THE NEXT REVOLUTION

Every so often, a new idea comes about that changes the world. The plow allowed early humans to change from a hunter gatherer society into stable, city based empires. The printing press gave literacy to the masses. The steam engine revolutionized manufacturing and transportation. The telegraph enabled instantaneous communication over extreme distance.

And now the computer is putting them all to shame. I DUNNO ABOUT THIS LINE, KINDA STUPID IN MY OPINION. SORT OF END UP CONTRADICTING IT MYSELF LATER ON

It has been barely half a century since the first modern computer, ENIAC, was completed. In that time, computers have drastically changed how people communicate, how scientists do research, how businesses plan, and how people get their entertainment. There is hardly a single job in the world anymore that does not depend in some fashion on computers.

Much of what has been done with computers to date involves automating extremely repetitive tasks. One of ENIAC's functions was to calculate ballistic trajectories, which involved many tedious calculations that were trivial for a computer but boring and difficult for any human. Similarly, word processors help cut down on time spent formatting. Where one used to have to reprint an entire document if they did not like how it looked using a typewriter, in seconds a computer can recalculate the formatting of a page to let the user instantly prototype different document layouts.

STUFF ABOUT THE INDUSTRIAL REVOLUTION, HOW IT IS PROBABLY THE MOST SIGNIFICANT AND WELL DOCUMENTED HISTORICAL UPHEAVAL DUE TO TECHNOLOGY. BEFORE/AFTER SNAPSHOT? DISCUSS CAUSES AND EFFECTS, AND THE WHOLE TRANSITIONAL PERIOD IN CONTEXT OF HOW AVERAGE PEOPLE WERE AFFECTED BY INDIVIDUAL TECHNOLOGIES AND TECHNIQUES.

The fundamental reason that computers have so far not made as dramatic an impact on humans as the steam engine is fairly basic. Steam engines could do things humans could already do, but they could do them faster, cheaper, and on a larger scale. In the case of computers, they can do things humans could never dream of, but many easy tasks for humans are near impossible for even the most powerful of computers.

However, computers are becoming smarter and smarter. Smart enough to begin replacing humans in a number of areas. In manufacturing, a new paradigm has come out termed “lights out manufacturing”, the idea being that robots don’t need the lights on in order to do their jobs. In farming, a number of different groups are experimenting with fully automated farms. Driverless cars could soon roam the streets. Personal assistants are now an integral part of smartphones for many. Warehousing continues to become more and more efficient thanks to robots doing the work of people. And this is just the tip of the iceberg of what is happening today. MENTION 3D PRINTING AND CONSTRUCTION? NOTHING TO DO WITH BETTER COMPUTERS OR ALGORITHMS, JUST BETTER HARDWARE BUT STILL AUTOMATION SO MAYBE RELEVANT (Other ideas: fast food, drone delivery, construction)

Lights out manufacturing is not so much a technology as it is a methodology. Similar to assembly lines, there are many different ways of doing lights out manufacturing, but the end result is the same. Greatly reduced assembly time, reduced cost, and increased uniformity. The whole goal is to get humans completely out of the manufacturing process, so that factories can run twenty four hours a day, seven days a week.

Many factories are capable of this sort of assembly to some degree even today, but they typically still require a person to load the raw materials into the machines and to remove the finished product for shipment, as well as someone to monitor the factory to make sure everything is running properly. In addition, there are usually a number of miscellaneous tasks to take care of, such as everyday maintenance and cleaning. However, a factory in the capital of robotics, Japan, has overcome many of these difficulties.

FANUC produces industrial scale electronics, particularly robots for assembly lines. Given their expertise in the area of automation, they decided to move one of their factories towards the lights out manufacturing method. The factory assembles full robotic arms. What is extremely impressive is that the factory doesn’t need any human intervention for weeks at a time. It works nonstop, producing 50 of the robots everyday, and can run unsupervised for up to a month. It only stops in order to let the finished robots get shipped out. HOW DOES IT WORK? ALSO MORE STATISTICS (IE WHAT DOES THE GROWTH OF ROBOTICS IN MANUFACTURING LOOK LIKE?)

SECTION ABOUT FARMING

<https://www.google.com/patents/US5651500>

<http://www.sciencedirect.com/science/article/pii/000326709280212P>

<http://link.springer.com/article/10.1007/s11370-010-0075-2>

<https://www.researchgate.net/profile/Gil_Katz/publication/284150372_Current_and_near_term_technologies_for_automated_recording_of_animal_data_for_precision_dairy_farming/links/566920ce08ae9da364ba0388.pdf>

Perhaps the most disruptive of any upcoming technologies are driverless vehicles. There are over a billion cars worldwide, which means that any innovation in their design will affect a huge number of people. And a large number of people make their livelihood driving. Taxis drivers, truck drivers, and delivery drivers all make their living by transporting goods and people. Millions in the United States alone are employed in jobs that involve driving.

Some people estimate that cars will be able to drive themselves as early as 2018. However, humans will probably still have to be behind the wheel in case of emergencies. It will probably take a while for them to mature enough that the cars will be able to operate completely unsupervised. It will take a little longer after that for fleets to be replaced with newer self driving cars, because replacing vehicles is expensive.

Nonetheless, they are coming. The progress made in recent years has been extremely rapid. Further, once driverless cars become as good as people, economic incentives will push both individuals and companies to adopt driverless cars. Because cars don’t need to sleep, eat, or stop for rest, they can make deliveries faster than people. And since they don’t need to be paid, they can operate cheaper than people.

Additionally, when they get safer than people, insurance companies will probably pressure their customers to move to driverless vehicles or else pay a premium. Not to mention the convenience for the average driver of not needing to pay attention while in transit could allow people to be more efficient with their time.

SECTION ABOUT PERSONAL ASSISTANTS

Siri, Google Now, Cortana, Alexa

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.706.5567&rep=rep1&type=pdf>

<http://aisel.aisnet.org/icis2014/proceedings/HumanBehavior/52/>

SECTION ABOUT WAREHOUSING

<http://link.springer.com/article/10.1007/s00170-013-5016-8>

<http://www.sciencedirect.com/science/article/pii/S0959652616312379>

<http://ieeexplore.ieee.org/abstract/document/7557755/?reload=true>

<http://www.scientific.net/AMR.859.426>

<http://ieeexplore.ieee.org/document/6301786/?arnumber=6301786>

<http://ieeexplore.ieee.org/document/6301787/?arnumber=6301787>

<http://content.iospress.com/articles/international-journal-of-rf-technologies/rft046>

Amazon robots

<http://ieeexplore.ieee.org/abstract/document/7557755/?reload=true>

BIG SECTION ABOUT IMPACTS OF EACH OF THESE

LOOKING FORWARD

BUT THE GOOD NEWS?

WHAT WE CAN DO

CONCLUSION

Hook, introduction, topic

Sean Russell Outline for The Next Revolution

Length - Approx 8 pages

Basic structure:

Intro:

1. Hook - Robots will take everyone’s jobs (including yours) and there is nothing you can do about it
2. Introduction to topic, overview of sections

Past:

1. Discuss major revolutions in the past (ie industrial revolution, digital revolution)
2. Talk about impacts of new technologies in those revolutions (steam engines, computers, etc. ALSO BARCODES)
3. What were the results? What happened to which groups of people? Mass migrations, the rise and fall of different cultural and ethnic groups, winners and losers, how it shaped the world today

Present:

1. Current technologies
   1. New manufacturing techniques (3d printing, lights out manufacturing)
   2. New hardware (robots, cheap sensors, batteries, and screens, VR and potential acceleration from this)
   3. New software (driverless cars, personal assistants)
2. Where these technologies might be applied, industries they might affect
3. Relating to the past

Future:

1. How this might impact jobs
   1. Projections and theories from the economists
   2. Employment data
2. Who will win? Who loses?
3. What might be done to maximise benefits to winners and minimize damage to losers

Conclusion:

1. Return to the past, reminder of impacts of previous technological revolutions
2. Connections to people should be obvious, but reiterate anyways how automation will impact everyone whether or not it takes their job

Ideas:

IBM watson diagnoses ills

Who will be affected?

* Near future
  + Taxis, delivery, and truck drivers
  + Repetitive tasks
  + Factory jobs
    - Have slightly recovered since the recession, but are still very low over last two decades
* Far future
  + Non unique tasks

Computers are becoming better at fuzzy logic

The Next Revolution

By Sean Russell

Welcome to the Information Age! For those of you just joining us, the invention of computers has revolutionized the way the world operates, influencing everything from the way the biggest corporation plots to increase their market share to the entertainment of a newborn child.

However, computers are just getting started. We are still in the Information Age Part One. But Part Two is coming upon us swiftly. What is the Information Age Part Two? What will happen then?

To answer this question, it helps to understand what computers are and what they are capable of. In short, a computer is nothing more than a really good calculator. Almost everything a computer does is adding, subtracting, and multiplying numbers at blistering speeds. Because of this, computers excel in the concrete and logical world of mathematics. They can do repetitive and uncreative tasks much faster than a human could ever dream.

Thus to date computers have mostly been a supplement to humanity, working in areas that humans were never particularly good at or interested in being involved in. They worked alongside us, from word processors helping authors quickly revise, edit, and share their writings to structural modeling software that lets architects tell how strong a building will be before the foundation is even lain.

Now however, computers are becoming better at fuzzy logic. While computers of the Information Age Part One were only any use in an abstract world of certainty, the computers of Part Two can function in the real world, in an existence where very little is known for sure. Fuzzy logic lets computers do marvelous things. For instance, some of you might have noticed that your phone can now understand your voice and act as a personal assistant. This is only possible because of fuzzy logic.

This growth in the capabilities of software comes from a number of places in the computer world. Better machine learning and statistical modeling allows computers to think and make decisions in a more flexible manner than before. Advances in artificial intelligence from both large companies and governments looking to capitalize on the potential of smart computers help push the field even further.

For most people, this will be a minor convenience, and many of the benefits will go unnoticed as the world seamlessly incorporates new technologies. But computers with the ability to think in a way similar to humans will disrupt many lives in massive ways. New fuzzy logic systems will be able to do tasks once thought dependent on human creativity.

Already some of the impacts are being seen. According to a study by the Center for Business and Economic Research at Ball State University, 85% of manufacturing jobs are lost to automation in the United States, as opposed to the remaining 15% lost to outsourcing. New robots, such as IBM’s Watson, can make diagnoses even doctors cannot. And new technologies, such as self driving cars, could put millions out of work.

The Past

Much of what is happening today has already happened in the past. The current automation revolution shares many similarities with the industrial revolution of the eighteenth and nineteenth centuries.

The industrial revolution started because the citizens Great Britain wanted access to cheaper textiles. Up until the 1700s, merchants had to get most of their nice fabric imported because labor was cheaper and laborers were more skilled elsewhere. However, since Great Britain had colonies everywhere, raw material was not an issue.

Inventions such as the Spinning Jenny, a way to mechanically spin yarn, led Britain to become a major manufacturer. Additionally, Britain happened to have a large supply of easy to access coal. Coal fueled the new steam engines, which in turn could be used to power inventions such as the Spinning Jenny. Prior to the steam engine, factories would have to be build on waterways, using waterwheels to mechanize production.

In addition, the steam engine powered the newest form of transportation, the railroad. Railroads allowed raw materials and finished products to be transported to where they were needed at a fraction of the price. All of these technologies led to the rise of Britain as a leading world power. These successes in turn led other colonial powers with access to raw materials to adopt the technologies of the industrial revolution.

Few people were unaffected by the industrial revolution. Before the revolution, most economies were based off of the strength of farmers. However, factory workers became the staple job on which powerful societies were built. Monarchies fell in the huge number of revolutions that swept the time period, from the French Revolution to the rise of Communism. For most, the effects were positive. The end of slave-like serfdom and the rise of democracy meant more individual freedoms for even the poorest of people. Technological upheaval and new manufacturing processes gave access to wealth once only available in the dreams of emperors.

Much of what happened in the industrial revolution is already happening with automation revolution. Automation is changing how the world's economies operate on a fundamental level. Instead of building economic power on factories, the powerful countries of the 21st century build economic power on ideas. Technological advancement is happening even faster than during the industrial revolution. Old power structures are being destabilized, as can be seen with the Arab Spring.

Of course, not everything will be the same. The industrial revolution supplemented workers abilities with those of machines, increasing productivity of individuals. However, automation seeks to replace workers entirely, which could have unprecedented effects on the world as we know it.

The Present

One of the major trends in modern manufacturing is known as “lights out manufacturing”. The basic idea is that manufacturers seek to completely replace all workers in factories with robots, so that factories become a black box where raw materials go in and finished products come out. There are a number of advantages to automated factories. Robots don’t need to sleep, eat, or take breaks of any kind, so an automated factory could run 24/7, increasing output. Factories could be built in smaller spaces when space doesn’t need to be allocated for people. Since robots can work in the dark, factories also wouldn’t have to pay for lighting, giving lights out manufacturing its name.

In the United States, 12 million people are employed in manufacturing. Even though this number has been shrinking for decades, this still represents about one tenth of the workforce. These jobs are all at risk. This is especially problematic because it is difficult to retrain so many people for new jobs after they have lost their old jobs.

This problem is not limited to the United States. Foxconn, a supplier to numerous large tech companies such as Apple and Samsung located in China, recently replaced 60,000 jobs with robots. This is approximately half of all people employed by Foxconn. Manufacturing employment has been on the decline in both the developed world and developing nations for years now.

For many developing nations, the way to become a first world nation has been through manufacturing. This may no longer be viable, as developed nations no longer have any reason to offshore production. And for many unskilled workers, manufacturing is an essential and irreplaceable part of their livelihood.

The good news is that replacement of manufacturing jobs is relatively slow. All the easy to automate tasks have for the most part already been automated, and replacing existing infrastructure is expensive. However, driverless cars may not take as long to adopt.

Not even ten years ago, driverless cars were thought to be a technology from the far future, something most people would never see in their lifetime. However, dramatic increases in the capabilities of machine vision and decision making, in addition to cheap and fast computers, has allowed car manufacturers to create driverless cars much faster than most have anticipated.

Most big name car companies are looking to be the first provider of driverless cars. Mercedes-Benz, General Motors, Nissan, Toyota, Audi, Hyundai, Volvo, and Tesla all have prototypes. In addition tech companies like Google and Apple are investing in the technology. Drive sharing companies like Uber are showing great interest in fielding fleets of driverless cars.

Quite a few people drive for a living. 2 million people in the USA work as truck drivers, with close to a million more working as taxi drivers or delivery services. Driverless cars could completely destroy all of these jobs within a decade.

The advantages in favor of driverless cars are overwhelming. Services that involve driving would be much cheaper without having to pay the wages of the driver. Transportation would be faster, given that driverless trucks would only need to stop to refuel. Driverless cars are also likely to be much safer than human drivers. A car can have a 360 degree field of view, meaning no blind spots anywhere. The reaction times would be much superior to those of humans. And with improved safety comes improved insurance rates. Already, some features of driverless cars are available in consumer vehicles, such as automatic braking when an obstacle is detected.

Many experts think that driverless cars will be available as soon as 2020. However, the first generations will probably still need a driver behind the wheel in case of emergencies where the car doesn’t know how to handle a situation. Also, adoption will be somewhat slowed by the fact that a car that can drive itself is somewhat uncanny to the average person. In addition, cars are expensive, so no matter how nice the new technology is it will still take a while for the old to be replaced by the new.

Even so, they will come faster than many people expect, and we must be prepared for the fallout.

Driverless cars and lights out manufacturing hit unskilled laborers the hardest, but those aren’t the only jobs at stake. IBM’s Watson had a rather innocuous start as a novelty on the show Jeopardy, but quickly proved its worth by reliably beating reigning Jeopardy champions. However, its ambitions are far greater than that. Watson’s next move is to become a leading doctor.

Engineers have been teaching Watson to diagnose tumors. They have been feeding it 600,000 pieces of medical evidence, more than 2 million pages from medical journals, and have given it the further ability to search through millions of patient records. This body of knowledge far outstrips anything even the best of doctors can hope to read.

While those numbers are impressive, it means nothing if Watson cannot perform. Already, though, it has saved a life. A woman in Japan had a rare form of leukemia that had eluded doctors for months. They turned to Watson to see if it had any insights. By analyzing genetic information, it prescribed a diagnosis that saved the patient's life. This is just the first of many medical miracles Watson is sure to create in the future.

So far, Watson only works at diagnosing cancer, but it has demonstrated it is useful. In the future, it could be expanded to include information from any number of medical fields to become a general purpose doctor with a wider body of knowledge than any alive today.

Are medical jobs at risk? Not just yet. Doctors will need to verify Watsons results to make sure that errors in the programming do not take any lives due to incorrect diagnoses. In addition, there is much more to being a doctor than just diagnosing illness. But as Watson improves, it could start being relied on more and more to make lifesaving decisions. There are about a million doctors in the United States, and while most would likely keep their jobs, becoming a doctor requires a huge amount of schooling. It would take quite a monumental effort to retrain all of these already highly specialized individuals.

Not to mention the fact that engineers are already exploring other applications of Watson. The computer has been applied in areas as wide ranging as weather forecasting, generating recipes, analyzing water usage, suggesting music, and development planning for the third world to name a few. It is difficult to say what of the applications will stick, and whether Watson will be the primary expert system of the future or some competitor, but many jobs thought to be safe from automation might not be as safe as people previously thought.

There are a number of other inventions that could replace jobs that haven’t been mentioned. Some of the notable ones are personal assistants, like Siri, Cortana, and Alexa which could replace the jobs of secretaries. Amazon has done a lot of work on automating their warehousing, with little robot that roam the floors to move products more efficiently than humans can. Amazon also has a new idea for a store that requires no cashiers called Amazon Go. And search engines, like Google, have been getting better and better, to the point where almost all information is more easily access through the internet than from books in libraries.

All told, between the technologies discussed above, 20 million jobs in the United States are at risk, or over one in ten. However, the real picture is of course more complicated than that. There are a whole lot of new techs coming out every year with unimaginable application. Many, such as virtual reality, were not discussed because their impacts are not immediately obvious, but could result in more disruption than anything else. Perhaps driverless cars will also impact the insurance industry, where claims would go down because fewer people are getting in accidents. Since the economy is so unpredictable, the effects of automation could be much worse than just a loss of 20 million jobs.

On the other hand, the new technologies introduced might create new job opportunities completely unavailable before. Teaching an artificial intelligence like Watson to do more jobs might be a viable career in the future. Also, the average person benefits from reduced prices of goods across the board, and cheaper medical advice could become a lifesaver to people who could not previously afford a medical professional.

What will happen in the political sphere of the world is somewhat more difficult to predict. During the industrial revolution, populist movements gained a lot of traction and power that previously was only available to nobility. Established power structures were destroyed in both nonviolent protest and bloody revolution. There are certainly echoes of these sorts of events already beginning to form, in the rise of conservatism around the world today. Whether the rise of nationalist parties is just a normal part of modern life or indicative of a greater shift in power remains to be seen.

The future

What of the future of humanity? Automation brings a whole mess of questions along with it, including what does it mean to be human, what rights do people have, and where does humanity belong.

The transition to an automated society could be messy. As in the industrial revolution, the average citizen will likely be better off after automation, but we have to think about what happens to all of those left behind.

One solution to care for people out of a job is to turn to the government. Some advocate a universal basic income for citizens of a country, where a government gives every person some baseline salary just for being alive. Alternatively, beefier government programs for taking care of and retraining those who are unemployed could help smooth the transition.

Alternatively, the free market might take care of the problem with no intervention. Market pressures could force employees to be better at adapting to changing demands, and the benefits of automation could ease the pressures of unemployment.

There are also concerns regarding the further future as well. Firstly, what are the limits of automation? It is hard to say what tasks can be automated and what tasks can’t. Perhaps everything that people can do, machines can do better. Or maybe there are some tasks that are only possible for people and that can never be replicated. Maybe the likes of art and science will only be attainable by humans. However, there is no certainty in this, so perhaps as a species we should brace for the day when we become completely redundant.

So, secondly, what is the place of humanity in an automated society?

Worst case scenario, we won’t have to worry about this question. Perhaps someday robots will surpass us, and seeing humanity as nothing more than spare carbon and hydrogen that could be put to better use doing something besides being human, would break down the human race for materials.

Another bad scenario involves inequalities between humans themselves. The people who own the automated factories would gain all of the wealth the factories produced, and the people who did not would have nothing to get by on. The poor would be dependent on the rich for hand outs to avoid starvation.

A third bad option is where humans become irrelevant. Perhaps the automatons do not kill everyone, but they turn out to be better than humans at every imaginable task. In this case, humans would have no role in society, and would essentially be pets for a super advanced robot society.

But perhaps there is still hope. There may be some far future where humans remain a relevant and important part of society, but where robots take care of all the less desirable jobs. World hunger and poverty would be distant history. Death and disease could be a thing of the past as well. Humanity would be free to focus on living life, creating art and exploring the universe.

Humans are too inventive and headstrong to not automate everything we can. And while automation could be the worst mistake ever made by man, it could also lead to the greatest society the world has ever known. Only time will tell.