

# The Threats of Automation and the Place of Humans in the Workforce of the Future

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**Abstract** - The world is rapidly experiencing disruptive changes to conventional business models and traditional job families as a result of automation, Artificial intelligence, robots and advancement in technological knowhow. Many of these major drivers of transformation in the workplaces and industries globally are expected to have huge implications for job creation, job displacement and widening skill gaps in the job market. There is a need for businesses, governments and individuals to prepare for future skills requirements and job content in order to fully seize the opportunities presented by these trends. We examine how much the available jobs are prone to take-over by computerisation and automation. We begin with a detailed look at current literatures on the subject matter. We examine the current and future impacts of the automation and computerization trends on job availability and human survival in the near future. We look at the jobs most at risk, the economic effects of automation and how humans can still be relevant in an era where most of the jobs will be done by machines.

**Index Terms:** Automation; Employment, Jobs, Skill Demand, Technological Change; Workforce of the future

## 1 INTRODUCTION

Technology is getting “smarter,” much more than we had envisaged. They are making life very easy and taking a lot of human deficiencies off the industries and workplaces.

In the first era of automation (19<sup>th</sup> century) machines were designed to take over the dirty and dangerous jobs - industrial equipment such as the looming machines were invented to relieve humans of drudgery in the workplaces and onerous manual labour.[1]

The next challenge was dealing with the routine services and repetitive jobs. The quest for a solution led to the second machine era (the 20<sup>th</sup> century). In this era, machines were employed to take away the dull jobs and relieve humans of routine service transactions and clerical chores. This gave rise to automated interfaces widely deployed in airline kiosks and call centres.

In era three, 21<sup>st</sup> century and beyond, new technologies are taking on more cognitive abilities and stretching their domain to eclipse the full range of the jobs that were traditionally reserved for the humans. They are taking on more complex actions and decision-making, and doing them better, faster and at a lower cost than the humans could do them.

The pace, nature, and ubiquity of technological change will have significant impacts on job availability, access, and quality [2].

This threat of automation to workforce is a huge concern especially for low-skilled workers who make up a large portion of the workforce in global manufacturing and agriculture value chains, and whose jobs are becoming increasingly cost effective to replace with machines.

Some jobs will be replaced by machines while new jobs are created and existing jobstake on new and different tasks.

Some of the key trends defining this era of automation that are particularly relevant to labor-intensive industries like manufacturing include:

*Intelligent Robotics:* these are faster and cheaper robots with greater cognitive abilities and greater dexterity and sensing. These machines will take on a great range of tasks and raise new questions about human capabilities versus machines.

*Additive Manufacturing:* Although the jobs to be replaced by 3D printing are not anticipated to be of the same magnitude as many other technologies, it could significantly reduce the human involvement in the manufacture and assembly of finished goods in the near future.

*Remote Connectivity:* Remote connectivity is eliminating the need for extensive travel to monitor production in remote

locations. It is also allowing employers to access specialized skills and 24-hour productivity by leveraging people from around the world. All these happen very fast and at low costs. This can lead to downward pressures on wages due to the ease of shifting remote jobs to lower-cost locations. On the other hand, it can also boost job opportunities in rural economies.

*Advanced Analytics:* advanced analytics, also known as Big Data, is helping many companies, especially in manufacturing, to automate complex tasks easily. For some of such companies, trends like advanced analytics are improving operational performance by helping diagnose and correct process flaws, increase yields, and reduce waste and the need for certain material inputs [3]

*Internet of Things:* In the coming decade, sensors and actuators may be embedded in almost every type of machine and physical asset. This will provide new ways of monitoring and managing all the "moving parts" that make up a business, from air temperature and quality to the flow of goods or materials through plants, distribution centers, and even onto store shelves. [4]

This provides manufacturers a number of benefits in terms of operational efficiency, precision, and transparency. It could also create new jobs as well as improve existing jobs by enhancing worker productivity [5]

This sophistication, combined with the global reach and ease of spread of change and adoption of technology, is changing the way goods are produced and services are delivered.

The robots are in Amazon warehouses relieving humans of the repetitive and drudge work of fetching items. In the hospitals AI software now reads MRIs. It can shop online, place orders and have their goods delivered. They are doing computationally intensive research work, analysing huge data sets and making more accurate inference from the results than humans.

Companies in Asia are on the leading edge of using robots in service jobs.

A "robotic journalist" called *Kuaibi Xiaoxi* or Little Xinhua has officially started work at state news agency Xinhua, China's

most influential news agency, in a move reporters fear will inspire other media to follow suit [6]

Companies across various industries are embracing these technologies to improve operational efficiency and performance, reduce waste and conserve natural resources, reach new markets and audiences with speed and convenience, and support product and process innovation.

However good and comfortable the picture of a world of robots and Artificial Intelligence (AI) looks, continuing to invest in technology and automation has a range of implications for labor markets around the world [7] and how humans will survive in the future

## 2 Review of relevant literatures

A lot has been written about the impending battle between humans and machines. Most times it is concluded that the machines will win and the humans will lose.

While he admits that the displacement of workers by technology is nothing new, Edward D. Hess stressed that the nature of our rapidly advancing technology and the wide variety of roles it's poised to replace are altogether new [8].

According to Brynjolfsson and McAfee [9], the pace of technological innovation is still increasing, with more sophisticated software technologies disrupting labour markets by making workers redundant. They pointed out that automation is no longer confined to routine manufacturing tasks.

Knowledge work could be seen as work that is more mental than manual and which involves consequential decision making. Such work traditionally requires a college education and accounts for a large proportion of jobs in today's mature economies. It is the high ground to which humanity has retreated as machines have taken over less cognitively challenging work. But in the very foreseeable future, as the Gartner analyst Nigel Rayner says, "Many of the things executives do today will be automated." [10]

On the other hand, even if we never run out of jobs, the rate at which jobs become obsolete and new skills spring up to displace old and already established methods is getting too fast for job creation to catch up.

Far back in the 90s, John Maynard Keynes [11] predicted a widespread technological unemployment “due to our discovery of means of economising the use of labour outrunning the pace at which we can find new uses for labour”

A study by Michael Osborne and Carl Benedikt Frey [12], leading experts on technological change at Oxford Martin School, estimated that more than 47 percent of the U.S. workforce is at high risk of automation, including both middle- and lower-skill-level jobs.

Their evidence showed that wages and educational attainment exhibit a strong negative relationship with an occupation’s probability of computerisation

James B. Huntington [13] warns that “major future inventions will have nowhere near the employment-boosting effect as cars, electricity, or television did in the past, as their work processes will be far too automated.”

The current state of unemployment corroborates the fact that we are not creating enough jobs.

### 3 How will it affect man?

Back in 1967, having witnessed the first attempts to automate knowledge work, Peter Drucker declared of the computer: “It’s a total moron ...the dumbest tool we have ever had” [14]

Automation is rapidly becoming more intelligent and affordable, while the global supply of talent is getting smaller and more expensive. This has raised concern among humans about its impacts on jobs and the growing social and physiological ills of joblessness.

Continuous decline of employment in manufacturing and occupations mainly consisting of tasks following well-defined procedures that can easily be performed by sophisticated algorithms, is causing the current low rate of employment.[15], [16] The reason is that the core job tasks of manufacturing occupations follow definite repetitive procedures that can easily be codified in computer software and thus performed by computers [17].

A significant number of jobs are likely to be made redundant, including predictable, routine tasks. New industries are

expected to be less labour intensive or provide less reliable employment, thus reducing net job creation

More part-timework and contractor work could mean less access to formal employer benefits and weakened job security. Downward pressure on wages as a result of competition with ‘cheap’ machine capital could lead to income losses. Reduction of available low-skill jobs could reduce negotiating power of workers in remaining low-skill positions. Lower-skilled and less-educated groups could face particular challenges in filling new higher-skilled roles if efforts are not made to help them grow needed skills.

As with every era of technological change, some jobs will be replaced by machines, new ones will be created, while some existing ones will take on new and different tasks

### 4 Will automation continue?

Technology has become an integral part of human life and plays prominent roles in our daily lives. The convergence of computer intelligence and business process applications keep accelerating and creating a new class of complex and intelligent automation that is capable of performing activities that currently require knowledge and skills by highly trained personnel.

The robots, machines and AI make this union more seamless like Siamese twins.

Expanding technological capabilities and declining costs will make entirely new uses for robots possible. Robots will likely continue to take on an increasing set of manual tasks in manufacturing, packing, construction, maintenance, and agriculture and in a wide range of low-wage service occupations where most US job growth has occurred over the past decades [18]

Technological advances are contributing to declining costs in robotics. Over the past decades, robot prices have fallen about 10 percent annually and are expected to decline at an even faster pace in the near future [19]

Industrial robots, with features enabled by machine vision and high-precision dexterity, which typically cost 100,000 to 150,000 USD, will be available for 50,000 to 75,000 USD in the next decade, with higher levels of intelligence and additional capabilities [20]

Declining robot prices will inevitably place them within reach of more users.

In china employers are increasingly incentivised to substitute robots for labour, as wages and living standards are rising – Foxconn, a Chinese contract manufacturer that employs 1.2 million workers, is now investing in robots to assemble products such as the Apple iPhone [21]

From 2010 to 2014, private investment in AI has grown from US\$1.7 billion to US\$14.9 billion, and it was on track to grow nearly 50 percent year-on-year in 2015 alone[22]. MarketsandMarkets estimates that the AI, or cognitive computing marketplace, will generate revenue of US\$12.5 billion by 2019

We want everything around us to be smart, from the home to the industry and hospitals. We crave the easy life where we spend little human effort, less resources and achieve the most result.

Our thirst for the good and easy life leaves corporate organizations, Toyota, Google, Apple, Samsung and other manufacturers with a heavy task. They jostle to meet up with our unending yearnings and expectations. Each wants their products to be innovative, earn higher human approval rating, outsmart the others and lead the market.

These technologies are helping companies respond to increasing competition, growing scarcity of natural resources, rising labor and material input costs, fill labor shortages, and increasing consumer demand for products that can be customized and delivered without long lead times. Automation is helping them raise productivity and precision in manufacturing.

Cost matters really little as long as our desires are handed whole to us. As much as we don't care about the prices they do care. Their utmost desire is to bring it down as much as possible; the lower the price, the higher the sales and their profit. They are going for cheap labor, and embracing every

means that helps them meet this target. They are not looking to the side of the humans any more for this labor.

The droids, the apps, the machines, Artificial intelligence, the burgs, and those fancy shinny ensembles of ambidextrous arms called robots are helping companies respond to increasing competition, growing scarcity of natural resources, rising labor and material input costs.

We are thrilled by their presence and how much extra abilities they give to the humans, and fail to notice how gradually our jobs slip away from us. They are timely, more accurate and faster than their human makers; and most importantly they don't charge wages and salaries. They take the burdens off our shoulders and leave us with heavier ones. Technology has become us and we have become technology. Our soaring thirst for the easy life and hunger for those fancy gadgets we carry about fuel their existence.

However, just because automation is possible doesn't mean it will necessarily happen on a massive scale. The decision to automate varies significantly by industry and country. Countries of the world are not at par in development and technological advancement. While some jobs will be lost in some countries to automation, in others, particularly in developing countries such jobs may still exist for a while longer. In such countries the benefits of human labor for many tasks will outweigh the costs and benefits of machine capital, at least for a period of time. Company decisions depend on a number of factors including wages, regulation, and ease with which tasks can be automated.

From the works of David Autor [23], an economist at the Massachusetts Institute of Technology (MIT), "the mere fact that a job can be automated does not mean that it will be; relative costs also matter.

For example, about 80 percent of all the work involved in manufacturing a car is said to be done by machines. David Autor noted that while Nissan relied on cheap local labour to run its plant in India, by contrast, it relied heavily on robots to produce cars in Japan [24]

## 5. However, there are some benefits

Some jobs will remain beyond the reach of automation, at least for now. This includes, for example, work that requires

creativity or moving in unpredictable settings and performing tasks requiring tactile feedback like placing fiberglass panels inside airplanes, boats, or cars [25].

By enabling more people to access the same information, automation can level the playing field for people to enter the economy and access opportunities. Facilities such as "makerspaces" and tech incubators, for example, provide affordable, shared access to new technologies, tools, and mentorships, to support innovation and small-scale manufacturing [26]. This, alongside the sharing economy, is bringing more people into the economy through self-employment.

According to a recent BSR report [2], the following benefits will come from automation:

Jobs may become accessible for certain groups such as women, and people with disabilities, by overcoming social, cultural and physical barriers to work.

Technology could make the means of production more accessible to small scale producers.

Factory spaces may become cleaner and safer, and some of the most difficult and dangerous tasks may be mechanised. Repetitive motion injuries may be reduced, and sensors and other tools may be used to monitor health and air quality.

Technology can augment human skills, enabling workers to extend their own capabilities and learn new skills, providing more mobility. The age of automation is not going to be an all loss scenario for the humans. Many pro automation analysts anticipate millions of jobs to be created by technology, including those involved in designing, creating, and repairing robots. Other jobs will be created in burgeoning industries and by new business models, such as the sharing economy and circular economy that are enabled by advances in these technologies.

Technology will also affect the quality of existing and new jobs. Automation could make certain jobs more attractive and advance the well-being of workers. Rather than expose humans to health and environmental risks, robots could fill the least attractive, most physical, and unsafe jobs. Technology could also make people more productive and, in turn, lead to

higher incomes. If workers have the right skills to fill these higher-paying manufacturing jobs and the benefits of improved efficiency are returned to workers, these could offer significant hopes for improving incomes and overall well-being. At the same time, as machines become more cost effective it may be harder for human capital to compete, which could lead to downward pressure on wages

## 6 How man could survive this era.

Unless we find as many tasks to give humans as we find to take away from them, all the social and psychological ills of joblessness such as economic recession and youth unemployment will continue to grow.

David Autor, an economist at MIT who closely tracks the effects of automation on labor markets, recently complained that "journalists and expert commentators overstate the extent of machine substitution for human labor and ignore the strong complementarities that increase productivity, raise earnings, and augment demand for skilled labor." He pointed to the immense challenge of applying machines to any tasks that call for flexibility, judgment, or common sense. However he clearly stated a fundamental point, "Tasks that cannot be substituted by computerization are generally complemented by it," [27]

An overriding implication of automating tasks is that the roles of humans in workplaces will be redesigned and organizations will have to become very good at understanding where machines can do a better job, where humans have the edge, and how to reinvent processes to make the most of both types of talent. [28]

*Thomas Davenport and Julia Kirby [29] looked at cases in which knowledge workers collaborate with machines to do things that neither could do well on their own and sought to reframe the threat of automation as an opportunity for augmentation.*

This strategy views smart machines as our partners and collaborators in knowledge work. "By emphasizing augmentation, we can remove the threat of automation and turn the race with the machine into a relay rather than a dash", they wrote. Those who are able to smoothly transfer the baton to and from a computer will be the winners.

They argue that smart machines can be our partners and collaborators in our creative problem solving and propose a change from pursuing automation to promoting augmentation.

Augmentation means starting with what humans do today and figuring out how that work could be deepened rather than diminished by a greater use of machines.

By maximizing performance of machines and employees, companies can simultaneously become more efficient and more innovative, raising both top- and bottom-line performance [30]

This new mindset could change the future.

Thomas H. Davenport and Julia Kirby pointed out that this new mindset could be implemented in the following ways:

1. Head for still higher intellectual ground. Those who are capable of more big-picture thinking and a higher level of abstraction than computers will always have jobs to do in the machine era. Such people will need higher education to stay broadly informed and creative enough to be part of its ongoing innovation and strategy efforts
2. Discover your uncodifiable strengths, focus on them and then work hard continually to heighten them.
3. Find a specialty within your profession that wouldn't be economical to automate. When you find such niches, dig deep inside them. Although they also have other interests, Such people go a mile deep on a subject an inch wide. Thus they professionally they have a very distinct brand in their area of specialization
4. Finally, be the one to construct the next generation of computing and AI tools. There is always a human being behind every great machine that exists. Someone intuits the human need for a better system; someone identifies the part of it that can be done is a computer program; someone writes the code; and someone designs the conditions under which it will be applied. Your job is to bring about machines' next level of encroachment.

## 7. Conclusion

Automation and computerization will not cease to advance. Human wants and desires to get ahead, conquer more grounds, achieve more, maximize scarce resources and get the best results with little effort and at a low cost will continue to fuel the trends in automation and computerization in every aspect of our life.

As technology races ahead, leaving job destructions in its wake, there are grave implications for human survival in the nearest future. Low-skill workers will be forced to seek tasks that are beyond the reach of robots and computerisation i.e., tasks requiring creative and social intelligence. Such people will have to acquire creative and social skills if they are to win the race against automation. A lot of the tasks that are the preserves of human will be eclipsed by technology.

Past waves of technological advancement and demographic change have led to increased prosperity, productivity and job creation. This does not mean, however, that these transitions were free of risk or difficulty. It is therefore critical for humans to anticipate and prepare for the challenges and risks of this current job transition.

There is need to change our attitude towards employment and career, and brace for the new job order that is rapidly unfolding.

However tight the race goes, man can still find opportunities to work with machines as counterparts in problem solving.

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