

Technology Phenomenon:

The Advancement of Technology and Its Effects on the Economy

“ Unemployment has been concentrated among those with little education or skill, while employment has been rising most rapidly in those occupations generally considered to be the most skilled and to require the most education. This conjunction raises the question whether technological progress may induce a demand for very skilled and highly educated people in numbers our society cannot yet provide, while at the same time leaving stranded many of the unskilled and poorly educated with no future opportunities for employment. ”

Report of the Commission on Technology, Automation, and Economic Progress – 1966

Introduction

The replacement of human labor with technology has been feared and bemoaned since Henry Ford's car company premiered the moving assembly line in 1908. Technology at its best increases efficiency and decreases economic costs. Yet it undeniably has a human cost – the replacement of human jobs.

Before Ford's assembly line cars were individually constructed by skilled workers, a slow and costly process. Automation was a game changer, and there is no escaping the ever evolving innovations of technology. What does this mean today for the American business owner, professional, or recent graduate, and for the American economy as a whole?

Increased automation and artificial intelligence have had a profound impact on all business models and business owners. In a [TED Talk](#) released in June 2013, Andrew McAfee of MIT's Sloan School of Management discusses the effects of automation on the blue-collar fields and predicts its future effects on high-skilled jobs, foreseeing a major alteration in the future of work.

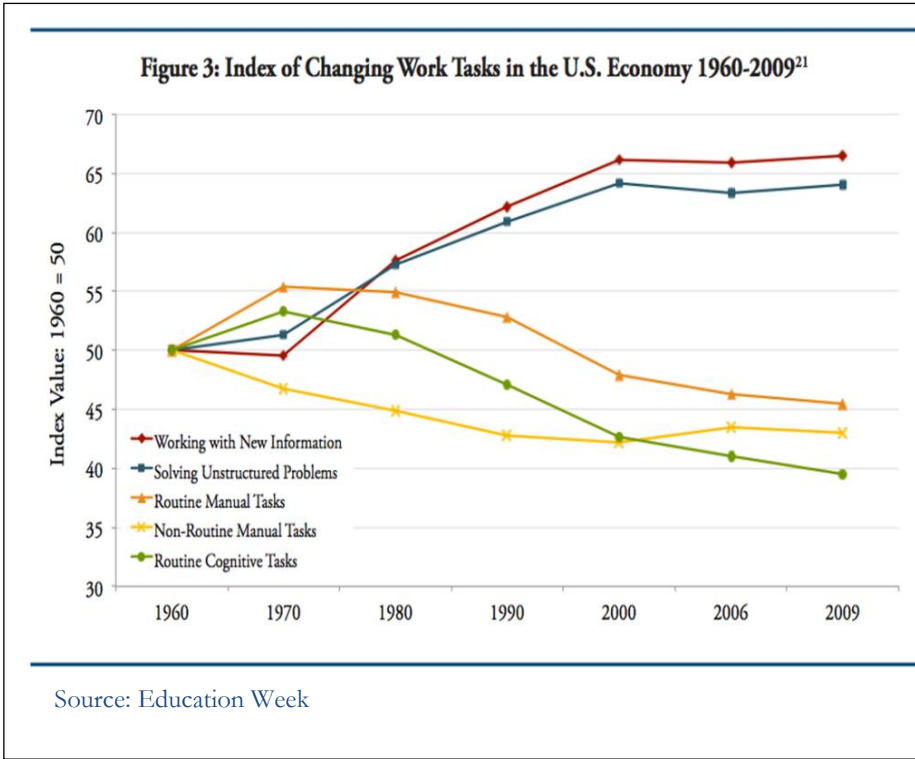
The discussion of technology's impact on work becomes more heated when the unemployment rate is high. In 2007, U.S. unemployment was 5%; by 2009 it had climbed to 10% as the U.S. was hit with what came to be called “the Great Recession.” In 2013 the rate has ranged from 7% to 7.9%, still high in comparison to less than a decade ago.

More than 200,000 new jobs have been created in three out of the last four months. Yet according to a recent [WSJ article](#), the economy remains 1.3 million jobs short of its 2008 peak even four years into recovery from recession, and despite population growth. Approximately 11 million Americans remain unemployed, with the ranks of those jobless for six months or more holding steady at around 4 million.

There is no denying that technological advancement contributes to the current unemployment rate. [Moore's law](#), coined around 1970, states that every two years the overall processing power of computers will increase twofold, and today

technology moves even more quickly. More people and industries than ever before – front line workers, professionals, business owners, recent graduates - are impacted by technology.

The recession that began in 2008 and the advancement of automation have forced American workers to simultaneously compete with one another and with technology.

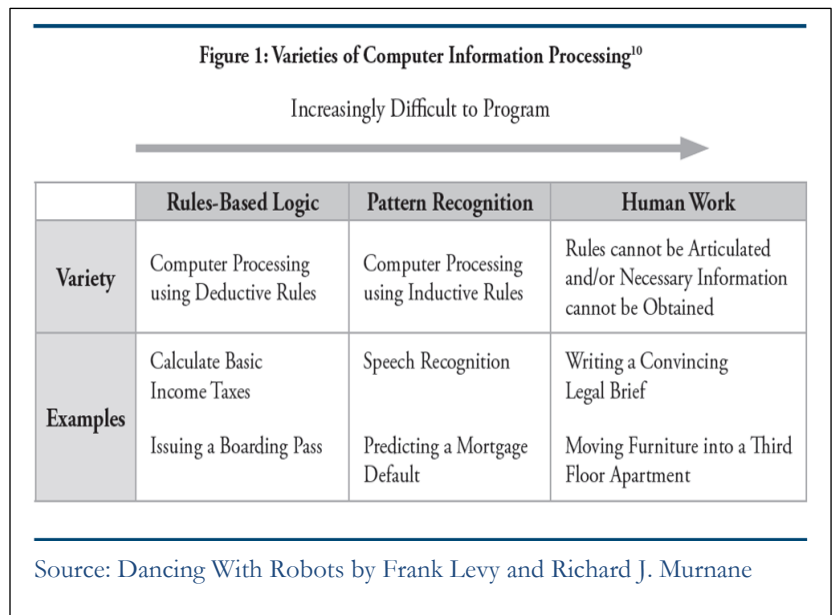


During the recession the pace of high school, college and graduate level workers entering employable ranks held firm while technology kept improving, influencing job opportunities and advancement prospects in existing careers. Recent graduates lucky enough to obtain a job entered the work force with lower wages, or in positions unrelated to their skills, degrees or training. Many remained in those jobs for 2-3 years before breaking in to their desired career paths; others are still there. When workers are jobless or stuck in jobs outside their fields, their skills erode and make it ever harder to get back on track. Career professionals and business owners are challenged by many economic influences, but none as powerful as technological advancement.

A New Paradigm

The recession and technological advancement have exposed inefficient companies, executives and frontline workers. New technology puts at risk the entire business model of some companies.

A professional’s tasks involve applying intellectual capital, problem solving and future planning skills. These capabilities are often referred to as the human comparative advantage to a machine or robot. However, this advantage may not last. As companies begin to incorporate the voice recognition capabilities invented by [Nuance Communications](#) and computers with logical problem solving abilities such as [IBM’s Watson](#), select white collar positions will be at best changed, at worst eliminated. McAfee argues in his TED talk that [technology is racing ahead](#), leaving the average worker behind.



Industry Example: Architecture

Architecture is a field hit hard by the recent recession. According to Kermit Baker, chief economist for the American Institute of Architects, during the downturn about 30 percent of the positions were dropped in architecture firms, but since have only increased by about 5 percent.

In a recent Boston Business Journal Article, Peter Kuttner, president of [Cambridge Seven Associates](#) and a former president of the Boston Society of Architects, said that his firm dropped from 70 to 45 people during the recession, and five years later has grown only to 60.

Professionals who graduated between 2005 and 2008 were excessively affected by layoffs, as typically the newest members of a firm were the first to be terminated.

“Now they’re down six or seven years out of college, and some might have maintained their technical skills but some probably not and they might now be seen as less favorable (job) candidates than a current graduate with new skills and trained in the latest technology,” said Baker.

AIA member surveys reveal that 25-to-30% of laid off architects moved to other professions such as construction or property management, and another 10 to 15% retired.

Industry Example: New Media vs. Old Media

New technologies and innovations have turned traditional information industries upside down, and many of those jobs are never coming back. Employment numbers in traditional media and advertising have plummeted in recent years.

According to the Pew Research Center’s “State of the News Media 2013,” newspaper jobs have been cut by 30% since 2000, and much of this is due to technology. Fewer printed copies of newspapers and magazines are needed as people turn to their smartphones and tablets for news; advertising revenues for newspapers are drastically lower as companies figure out how to advertise on social media.

A recent *Adweek* article describes the concept of “programmatic” advertising: a new media buzzword for the idea that all advertising will be bought and sold by an automated system that calculates fair price, target audience, and optimal timing. According to Eric Bader of RadiumOne, “programmatic is about software that is productive in a way that humans can’t be.”

Bader continues: “The media buying process has completely outstripped human capabilities. We’re using millions of fragmented places and data sources.”

The Rise of Artificial Intelligence

Robotic technology is becoming more popular across several industries including manufacturing, medicine, media and more. While robots increase productivity and efficiency, they also relieve some human laborers of jobs.

Boston company [Rethink Robotics](#) talks about its new robot, [Baxter](#), in a recent *Boston Business Journal* article. Baxter is already being used in U.S. and European factories “to automate a variety of manual labor tasks alongside workers in factories.” According to the company, Baxter is operating in plastics and packaging factories, and may soon be used by automakers. A sophisticated robot may be more effective and less prone to error than a human factory worker, so jobs are being replaced with automation.

Skilled Manufacturing Workers Needed

Right now, manufacturing companies can't find the people they need among recent graduates and existing workers.

A recent survey of manufacturing companies conducted by Deloitte on behalf of the Manufacturing Institute found that as many as 600,000 U.S. jobs are unfilled. Yet there are 12.8 unemployed workers in this country, according to the [Bureau of Labor Statistics](#).

The shortage of highly skilled factory workers comes amid increased worries about U.S. failure to produce enough strong graduates in science, technology, engineering and mathematics (STEM) fields.

The *Wall Street Journal* recently reported that 24% of Indiana manufacturers surveyed reported "serious deficiencies" in math skills among their current employees, and 36% said there was a shortage of skilled production workers.

When existing employees lack the necessary skills and companies can't find recent graduates with strong STEM degrees, they end up hiring foreign workers.

New Initiatives

There is hope for a more productive future that improves human labor rather than eliminating it. Two companies, Globalfoundries Inc. and Bayer Corporation, have taken steps to reduce skill erosion in the workforce.

[Globalfoundries Inc.](#) - Global Manufacturing and Technology, *Malta, N.Y.*

At Globalfoundries, an innovative training program enables workers to keep up with the rapid pace of technology and simultaneously inspires creativity within the company. Globalfoundries also partners with the State University of New York (SUNY) to better prepare students for sophisticated manufacturing jobs. A mentoring program funded by \$3 million from the National Science Foundation pairs graduate students and postdoctoral fellows with middle schoolers interested in STEM careers.

[Bayer Corporation](#) - Health Care and High-Tech Materials, *Baytown, Texas*

Bayer prefers candidates with STEM degrees even for sales and marketing positions. To respond to the shortage of such candidates, Rebecca Lucore, chief of staff for the company's U.S. chemicals business, says that Bayer is using more internships and scholarships in an effort to build engineering expertise. Lucore points out that there is also a need for candidates with two year degrees in areas such as process engineering. "There are lots of good jobs that don't require a four-year degree, just two." ([WSJ article](#))

Robot Collaboration

Some argue that rather than replace human workers, robots will work in partnership with skilled laborers, alleviating the workload and complementing human skills. Bob DeAngelis of [Precision Coatings](#) in Boston, a small specialty manufacturer of precision devices, says that incorporating robotics to his manufacturing process required a significant capital investment, months of engineering time and meticulous production line planning.

DeAngelis had to retrain select operatives to support the robot equipment. Although engineering degrees were not needed by the team, critical thinking and problem solving were essential to support this new technology. DeAngelis reports that worker stress has been reduced and safety risks have declined because the robot can work around the clock when production schedules are tight. In the production process, worker knowledge of chemical components, mechanical operations, work flow and process efficiency are crucial when working directly with the robot. With the new robot and a highly trained support team, product defects are substantially less common and the company's production yield has increased.



Some argue that rather than replace human workers, robots will work in partnership with skilled laborers, alleviating the workload and complementing human skills.

From Manufacturing to Creative Thinking

Innovation and automation have improved our standard of living. Automation reduces the cost of products, allowing people more disposable income. Innovations such as online shopping save us time and increase our efficiency. With time freed up from monotonous tasks that automation is now doing for us, we can think more creatively and come up with ever more innovations.

There are no perfect solutions to solve the current unemployment rates and shortage of skilled workers, but many companies are working on it.

Business Owner Perspective

The first step in determining solutions for your current workforce is to establish which employees need new training, and what form it should take. Either an internal HR department or external career consultant can work directly with management to research and design effective training and educational programs. The goal is to fill talent gaps by discovering and fixing skill deficiencies.

Some companies find it helpful to create annual budgets for “talent improvement.” These employers implement skill and intellectual capability assessments for employees, then connect them with available training and educational programs.

Change is Good

Top business owners, professionals and workers are not complacent even when economic times are good. Many are taking action as automation, robotics and mobile technology merge, staying on the forefront of change. According to a recent New York Times article, Lee Kun-hee famously told his executives when he took over Samsung 20 years ago, “Change everything but your wife and children.” More recently, in the wake of a record year of sales for Samsung, he cautioned: “As we move forward, we must resist complacency and thoughts of being good enough, as these will prevent us from becoming better.”

Contributors: Alan Arcadipane is a Business Analyst of the Business Advisory Group at Riverview Capital Advisers. Henry Wilson is an Investment and Business Analyst of the Business Advisory Group at Riverview Capital Advisers. Melysa Latham is a member of the Business Advisory Group at Riverview Capital Advisers.

Sources:

- <http://stateofthedia.org/2013/overview-5/>
- http://www.nytimes.com/2013/12/15/technology/samsung-uneasy-in-the-lead.html?_r=0
- <http://www.eyewitnesstohistory.com/ford.htm>
- <http://online.wsj.com/news/articles/SB10001424052702303497804579241862778923036>
- <http://www.moorelaw.org/>
- http://economix.blogs.nytimes.com/2013/11/20/the-unemployment-rate-at-full-employment-how-low-can-you-go/?_r=1&pagewanted=print
- <http://www.bizjournals.com/boston/print-edition/2013/08/30/the-new-hiring-blueprint.html>
- <http://www.bizjournals.com/boston/blog/startups/2013/09/new-brain-for-baxter-rethink-robotics.html?page=all>
- <http://www.adweek.com/news-gallery/programmable-dummies-153590#what-programmable-anyway-1>
- http://money.cnn.com/2011/03/11/news/economy/skilled_factory_worker_shortage/index.htm
- http://articles.washingtonpost.com/2012-02-19/business/35444240_1_factory-workers-laid-off-workers-jobs
- http://articles.washingtonpost.com/2012-01-17/business/35439314_1_science-and-technology-number-of-research-workers-china
- <http://www.newgeography.com/content/004062-the-surprising-cities-creating-the-most-tech-jobs>
- <http://online.wsj.com/news/articles/SB10001424052702303672404579147282887082384>
- <http://content.thirdway.org/publications/714/Dancing-With-Robots.pdf>
- <http://www.bhcc.mass.edu/programsofstudy/associateinsciencedegrees/engineeringprogram/engineeringtransferoption/>
- <http://www.wpi.edu/academics/robotics.html>
- <http://www.cps.neu.edu/degree-programs/undergraduate/associates-degrees/associates-mechanical-engineering.php>
- <http://www2.itt-tech.edu/nbkw1/programs/prog.cfm?tag=iet>
- http://continuinged.uml.edu/CSCE/New_Sem_Search_Record.cfm?category=Online
- <http://www.cps.neu.edu/degree-programs/graduate/masters-degrees/masters-informatics.php>
- Nuance Communications: <http://www.nuance.com/index.htm>
- IBM: <http://www.ibm.com/us/en/>
- Cambridge Seven Associates: <http://www.c7a.com/>
- Rethink Robotics: <http://www.rethinkrobotics.com/>
- Globalfoundries Inc.: <http://www.globalfoundries.com/>
- Bayer Corp.: <http://www.bayer.com/>
- Precision Coating Co.: <http://www.precisioncoating.com/about.htm>
- Ted Talk: http://www.youtube.com/watch?v=cXQrbxD9_Ng
- IBM talk, Tech Racing Ahead: <https://www.youtube.com/watch?v=GPaf9YGz6Es>
- Baxter: <http://www.youtube.com/watch?v=i2bo1Z5cV70&feature=youtu.be>