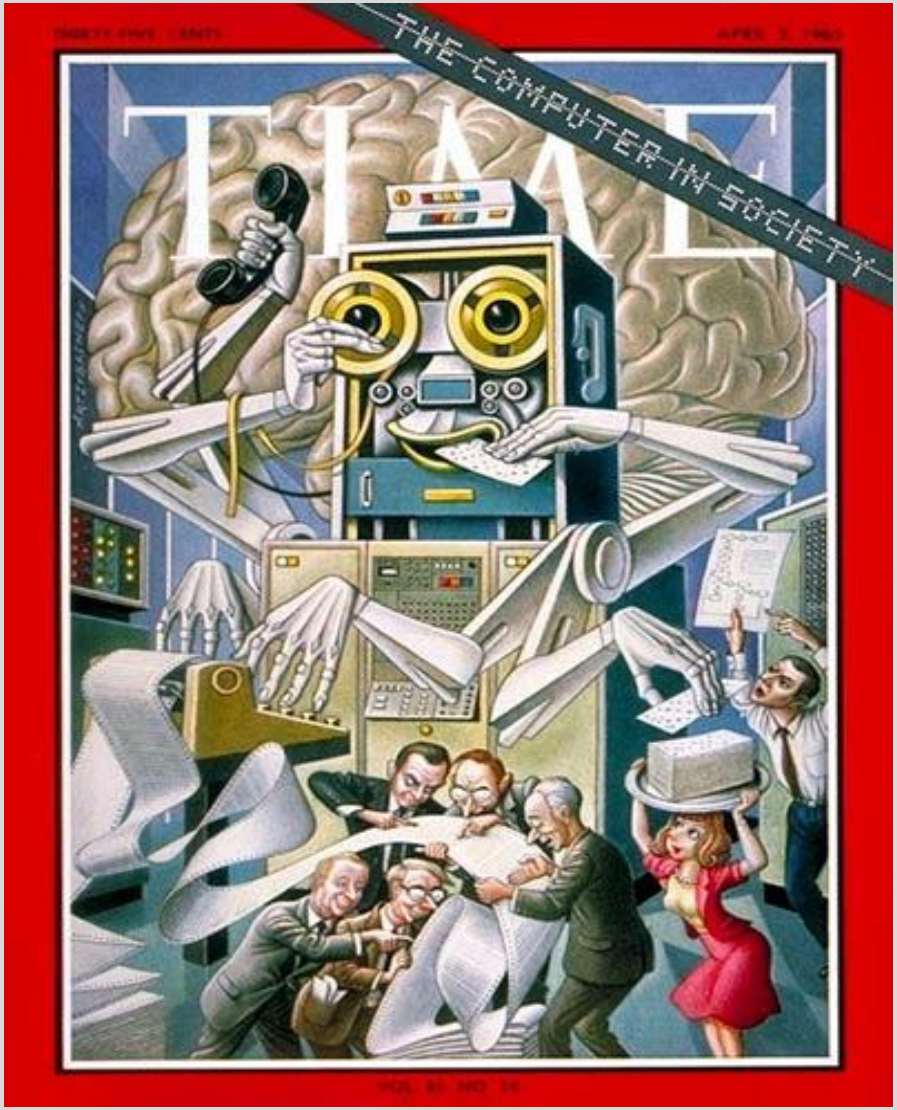
- “How will it be possible to feed the populace?”
  – Roman Emperor Suetonius, AD 69-79.

- “Thou aimest high, Master Lee. Consider thou what the invention could do to my poor subjects. It would assuredly bring them to ruin by depriving them of employment, thus making them beggars.”
  - Queen Elizabeth I, 1589.

- “Our wretched species is so made that those who walk on the well-trodden path always throw stones at those who are showing a new road.”
  - Voltaire, 1694-1778.

- "We are being afflicted with a new disease … – namely, technological unemployment. This means unemployment due to our discovery of means of economizing the use of labor outrunning the pace at which we can find new uses for labor.”
  - John Maynard Keynes, 1930.

TIME – April 1962



Advantages of Machines over Human Workers – Legal & Social

- No wages
- No sick days
- No breaks
- No human error
- 168 hour work weeks
- No retention issues
- No training (time & $)
- No complaints
- No strikes or labor issues
- No discrimination (or other) lawsuits
- No unemployment insurance payouts
- No benefits pay
- No workers' comp
- No healthcare coverage

Will Technology Kill All Jobs?

- No one on the same page.
- Some say yes, others no.
- Some say what gets killed will be replaced with something better, provided one has the skills. They say we will complement and work alongside machines.
- Some say we will work less but we will also enjoy ourselves more.
- Some say we shouldn't even reflect too much on this as it is impossible to predict the future!

WHAT DO THE REPORTS SAY?

- Reuters Analysis – 2014
- Pew Research Report – 2014, *AI, Robotics and the Future of Jobs.*
- National Academy of Engineering – 2015, *Making Value for America.*

Proposal

- If technology innovation eliminates jobs ….
- And jobs are central to our economic and social well-being ….
- Then maybe it would be in society's interest to slow or halt technology innovation?

“To paraphrase Dr. Ian Malcolm in Jurassic Park, our business executives have been so preoccupied with how much money they could make removing the need for human labor, they never stopped to think if they should.”

The Benefits of Actively Slowing or Stopping Techno-Innovation

- “The more jobs are automated, the more out of touch people involved in the process become.”

  - Carr, The Glass Cage, 2014.

- “What if the cost of machines that think is people who don’t?”

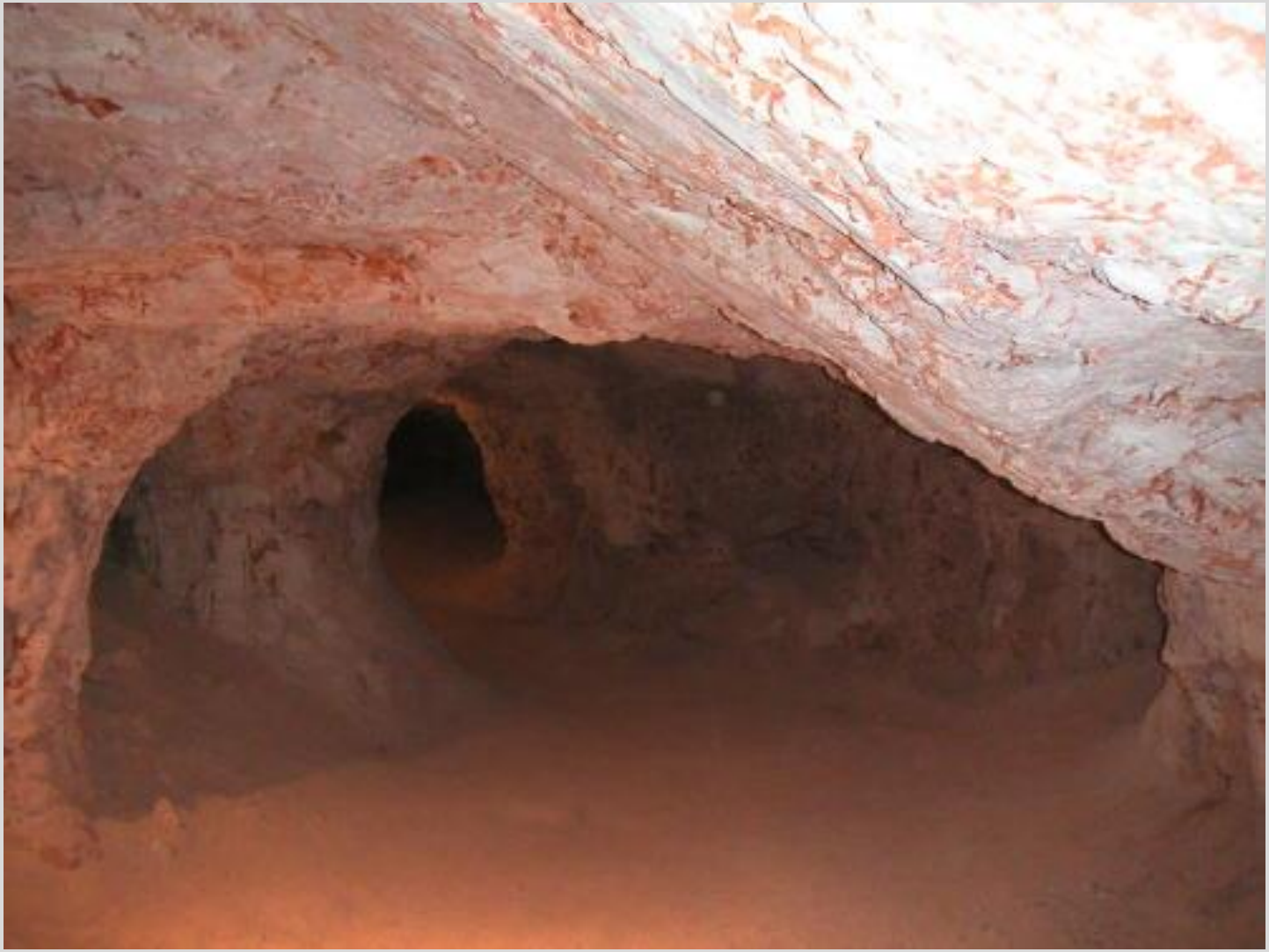
  - George Dyson.

The Benefits of Actively Slowing or Stopping Techno-Innovation

- Reduces possibility of “bad use” of technology or eco-terrorism.
- Perceived safety (e.g. precautionary principle – GMOs, nanotechnology).
- Reduces risk of “new” health afflictions such as electromagnetic hypersensitivity.
- Reduces need to update or create new laws, regulations and policies.

The Risks of Actively Slowing or Stopping Techno-Innovation

- Reduction of global competitiveness (over-reliance on imports) (The Economist, 2014).
- Reduction of economic growth & prosperity (Brookings, 2011 and Solow, 1950).
- Reduction of standard of living.
- Negative impact on productivity, human/environmental health & safety, food supply, communication, infrastructure, convenience, opportunity, education, human productivity, efficiency, creativity, accessibility, etc.



Innovation: Benefits & Jobs

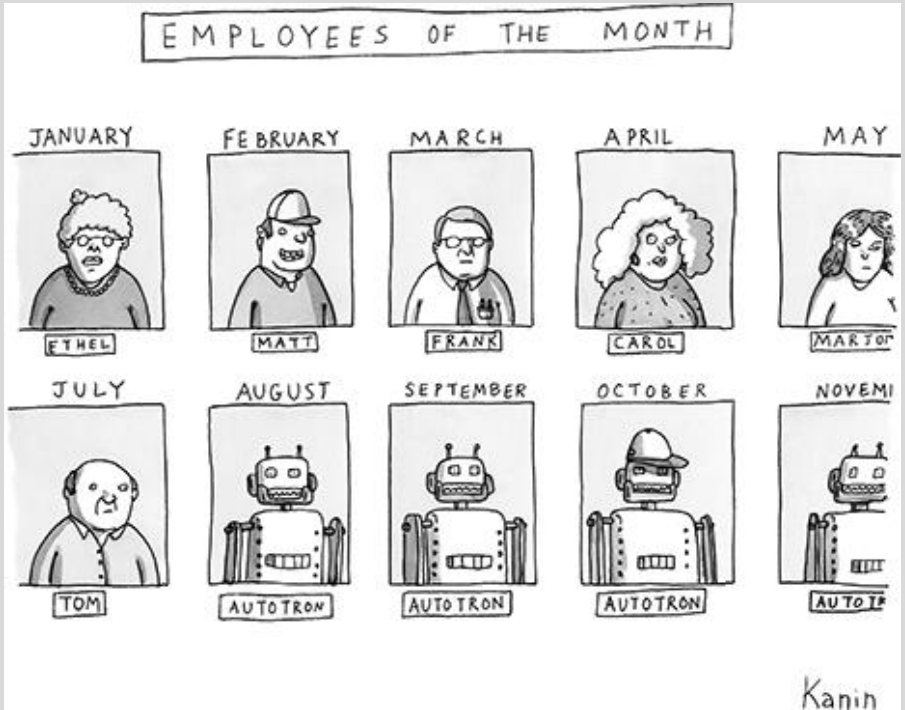
- Innovation has many benefits.
- Innovation creates jobs, even if it takes some away.
- Innovation is naturally disruptive at first.

Innovation: Benefits & Jobs

- Worker displacement is and has been unavoidable for many years.
- Innovation requires adaptability: new skills and education (Brynjolfsson & McAfee, 2011 & 2014).
- Complement innovation, not compete with it: new skills & education (Brynjolfsson & McAfee, 2011).
- Not innovating kills jobs – avoid complacency (e.g. Eastman Kodak).

They Say It's Different This Time…

- Moore's Law.
- "Exponential vs. linear growth" of technology.
- Technological innovation is hitting all job sectors at once, displacing many workers.



But..

- "I see Moore's law dying here in the next decade or so." - Gordon Moore, 2015.

- "The rapid progress made over the past 250 years could well turn out to be a unique episode in human history." - Robert Gordon, 2014.

- "In fact, things are slowing down. In 2045, it's going to look more like it looks today than you think." John Markoff, 2015.

But…

- There were more bank tellers, more bookkeepers and more sales clerks in 2009 than in 1999 (Occupational Employment Survey, BLS).

- “Studies have shown conclusively that neither automation nor productivity gains … lead to decreases in overall employment.”

  - Atkinson & Burnstein, 2015.

- “[S]avings from increased productivity are recycled back into the economy to create the demand that in turn creates jobs.”

  - Miller & Atkinson, ITIF, 2013.

Economics

Technology has created more jobs than it has destroyed, says 140 years of data

Study of census results in England and Wales since 1871 finds rise of machines has been a job creator rather than making working humans obsolete

Katie Allen

Tuesday 18 August 2015 02.00 EDT

More Buts…

- “[M]anagers of warehouses and other supply chain facilities report …difficulty hiring enough workers…with the skills needed to use the new technologies” (Finance & Development, 2015).

- Jobs have grown faster in occupations that use computers than in the overall labor force (Bessen, 1982-2012).

- Each tech job supports three jobs in other sectors of the economy (Brookings, 2011).

Last Buts…

- Investment in the human genome project has led to “millions of biotech jobs” (Science Progress, 2011).

- New jobs: big data architects, iOS developers, data scientists, specialty engineers, genetic counselors, etc.

- “Highest Paying In-Demand Jobs In America:” the list is dominated by technology jobs (Glassdoor).

What jobs are on shakier ground?

- Middle-skill, routine and repetitive jobs: book-keeping, clerical work, repetitive physical work.
- Jobs that involve a changing environment, judgement, flexibility, creativity, social intelligence, abstract thinking have been vexing to automate.
- Also, jobs involving manual labor, food preparation, janitorial, landscaping, security services and so forth, are also less amenable to automation.
- The “barbell” visual.

Technology

Will a robot take your job?

11 September 2015 | Technology

Type your job title into the search box below to find out the likelihood that it could be automated within the next two decades.

About 35% of current jobs in the UK are at high risk of computerisation over the following 20 years, according to a study by researchers at Oxford University and Deloitte.

I am a...

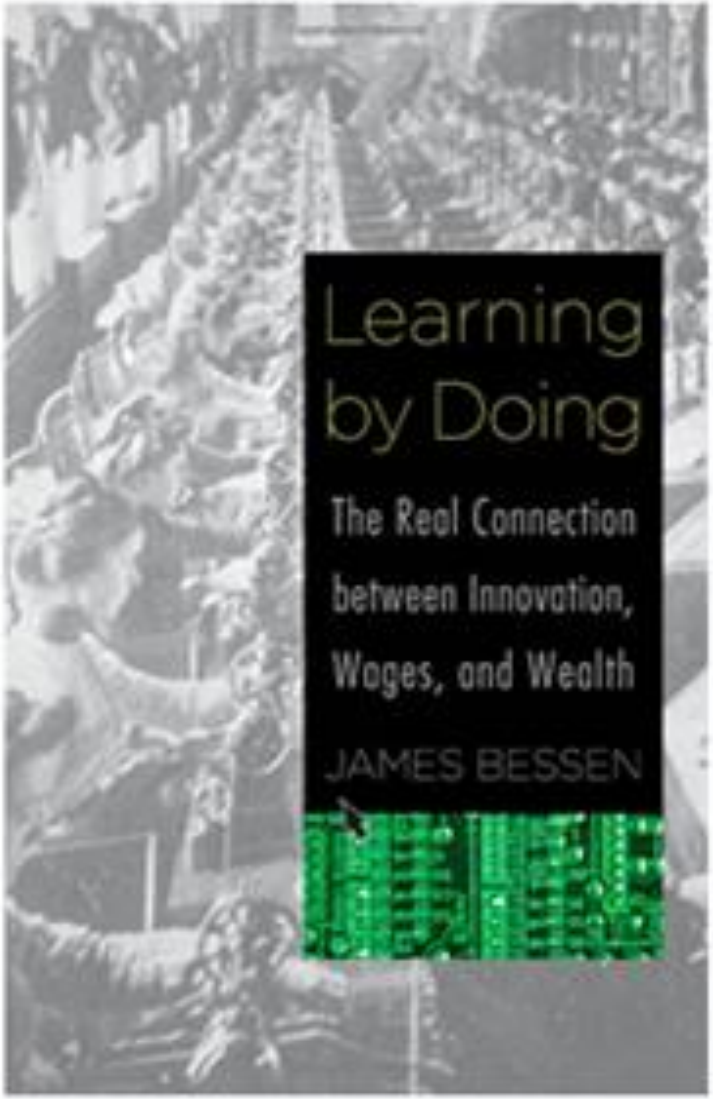
Technology Innovation & the Future of Jobs

- On the bright side: techno innovation = job shift (Brynjolfsson & McAfee, 2014).
- Training, education, skills upgrading, infrastructure, R&D investment and immigration reform are key to job growth.
- Don’t singularly blame technology – look at the system as a whole.
- We should not be surprised by change, rather, we must anticipate it.
- On the dark side: there will be losses, but…

Learning By Doing

Argument: "Technology does not inexorably destroy opportunities for mid-wage jobs"

- Technology creates new jobs as it displaces old jobs, but requires workers with new sets of skills and on-the-job training
- Problem is the lag between the technology innovation and worker retraining



Freakonomics Radio: *When Will the Robots Replace Us?*

- "The interactions by which technological changes lead to changes in employment are really rich and complex – it's not simply a matter of you know, a machine does the job, therefore the worker doesn't do the job, therefore there are fewer workers needed."

“2 Billion Jobs to Disappear by 2030”
Thomas Frey, 2012

Jobs Going Away

- Fishing bots will replace fishermen.
- Mining bots will replace miners.
- Ag bots will replace farmers.
- Inspection bots will replace human inspectors.
- Warrior drones will replace soldiers.
- Robots will replace builders.

BUT: New Jobs Created!

- Robot designers, engineers, repairmen.
- Robot dispatchers.
- Robot therapists.
- Robot trainers.
- Robot fashion designers.

Jobs Going Away

- Shoe & clothing manufacturers/retailers.
- Lumber, rock, drywall, shingle, concrete, and other construction industries.

But: New Jobs Created!

- 3D printer design, engineering, and manufacturing.
- 3D printer repairmen.
- Product designers, stylists, and engineers for 3D printers.
- 3D printer 'Ink' sellers.

The Impossibility of Stopping Innovation

- The “global degrowthist empire.”

  - Campa, JET, 2014.

- “The will to power.”

The Atlantic: The 50 Greatest Breakthroughs Since the Wheel

" technology breeds optimism"

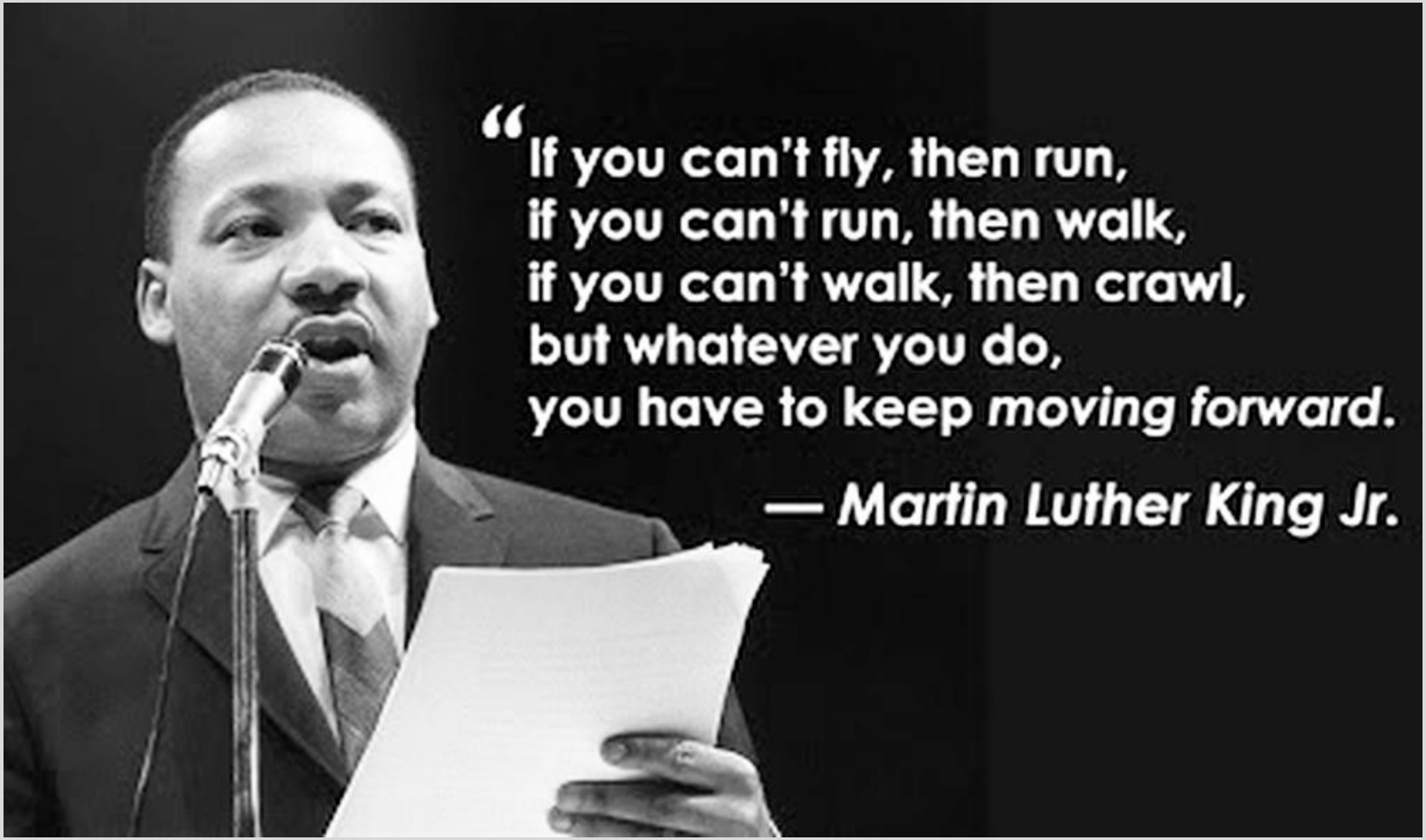
- Compass, 1100s.
- Printing press, 1430s.
- Steam Engine, 1712.
- Vaccination, 1796.
- Electricity, 1831.
- Sanitation systems, mid-1800s.
- Refrigeration, 1850s.
- Telephone, 1876.
- Airplane, 1903.
- Penicillin, 1928.
- Personal computer, 1970s.

http://www.theatlantic.com/magazine/archive/2013/11/innovations-list/309536/

Solutions

- Protect employment.
- Work sharing.
- Making new work.
- Income redistribution.
- Education.
- New social contract.

Conclusion


“If you can’t fly, then run,
if you can’t run, then walk,
if you can’t walk, then crawl,
but whatever you do,
you have to keep moving forward.
— Martin Luther King Jr.