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Automation could lead towards a socio-economic crisis

My Statement Paper, in the context of the Master Thesis

"Autonomous Mobile Robot Navigation, using the iRobot Roomba"

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The Path towards an autonomous World

https://theautonomousworld.wordpress.com/

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Academic year 2014-2015

Work saves us from three great evils: boredom, vice and need.

Voltaire, Candide, 1759

Foreword

In this foreword, we would like to inform the reader how our statement and its pro and con arguments are build up and how it should be interpreted.

On the basis of our analysis, we do not question if there will be *a socio-economic crisis, due to automation* all credible evidence points in that direction. What we see as more relevant is to assess whether there are credible ways to mitigate the impact of such crisis.

In the *Introduction*, we set the scope of the problems. In *This time, it is different*, we come with clear examples why there will be an economic crises. In *Solutions*, we come up with changes that are definitely needed in our current society to limit the impact of this crisis. In the *Conclusion* we sum up the problems and solutions and analyse if mankind can overcome this fate. We end the paper with our *Personal Opinion*.

Introduction

At the beginning of humanity everyone had to gather food to survive. We soon started to create tools, or "mechanical muscles", to help us become more productive. During the industrial revolution, the "mechanical tools" took a gigantic leap forward. With steam and electrical engines, mankind's productivity increased exponentially. Look at agriculture; it is not that long ago that a large share of the population in Europe or North America was employed in this sector. Nowadays, only two to three percent of the population are still employed in this sector, but they produce abundant food for the whole population. (Grey, 2014)

Mechanical muscles made it possible for us to specialise. This is how we achieved developed economies and increased our standards of living. At the outset of the industrial revolution, automation brought a very important question: will people lose their jobs and livelihood because of automation? While this was the immediate impact of some machines in the textile, agricultural and mining industries, over time, the economy created new job opportunities in other sectors, which gave rise to a massive surge in productivity and the development of a service economy. So far, the fear of "technological unemployment" proved wrong. The main reason was that technology and increased welfare generated more jobs than it destroyed. Let us focus on this simple formula: As long as $job\ creation > job\ destruction$, our economy based on an assumption of full employment continues to work. (Brynjolfsson & McAfee, 2014)

But does this paradigm still holds? With the onset of the information technology, the speed of innovation accelerated significantly. The change did not only impact production processes, but is changing every part of our daily live. These changes require people to widen their skillset if they want to be part of this quickly moving society.

We can now look back at 30 years of IT developments. So far, the $job\ creation > job\ destruction$ formula has held up. With the development of automated processes, we are now able to create abundance at a small price. Of course, innovation has brought a whole new variety of jobs that couldn't have existed without new technologies: think about web-designers, electrical engineers or even technicians for robots! Because of those jobs, modern (technological) countries have maintained high levels of employment. Why should it be any different now? (BBC Radio 4, 2015)

Over the last few years, robots began to develop new skills they didn't have before; those are mainly cognitive skills like: understanding, seeing, writing, talking, hearing, and answering. These robots are not like the previous generation that was involved in mass production, that required highly skilled

labour to operate them and cost millions of dollars, but are blind to the outside world. Those were "specialised robots" programmed and capable to do only one thing. This new generation of robots however are "general purpose robots".

So what do we see? With increasing cognitive skills, robots increase their capacity to take over human tasks. As they start learning themselves to improve their performance and as their production cost comes down, they are more and more becoming competitors to humans to carry out not only physical but also intellectually complex tasks. This is where our $job\ creation > job\ destruction$ formula is getting in danger.

Could this lead towards a social-economic crisis? Are we now approaching the age of technological unemployment? In the developed countries, the more modest increases in GDP over the last years are not sufficient to solve the unemployment problem. Even in countries like the US where employment rates have improved, this is only due to high levels of low skilled temporary jobs. Technology based countries try to react by pushing for a knowledge based economy, but looking at the high levels of unemployment there is no solution in sight. Is this the beginning of an economic system that grows by destroying instead of creating jobs?

This time, it is different

First, an economic problem

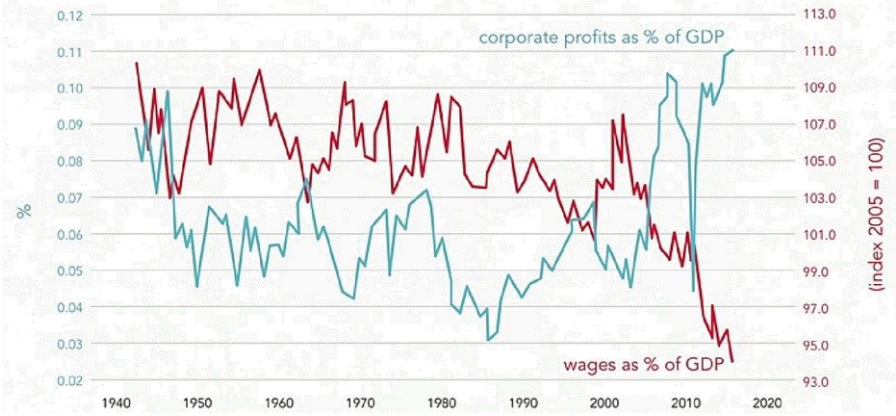

Figure 1: Returns to capital and labour in the U.S. (U.S. Bureau of Economic Analysis, 2015)

Over the last 30 years, we have seen in the US a trend whereby corporate profits are moving to an all-time high and total wages paid in the economy are at an all-time low as a share of GDP.

If a business wants to sell huge volumes of expensive goods, it also needs a prosperous middle class to buy them. But this class is getting under a huge economic threat! The mean income, since the start of automation, hasn't ceased to drop! How are we going to sell cars to people who were replaced by robots? (McAfee, 2013)

Let us turn to some concrete examples to illustrate the risk of job-losses we are facing.

Innovation is further accelerating job-losses: self-driving cars, medicine, law and androids

Figure 2: One of the self-driving car designed by Google (Poort, 2013)

Figure 3: IBM's super computer "Watson" (Apple Magazine, 2015)

Figure 4: Baxter can be "programmed by everyone" (Guizzo & Ackerman, 2012)

Self-driving cars (SDC's) are not a mere futuristic vision; they have now driven over a million km without accidents (Urmson, 2014). The only question is how quickly society will accept them in everyday life. Even if SDC's aren't flawless, they only need to be better than humans and that doesn't look too difficult, if we take into account that SDC's will never text while driving, get sleepy or drive under influence.

Extrapolating from US data, we can evaluate that 100 million people work in transportation. All those jobs will be taking over by SDC's. This is simple economics because at the moment, human salaries represent a third of the operating costs of a transportation company. SDC will save money, lives, and reduce pollution at the cost of the livelihood of many. (Grey, 2014)

We could try to save those 100 million jobs by educating the people who were in the transportation business before, so that they can access higher skilled jobs! But even if we solve the problem of pushing 100 million people into higher education, white collar work is no safe heaven either. (BBC Radio 4, 2015)

Pattern recognition is an important part of a doctor's job: from the symptoms described by the patient, the doctor has to perform a correct diagnostic. This requires a lot of practice. Sometimes, symptoms are not interpreted in the right way and doctors omit a (lifesaving) diagnostic. We have now such advanced computers (IBM, 2015), that this job of pattern recognition / diagnostic coming from a computer is often better then doctors. So, a part of the doctor's job is in danger. (BBC Radio 4, 2015)

A few words about eDiscovery, the lawyer robot

The bulk of lawyering is called “discovery”: the exchange and interpretation of all the documents send by the opposing parties. From this, a whole team of junior lawyers has to summarise and to find the clues to build their case before the judge. This job is also better performed by software, because it is faster, better and more accurate (a computer can compare more data and doesn’t fall asleep while reading). Here, a third of the jobs in a law firm could potentially be replaced by robots. (BBC Radio 4, 2015)

The coming era of the General Purpose Robots

Baxter is a humanoid-robot (android, human-looking robot), has vision and can learn by watching a human performing a task. The fact that he can learn, distinguishes him from the previous generation of robots. Baxter can be used in a large variety of situations, adapts to its environment and can easily be programmed by everyone, by showing him what to do: no software engineer is needed for this (Guizzo & Ackerman, 2012)! Even if Baxter isn’t really performing well so far, its electricity bill is still far less than a human’s salary: he manages a tenth of the performance speed of a human for a hundredth of the price (Grey, 2014)! Androids (humanoid robots) are thus trying to perform our tasks. They are very primitive now but are evolving very fast. We can imagine that once perfected, they will take over a lot of our jobs.

The outcome

The above are just a number of examples to illustrate that, both blue and white collar jobs are under pressure. In the near future, we will see a lot of technology, but less and less jobs for us. Automation will have a huge impact on production and service employment and an easy solution is not in sight to keep people employed, because automation is even impacting higher educational jobs. Our $job\ creation > job\ destruction$ formula is under severe threat.

What will we do with those millions of people with zero economic value, due to no fault of their own? This will definitely lead towards a social-economic crisis. We have to look at ways to mitigate the impact of job losses from automation.

Solutions

As both cognitive and manual labour is no longer guaranteed to provide jobs for everyone, solutions have to be designed to tackle the problems explained earlier. To limit the impact of the problems, maybe we have to find the true reasons why we work. Do we really need jobs and what is the function of jobs in society! Currently income and employment are heavily bonded, if you work you have an income and if you don’t, your income will be a lot lower or in some countries reduced to zero. People currently work to make money, to do activities and buy stuff they like to spend the money on, maybe this idea should be obsolete. Working also provides us with a status in society; we get out of bed, and interact with others on the job. So what can be done? (BBC Radio 4, 2015)

Education… A short term solution that is also too simplistic would be to improve our educational system. Invest in people so they find jobs that are less likely to disappear in the near future and invest in the training of the workers so they can get better jobs (Michael S. Malone, 2014). But this solution only works for a while as there aren't enough jobs for everyone to get a higher job in the company's structure and these improvements in education and the work force wouldn't be able to keep up with the dramatic improvements made in robotics. For a longer term solution we maybe need to rethink society, economy and the definition of a job.

Evolve to "trans-humans"….Another way forward to cope with automation is to use it in our favour, even if robotics progress rapidly in the next 50 years, there still will be things at which humans will be better, first of all humans are better at communicating, a big part of being a doctor or lawyer is being able to communicate to your patients, this is something humans are sure to be better at in the years to come. (Guterman, 2012) Imagine a doctor having Watson at his disposal, this would be a very successful combination. Humans will also stay better at adapting to new situations; a lot of the jobs nowadays still require a high level of adaptability. By further integrating technology into our way of working, and potentially our way of being, we can significantly enhance our productivity.

Minimum income for all… Longer term solutions will always require a way to keep the economy healthy, as stated above this requires a stable middle class which is currently endangered (Heather Boushey, 2012). One of the solutions would be to provide a minimum income for those who don't have jobs so they still have the ability to not only keep themselves healthy but also the economy. If automation indeed delivers much higher productivity, this gain should be shared to ensure a valuable life for all. (Brynjolfsson & McAfee, 2014)

Re-assess "wider community" jobs… Currently people get a salary by creating economic value; it could be a good idea if people got a salary by not only creating economic value but also for creating societal and environmental value. For example, a lot of the volunteering work done today is very useful for our society but is not rewarded, as more people don't have a traditional job, people could spend time doing this new kind of job where value is created and they get rewarded by a wage. This kind of solution could be part of a society where people aren't working to improve the economy and thus get a salary, but where people work on a more healthy society.

It seems to be that with the incoming changes due to robotics our society should shift towards a more social driven and maybe greener society, this could mean the function of economy in society should be rediscovered to match the needs of the society in the future. In our classical capitalistic economy, it provides abundance and is supposed to grow and become more and more profitable, maybe the economy should be more focussed on providing innovation and improve society (Brynjolfsson & McAfee, 2014). It is important to note that this doesn't mean a robotic revolution should be stopped, but the function of jobs should be redesigned. This is a discussion that is not only economical but also rather philosophical.

Conclusion

Drastic changes in our current society are bound to happen due to ever increasing automation. The signs of problematic situations are beginning to show. To mitigate its impact, we will need to make structural changes in our way of living. It can be a painful process, but if this isn't addressed soon, a major social-economic crisis is inevitable. But still, as Voltaire stated in Candide*, work is needed to save us from boredom, vice and need*.

Some solutions are developing. We need more education, potentially a guaranteed income for all. Maybe we need to embrace more actively automation to improve our own productivity with increasingly sophisticated human “enhancement”. The definition of work should not remain fixed to getting money from a traditional job. People could work more on “societal projects”. This will permit us to broader our view and create “new types of work” that we can evolve to a new type of society.

Personal Opinion

We think there are big challenges ahead of us and hope that society will be able to react quick enough to these incoming problems. When capitalism will have to shift towards a more social society, there will be major opponents to this change, it will be important for all parties to keep in mind the greater good of the overall society. Another problem we think might be dangerous is that there will be a small part of the population that would own these robotic companies and create their own private game of “Capitalistic Monopoly”. In a new society where people invest their time in the greater good, we cannot allow this to happen in an extreme manner.

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