

The Perfect Storm. How the Confluence of AI, Robotics Technology and Big Data Will Affect Human Employment

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If you wanted to look back to a time when machines did not augment the efforts of human beings, you would need to go very far back in the past, indeed. Even Stone Age humans used simple machines to improve the results of their efforts and to simplify their labours. Fast forward several millennia, and you find the same thing held true for Bronze Age, and then Iron Age humans.

Machines have been with us almost from the very beginning. The lever. The block and tackle. The nail. These are all examples of so-called simple machines. They are kin, albeit very distant, to today's machines. Things like automobiles, PCs, smartphones, and microwave ovens.

It is safe to say that using machines is a very human thing to do, perhaps one of the most human things. However, the situation is beginning to change. In preceding centuries, humans used machines to make their jobs simpler and less labor intensive. They were designed to improve the efficiency and reduce the cost to human workers in terms of time and physical labor.

In today's world, though, machines are not just helping people. They're beginning to replace human beings in the workplace.

The Trend Toward Automation and Mechanization

More advanced machines, robots are nothing new to the realm of manufacturing. They have actually been in use for decades at this point. The first such robot to ever be designed was completed back in 1954, although it did little more than move an object from one point to another. It was a sign of things to come, though.

The first robot to ever take a job with a major manufacturing company was UNIMATE. It was manufactured by a company called Unimation, and it was purchased and installed by General Motors in the company's New Jersey manufacturing plant way back in 1962. From that point, more and more companies invested in manufacturing-related robots, and by the 1980s, a new production robot was being introduced to the market at a rate of one per month.

Want another example of how mechanization has radically altered an industry? Consider agriculture. In the late 1800s, almost 80% of the workforce in the US was involved with agricultural production. Today, less than 2% of the workforce deals with agriculture in any way.

You can point to numerous other industries and identify the same trend - mechanization, automation, and AI based robotization. And it's happening faster and faster. Today, we're seeing the confluence of these trends and the emergence of what could be a perfect storm.

The Pace of Development and the Speed of Change

What began with simple machines like the lever and the screw has not slowed. In fact, it is accelerating. We live in a world today where it is increasingly difficult to tell the difference between automation and intelligent robots - where does one end and the other begin.

The truth is that the line is blurring between what were once considered mere tools and what we used to considered science fiction. That seismic shift will not slow, either. For proof, we can look to the increasingly rapid adoption of home automation technology and smart assistants. These days, we all have an increasingly complicated world augmented in virtually all areas by some form of mechanization, robotization, or artificial intelligence, such as:

- Increasing automation within automobiles (with mass produced self-driving cars just years down the road at this point)
- Increasing home automation with things like Google Home and Amazon's Echo
- Increasing automation within a wide range of fields, including fast-food service, manufacturing, and shipping to name just a few

Ultimately, the widespread adoption of automation and robotics, as well as the rise of artificial intelligence will have profound impacts on the world, particularly in terms of human employment and even the global economy, such as the questions asked by Martin Ford, in his book, *Rise of the Robots*. Martin Ford suggests the outlook is bleak for millions of workers who define their self-worth in terms of their employment. Increasingly workers will no longer be exploited by those in control of capital and intelligent machines, they will be irrelevant to them.

The Perfect Storm

In order to comprehend the future and its impact on human employment and economics, one must take a look at the perfect storm that is brewing. This is the confluence of several different things, including the development of sophisticated artificial intelligence, the improvement of robotics technologies, the rise of machine learning, the development of deep learning artificial neural networks, the spread of big data and the use of data science.

To listen to most authorities, the impact of these elements will be minimal, even positive. [McKinsey & Company](#) states that, "Automation will displace many jobs over the next 10 to 15 years, but many others will be created and even more will change. Jobs of the future will use different skills and may have higher educational requirements."

In an article for [CIO](#), senior writer Sarah K. White states, "Robots and AI won't displace job categories whole cloth, but may help make jobs easier in the future, as more tasks are automated for improved productivity or safety." She goes on to note that in almost all areas, the expected outcome is at worst for humans and robots to work together (so-called "co-bots").

[Forbes](#) points out the belief that, "Artificial intelligence will replace tasks, not jobs", with the article's author, Joe McKendrick, concluding, "Ultimately, the key to success in this emerging environment is to be able to marshal and capitalize on AI capabilities to deliver more value and service to customers. Employees can play a vital role in identifying opportunities, training models and algorithms, and taking a leadership role in determining if the systems are delivering business value in an ethical way.

Jobs will be enriched and elevated by AI and machine learning, but the best jobs will be those created to employ AI that link customers to the services and products they need."

However, not all authorities take such a benign view of the situation. [Brookings Institution](#), a nonprofit public policy organization based in Washington, DC, points out after discussing several studies published by reputable sources that predict a drastically different outcome. "While some dispute the dire predictions on grounds new positions will be created to offset the job losses, the fact that all these major studies report significant workforce disruptions should be taken seriously. If the employment impact falls at 30% mean of these forecasts, Western democracies likely could resort to authoritarianism as happened in some countries during the Great Depression of the 1930s in order to keep their restive populations in check."

What is the threat here, though?

The Risk to Human Jobs

The risk here is to human employment – the ability of the average individual to find gainful employment and earn a paycheck for his or her efforts. Technology has already had a massive impact on global industries over the years. Today’s world is nothing like it was even 100 years ago, much less in the 1700s or 1800s.

Many people assume that automation, robotics, and AI will only affect low-level jobs, or they will affect manufacturing jobs, much as they have done for several decades at this point. After all, a robot with similar technology to today’s Roomba robotic vacuum cleaners could easily drive a forklift, move pallets from shipping containers to a warehouse, or load trailers with palletized goods for distribution across the nation.

Robots have already proven to be better suited for harvesting produce than humans, and today’s farms are almost 100% automated, requiring only a handful of people to accomplish what would have taken hundreds of people in the past.

Automation can also be seen in other areas that we have all come to take for granted:

- Grocery stores and big-box stores are replacing some cashier lines with self-checkout lines.
- Bank teller and “money changers” in general have been under pressure by ATMs for decades.
- Fast food workers are being replaced by automated machines, including kiosks that replace cashiers, and even robotic cooks.

Most of these positions are lower end. They require little in the way of training and education, and can easily be performed by machines. We’re actually used to seeing this, and many of us assume that this is the limit to which machines can replace human beings, but the truth is actually very different.

In reality, thanks to advancements in AI, robotics, data science, and other areas, robots can now take many other positions. In fact, any job that is repetitive and/or predictable, can be automated to some degree, many of them completely. That includes many desk jobs.

In an interview with [Wired magazine](#), author Martin Ford explained, “It’s becoming evident that computers, machines, robots, and algorithms are going to be able to do most of the routine, repetitive types of jobs. That’s the essence of what machine learning is all about. What types of jobs are on some level fundamentally predictable? A lot of different skill levels fall into that category. It’s not just about lower-skilled jobs, either. People with college degrees, even professional degrees, people like lawyers, are doing things that ultimately are predictable. A lot of those jobs are going to be susceptible over time.”

What sort of timeframe are we looking at, though? It could be as little as 20 years. Imagine, merely two decades and we could be living in a world where lawyers, architects, courthouse clerks, even designers, have been replaced by machines.

The Stakes for Businesses

What does the rise of automation and robotics mean for businesses? Actually, there are several different aspects that must be discussed.

Winner Take All

Perhaps the single most important takeaway here is that the winner-take-all market model will become much more common. Unsure what this means? According to [Farnam Street](#), “A winner-take-all market doesn’t mean there is only one company in the market. Rather, when we say a winner takes all, what we mean is that a single company receives the majority of available profits. A few others have at best a modest share. The rest fight over a miniscule remnant, and tend not to survive long.”

The reason for this? There is really only room for just one major technology. We can see this at work in today’s world already, and the ongoing automation of all industries will only exacerbate it. A few examples of winner-takes-all businesses include:

- Google
- Facebook
- Apple
- Amazon
- Uber
- Airbnb

These are the so-called major players within their sectors. For instance, we all know (and use) other social networks beyond Facebook such as Twitter, LinkedIn and Snapchat. However, while there are alternatives that do have some traction, there's no denying the fact that Facebook's supremacy is largely unchallenged. Even Google couldn't dethrone them, and the search giant's contender, G+, was mothballed in late 2018.

We can take Google as yet another example. Google was not the first search engine. It remains only one of several search engines out there. However, it accounts for the lion's share of organic searches on the Internet every day. A quick breakdown of search engine market share as of the end of 2018 looks like this:

- Google - 92.06% of worldwide search
- Bing - 2.37% of worldwide search
- Yahoo - 2.25% of worldwide search
- Baidu - .96% of worldwide search
- Yandex - 0.63% of worldwide search
- DuckDuckGo - 0.36% of worldwide search

While we've all heard of each of those search engines, the one that dominates the entire industry is Google. Bing and Yahoo, while successful, have less than 3% of the global market each. The other three competitors, Baidu, Yandex and DuckDuckGo, have under 2% of the global market - under 0.5% in the case of DuckDuckGo.

This is exactly what a winner-takes-all market looks like. Google gets not only the most searches, but earns the most revenue. Bing and Yahoo get a smaller share. The other three are left to battle over and split less than half of Yahoo's share of the global search market.

Take a less well persified market and look at it for yet another example - say Airbnb. Ostensibly, Airbnb is part of the hotel sector, and the wider hospitality industry. However, it has few direct competitors. They do not really compete with hotel chains like Hilton and Marriott, at least not directly. So, who do they compete with? Other new marketplaces built on a similar premise, such as:

- Tripping.com
- HomeToGo
- FlipKey
- VRBO
- VayStays

How many of those names do you recognize? How many have you used personally? Probably not many, and you can expect that trend to continue. As more and more companies attempt to cash in on the trend, they're squabbling over smaller and smaller pieces of the pie, while Airbnb will likely remain the industry leader by a major percentage.

Specialization Is No Longer Protection

What other ways will businesses be impacted by the rise of automation, robotics, and AI? One of the most startling changes can be traced back to something we already discussed – the displacement of human workers from surprising areas. Once, specialization meant that a worker was able to enjoy significant demand for his or her skills. It meant they were difficult to replace, and brought something to the table not available from many other potential employees. However, that is changing today.

Increasingly, those with specialized skills enjoy no more protection from automation than those in lower-skilled positions. For instance, it's well understood that jobs in the following areas are being lost to machines:

- Agriculture
- Food preparation
- Manufacturing

However, according to a study discussed by [The Economist](#), a range of positions requiring specialized knowledge and skill are also at risk of being outsourced to automated systems, including:

- Professional and personal assistants
- Construction
- Personal service
- Sales
- Customer service
- Teaching
- Healthcare

What is fueling this rise in automation adoption? Is it solely due to the way that technology has improved? That's part of it, certainly, but there are other reasons.

No More Overtime - Automated systems, whether we're talking about traditional robots, or today's software-based bots, don't need to worry about overtime. They can work 24 hours per day, 7 days per week. They never get tired, they never go on vacation, and they never take a sick day. Moreover, their productivity and accuracy don't suffer from lack of rest.

Cheap to Use - Another reason that automated systems are increasingly replacing those with specialized skills is that they are cheap to use. Yes, there is an initial investment and it is often significant. However, when factored over time, automated systems are orders of magnitude more affordable for businesses to operate. That improves profitability, certainly, but also frees up capital for the business to reinvest into other areas, such as product development and refinement, R&D, and more.

More Accurate - What is the smallest fraction of a centimeter that you can see with your eye? It's not all that small. Now, what's the smallest item you can manipulate with your fingers? Again, probably not all that small. Automated systems, particularly specialized robots purpose-built for particular tasks within an operation, are far, far more accurate. They are able to work with virtually no errors. That saves a company time and money, plus reduces the demand for raw resources and increases overall product quality, which drives up customer satisfaction.

More Efficient - Finally, automated systems are more efficient than human beings. They don't stop for a cup of tea or a coffee break. Employers do not need to worry about them taking too long around the water cooler as they exchange the latest tidbit of gossip, or catch up on sports statistics. They are highly efficient, which allows the company itself to become that much more efficient. Greater efficiency means better profitability across the board.

Removing People from the Equation

What would you say is the single largest challenge faced by companies large and small today? Is it getting the right product in front of the right audience at the right time? Is it marketing related? Is it compliance with increasingly strict government rules and regulations?

Actually, it is none of these things. The single largest liability for any company is its workforce. The employees that make the company go are also responsible for holding it back. The single largest expense of any company is not the cost of the product or service, but the cost of paying employees. The single largest drain on corporate resources is not government compliance, but worker-related costs.

This has given rise to a number of robotics companies whose sole goal is to replace the human worker, not to create technological solutions to assist them. After all, if you remove the people, then you remove a major obstacle to profitability and efficiency.

The Future

What will the future look like once automated systems have largely replaced today's worker-driven companies? It will be a very different place. We'll leave out the predictions for what it will do to the economy itself, if the middle classes are no longer earning, they will not be able to purchase what companies are producing, or how the average person will earn a living and support their families. The most likely outcome for the "regular Joe" is the provision of a basic income by the government, with incentives to pursue higher education and then become an entrepreneur.

Instead, let's look at how it will change companies.

Look for the corporate structure to evolve radically, in a very short time. Ultimately, it will consist of one director, a single technical specialist, a handful of programmers, a few maintenance people, and teams of robots tasked to do all the tasks that humans once did. There will be little need for the HR department. There will be virtually no need for workers' compensation insurance.

The future is very bright for a handful of technology companies. It only remains to see who comes out on top.

Works Cited:

<https://www.wired.com/brandlab/2015/04/rise-machines-future-lots-robots-jobs-humans/>

<https://ig.ft.com/sites/business-book-award/books/2015/winner/the-rise-of-the-robots-by-martin-ford/>

<https://www.mckinsey.com/featured-insights/future-of-work/how-will-automation-affect-jobs-skills-and-wages>

<https://www.cio.com/article/3285705/artificial-intelligence/ais-impact-on-the-future-of-work.html>

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<https://www.brookings.edu/blog/techtank/2018/04/18/will-robots-and-ai-take-your-job-the-economic-and-political-consequences-of-automation/>

<https://www.forbes.com/sites/joemckendrick/2018/08/14/artificial-intelligence-will-replace-tasks-not-jobs/#6b546d97a7fa>

<https://cerasis.com/2014/10/06/robotics-in-manufacturing/>

<https://www.robotics.org/blog-article.cfm/The-History-of-Robotics-in-the-Automotive-Industry/24>

<https://bigdata-madesimple.com/the-evolution-of-robots-from-single-task-machines-to-backflipping-robots/>

<http://gs.statcounter.com/search-engine-market-share>

<https://fs.blog/2018/09/mental-model-winner-take-all/>

https://www.hotel-online.com/press_releases/release/airbnbs-market-share-of-u.s.-lodging-demand-increasing-at-a-decelerating-rate#When:18:40:07Z

<https://www.forbes.com/sites/hbsworkingknowledge/2018/02/27/the-airbnb-effect-cheaper-rooms-for-travelers-less-revenue-for-hotels/#4a1535c1d672>

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The Data Science Foundation is a professional body representing the interests of the Data Science Industry. Its membership consists of suppliers who offer a range of big data analytical and technical services and companies and individuals with an interest in the commercial advantages that can be gained from big data. The organisation aims to raise the profile of this developing industry, to educate people about the benefits of knowledge based decision making and to encourage firms to start using big data techniques.

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