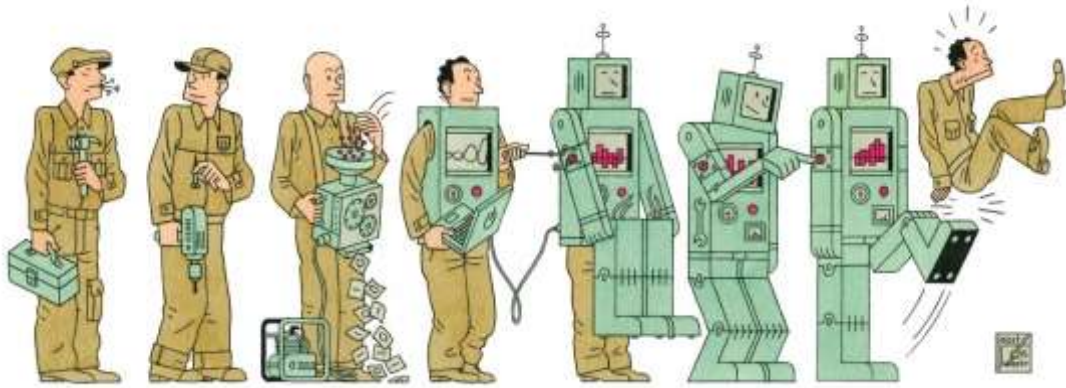


COVER STORY

Automation And Anxiety: Will Smarter Machines Cause Mass Unemployment?



SITTING IN AN office in San Francisco, Igor Barani calls up some medical scans on his screen. He is the chief executive of Enlitic, one of a host of startups applying deep learning to medicine, starting with the analysis of images such as X-rays and CT scans.

Red blobs flicker on the screen as Enlitic's deep-learning system examines and compares them to see if they are blood vessels, harmless imaging artefacts or malignant lung nodules. The system ends up highlighting a particular feature for further investigation.

In a test against three expert human radiologists working together, Enlitic's system was 50% better at classifying malignant tumours and had a false-negative rate (where a cancer is missed) of zero, compared with 7% for the humans. Another of Enlitic's systems, which examines X-rays to detect wrist fractures, also handily outperformed human experts. The firm's technology is currently being tested in 40 clinics across Australia.

It is an obvious use of the technology. Deep learning is renowned for its superhuman prowess at certain forms of image recognition; and there is tremendous potential to make health care more accurate and efficient.

A computer that dispenses expert radiology advice is just one example of how jobs currently done by highly trained white-collar workers can be automated, thanks to the advance of deep learning and other forms of artificial intelligence. The idea that manual

work can be carried out by machines is already familiar; now ever-smarter machines can perform tasks done by information workers, too. Hence the question that looms large at this point of time is whether automation would lead to mass unemployment?

AUTOMATION: LEADING TO THE MASS UNEMPLOYMENT

- There have been periodic warnings in the last two centuries that automation and new technology were going to wipe out large numbers of middle class jobs.
- The best-known early example is the **Luddite movement** of the early 19th century, in which a group of English textile artisans protested the automation of textile production by seeking to destroy some of the machines.
- Automation increased during the latter half of 20th century, as computers were combined with machines to produce highly sophisticated robotic systems and other automated processes. The result has been increased productivity and lower human resource costs for manufacturers and the elimination of some categories of jobs for workers.
- In 21st century, with the development of Artificial intelligence and robotics along with software to handle big data the process of automation has hastened.
- According to Stephen Hawking, artificial intelligence and increasing automation is going to decimate middle class jobs, worsening inequality and risking significant political upheaval.
- According to him, while artificial intelligence will bring radical increases in efficiency in industry, for ordinary people this will translate into unemployment and uncertainty, as their human jobs are replaced by machines.
- For example, we expected waiters and waitresses to be non-automatable: what we saw as the requirement to make pleasant small talk with restaurant customers was beyond what we could see a robot server providing. Nonetheless, new algorithms gave waiters and waitresses a (high) probability of computerisation of 94%. Since then, of course, US restaurant chains like *Chili's* have introduced *Ziosk tablets* to their tables, which are able to take orders, recommend specials and take payment more efficiently than a human server.
- When AlphaGo, a program developed by Google's DeepMind unit, has defeated legendary Go player Lee Se-dol, the automation has announced its arrival in the arena of sports.

- Google's driverless cars and Amazon's drones delivering the products further provide the gloomy picture for employment scenario in future.
- Technology might create fewer and fewer jobs, while exposing a growing share of them to automation. Biggest example is that of **Instagram, a photo-sharing app**. When it was bought by Facebook in 2012 for \$1 billion, it had tens of millions of users, but only 13 employees. Kodak, which once employed 145,000 people making photographic products, went into bankruptcy at around the same time.
- Some Statistics showing the possible impact of automation on employment and economy:
 - A report put out in February 2016 by Citibank in partnership with the University of Oxford predicted that 47% of US jobs are at risk of automation. In the UK, 35% are. In China, it's a whopping 77% — while across the OECD it's an average of 57%.
 - According to World Bank research, automation threatens 69% of the jobs in India, while 77% in China. It said that technology could fundamentally disrupt the pattern of traditional economic path in developing countries.
 - Traditional economic path from increasing productivity of agriculture to light manufacturing and then to full-scale industrialisation may not be possible for all developing countries due to technological disruption in the form of automation. It may further affect their path of development and thereby affecting the overall employment scenario in the country.
- Also, automation will have an adverse impact on inequality. According to Hawking, automation will accelerate the already widening economic inequality around the world.
- The internet and the platforms that it makes possible allow very small groups of individuals to make enormous profits while employing very few people. This is inevitable, it is progress, but it is also socially destructive.

WHICH JOBS ARE MOST VULNERABLE?

- No office job is safe as the **Automation is now "blind to the colour of our collar"**. What determines vulnerability to automation is not so much whether the work concerned is manual or white-collar but whether or not it is routine.
- Machines can already do many forms of routine manual labour, and are now able to perform some routine cognitive tasks too. As a result, a highly trained and

specialised radiologist may now be in greater danger of being replaced by a machine than his own executive assistant who does so many different things that a machine will not be able to automate.

- Many experts warn of the threat of a “jobless future”, pointing out that most jobs can be broken down into a series of routine tasks, more and more of which can be done by machines.
- However, there are certain sectors which are more vulnerable than others.
- The most affected sector is the manufacturing sector where middle-skill jobs are declining. The stagnation of median wages in many Western countries is cited as evidence that automation is already having an effect—though it is hard to disentangle the impact of offshoring, which has also moved many routine jobs (including manufacturing and call-centre work) to low-wage countries in the developing world.
- According to a study published in 2013 by Carl Benedikt Frey and Michael Osborne, most workers in transport and logistics (such as taxi and delivery drivers) and office support (such as receptionists and security guards) “are likely to be substituted by computer capital”.
- Many workers in sales and services (such as cashiers, counter and rental clerks, telemarketers and accountants) also faced a high risk of computerisation.
- They concluded that “recent developments in machine learning will put a substantial share of employment, across a wide range of occupations, at risk in the near future.” Subsequent studies put the equivalent figure at 35% of the workforce for Britain (where more people work in creative fields less susceptible to automation) and 49% for Japan.

AUTOMATION LEADING TO MASS UNEMPLOYMENT: A MYTH

- In the past two centuries of automation and technological progress havenot made human labour obsolete: the employment-to-population ratio rose duringthe 20th century even as women moved from home to market; and although theunemployment rate fluctuates cyclically, there is no apparent long-run increase.
- Automation does indeed substitute for labour—as it is typically intended to do. However, automation also complements labour, raises output in ways that lead to higher demand for labour, and interacts with adjustments in labour supply.

- There is strong complementarities between automation and labour that increase productivity, raise earnings, and augment demand for labour. Automating a particular task, so that it can be done more quickly or cheaply, increases the demand for human workers to do the other tasks around it that have not been automated.
- For example, during the Industrial Revolution more and more tasks in the weaving process were automated, prompting workers to focus on the things machines could not do, such as operating a machine, and then tending multiple machines to keep them running smoothly.
- This caused output to grow explosively. In America during the 19th century the amount of coarse cloth a single weaver could produce in an hour increased by a factor of 50, and the amount of labour required per yard of cloth fell by 98%. This made cloth cheaper and increased demand for it, which in turn created more jobs for weavers: their numbers quadrupled between 1830 and 1900.
- In other words, technology gradually changed the nature of the weaver's job, and the skills required to do it, rather than replacing it altogether.
- In a more recent example, automated teller machines (ATMs) might have been expected to spell doom for bank tellers by taking over some of their routine tasks. But that reduced the cost of running a bank branch, allowing banks to open more branches in response to customer demand. The number of bank branches rose, so the total number of employees increased.
- Even after the introduction of computers, the net effect was that more computer-intensive jobs within an industry displaced less computer-intensive ones. Computers thus reallocate rather than displace jobs, requiring workers to learn new skills.
- The same seems to be true of fields where AI is being deployed. Self-driving vehicles may need remote operators to cope with emergencies, or ride-along concierges who knock on doors and manhandle packages. Corporate chatbot and customer-service AIs will need to be built and trained and have dialogue written for them; they will have to be constantly updated and maintained, just as websites are today.
- And no matter how advanced artificial intelligence becomes, some jobs are always likely to be better done by humans, notably those involving empathy or social interaction. Doctors, therapists, hairdressers and personal trainers fall into that category.

- While it is easy to see fields in which automation might do away with the need for human labour, it is less obvious where *technology might create new jobs*. We can't predict what jobs will be created in the future.
- For example imagine trying to tell someone a century ago that his/her great-grandchildren would be video-game designers or cybersecurity specialists. These are jobs that nobody in the past would have predicted.
- Humans, for the foreseeable future at least, are in charge and whether or not a job can be automated doesn't mean it actually will be automated. There are *a number of potential inhibitors including the capital cost of automation as well as certain jobs requiring human interaction*.
- Most firms tend to implement new technology more slowly, not least for non-technological reasons. Enlitic and other companies developing AI for use in medicine, for example, must grapple with complex regulations and a fragmented marketplace. It takes time for processes to change, standards to emerge and people to learn new skills. It provides ample time for proper adjustment in an economy.
- Many researchers contend that it was smartphones, not Instagram, that undermined Kodak, and far more people are employed by the smartphone industry and its surrounding ecosystems than ever worked for Kodak or the traditional photography industry.

IS THIS TIME THE IMPACT WILL BE DIFFERENT?

- Many analysts believe that the impact of automation this time around is broader-based: not every industry was affected two centuries ago, but every industry uses computers today.
- During previous waves of automation, workers could switch from one kind of routine work to another; but this time many workers will have to switch from routine, unskilled jobs to non-routine, skilled jobs to stay ahead of automation.
- Another difference is that whereas the shift from agriculture to industry typically took decades, software can be deployed much more rapidly. Hence, it can affect the employment scenario more severely. For example, India suffers from a high rate of unemployment due to this reason.

WHAT IS NEEDED?

- *Human capital investment* must beat the heart of any long-term strategy for producing skills that are complemented by rather than substituted for by technological change.
- The government must act as the *employer of last resort* for the hard-core jobless.
- *Education system must reflect* the new and expected demand. We need more re-training, encouraging workers towards the kind of jobs we would expect to survive.
- The distinction between invention and implementation is critical, and too often ignored. We must not ignore this distinction so as to effectively use this duration to raise awareness, to impart new skills to the masses and to formulate new policies conducive for inclusive growth.
- Increase in online learning will play a pivotal role here in improving skills across age ranges, to help fill those vital roles. In India, the government has launched Massive Open Online Course platform 'SWAYAM' to promote learning.
- People should be allowed to learn "at their own pace" and governments "should not try to protect current or future jobs." Instead, "it is crucial that governments take steps to reduce the cost of education while improving its quality."
- If human labour is indeed rendered superfluous by automation, then our chief economic problem will be one of distribution, not of scarcity. In this situation, a guaranteed minimum income for each family in the form of *universal basic income (UBI)* can be a possible solution.
- If machines were in fact to make human labor superfluous, we would have vast aggregate wealth but a serious challenge in determining who owns it and how to share it. Here the role of government would become important, as there is always perceived scarcity and ongoing conflict over distribution.

CONCLUSION

- There is a tussle between the pessimists (who say this time is different and machines really will take all the jobs), and the optimists (who insist that in the end technology always creates more jobs than it destroys).
- The truth probably lies somewhere in between. AI will not cause mass unemployment, but it will speed up the existing trend of computer-related automation, disrupting labour markets just as technological change has done before, and requiring workers to learn new skills more quickly than in the past.

- Change always provides new opportunities and the automation will be no different. While this is true, change is not always without its winners and losers.
- This distinction between winners and losers can be narrowed down if companies and governments make it easier for workers to acquire new skills and switch jobs as needed.
- This would provide the best defence in the event that the pessimists are right and the impact of artificial intelligence proves to be more rapid and more dramatic than the optimists expect.



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