University of Hradec Králové

Faculty of Informatics and Management

THE FUTURE OF AUTOMATION

IN A WORKPLACE

Master's Thesis

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DECLARATION

I, the undersigned, hereby declare that the project report entitled *"Future of Automation in Workplaces"* written and submitted by me to the University of Hradec Kralove, in partial Fulfillment of the requirement for the award of degree of Master of Information Management under the guidance of Ing. Karel Mls, Ph.D. is my original work and the conclusions drawn therein are based on the material collected by myself.

ACKNOWLEDGEMENT

First of all, I thank GOD. I am grateful for my parents who always supporting me and encouraging me to move forward. I thank my friends, colleagues, classmates even strangers in different companies who have generously given their time and offered their advice and also took time to answer my questions regarding this topic. If it wasn't for my supervisor's Ing. Karel Mls, Ph.D. advice and guidance, I wouldn't be able to finish it well.

ABSTRACT

ENGLISH

In this thesis, I talk about the Future of Automation in a workplace, how it has affected the labor market and the people by providing the negatives and the positives of it. We have seen the evolution of different machines and the changes the technology has made in our lives and also for organizations. In 18th century was the beginning of the mechanization of machine tools for production and during the industrial revolution which was at the end of 18th century where Watt steam engine were introduced together with the Jacquard loom, the lathe and the screw machine. The Jacquard loom idea of a programmable machine was another important development in the automation history. I realized that the more machines were created the more some jobs were lost and the new ones were created, we've seen that. Automation provided assistance in education, healthcare, army, business and in so many other sectors and we have seen so many jobs getting created due to Technology. In this paper, you will also discover the jobs that were lost, to show the negatives side of it. The Future of automation is more exciting that it is scaring, today all things involves on DATA in a work place, so many data, which needs to be protected that provided a spot for cybersecurity and other jobs mentioned in this paper. People can work remotely from anywhere, which provides flexibility. In the Future we may not need people at the information center, or offices, or cashier, but for sure they are going to be so many other jobs. For last I did a research talking to people about what they think and I also used a survey questions and from their responses I got, using charts, I concluded that 99% of people are excited about the future of automation in a workplace, for sure things will change but as human we are able to adapt to anything. What is required from us is to stay relevant, to keep on educating ourselves, as for employers, they need to offer trainings to their employees so that they can stay updated to the last trend, other than that we can't resist it, it is happening and it is clear that it is helping us in all walks of life.

CZECH

V této práci hovořím o budoucnosti automatizace na pracovišti, o tom, jak ovlivnila trh práce a lidi svými negativy a pozitivy. Viděli jsme vývoj různých strojů a změny, které technologie učinila v životech lidí a také pro organizace. V 18. století byl začátek mechanizace obráběcích strojů pro výrobu a během průmyslové revoluce, která byla na konci 18. století představena parním strojem Jamese Watta společně s Jacquardovým stavem, soustruhem a automatickým soustruhem. Myšlenka programovatelného stroje podle Jacquardova stavu byla dalším důležitým vývojem v historii automatizace. Uvědomila jsem si, že můžeme pozorovat, že čím více strojů bylo vytvořeno, tím více pracovních míst bylo ztraceno, a současně nová byla vytvořena. Automatizace poskytla pomoc ve vzdělávání, zdravotnictví, armádě, podnikání a mnoha dalších odvětvích, kde všude pozorujeme, kolik pracovních míst se vytváří díky technologii. V tomto textu také budou představena ztracená povolání, aby byla ukázána negativa automatizace. Budoucnost automatizace je více vzrušující, než strašidelná - dnes vše zahrnuje DATA na pracovišti, obrovská množství dat, která je třeba chránit, což vytváří prostor pro kybernetickou bezpečnost a pro další pracovní místa uvedená v tomto dokumentu. Lidé mohou pracovat vzdáleně odkudkoli, což poskytuje flexibilitu. V budoucnosti možná nebudeme potřebovat lidi v informačních centrech, kancelářích nebo na pokladnách, ale určitě tu bude mnoho jiných pracovních míst. Nakonec jsem provedla výzkum, kdy jsem hovořila s lidmi o tom, co dělají. Také jsem použila výzkumné otázky a z jejich odpovědí jsem, pomocí grafů, došla k závěru, že 99% je nadšeno budoucností automatizace na pracovišti - situace se jistě bude měnit, ale jako lidstvo se dokážeme přizpůsobit čemukoliv. Od nás se bude vyžadovat, abychom zůstali relevantní, abychom se neustále vzdělávali; zaměstnavatelé pak musí svým zaměstnancům nabízet školení, aby mohli zůstat aktualizováni podle posledních trendů, které kromě toho, že jim nemůžeme odolat, nám pomáhají ve všech oblastech života.

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CHAPTER 1.   INTRODUCTION

Technology has been a part of human life for so many years now, we have seen generations of different inventions come to live, the use of machines and robots started a long time ago. The work has shifted, they are a lot of new jobs related to technology, people are more online that ever, we have driverless cars, trains and many other new technologies now that I will mention later on. In this paper I will focus on how automation will change in the future, how it will affect people job, and if we all should be concerned or not. They are thousands of articles online talking on whether the automation or Artificial intelligence will have an impact on the labor market, everyone has their own opinion on how they see things. I will try to represent both sides in this paper, looking at both negative and positive sides of the future of automation in the workplace.

A decade ago, robots seemed limited, now not so much. Computers don't just win chess anymore, they are used to do much more than that, all of this is happening so fast that it starts to make people wonder and ask questions. However, a lot of economics are very skeptical on whether these robots will take over the work of people or not as that it is not the first time that people start to worry about robots or machines. They were a lot of anxiety back in the late 20's and in the 30's when machines were starting to replace some of the jobs in factories and also in farms that people were doing. In the late 1950's and early 60's when the president of the United States of America John F. Kennedy ranked automation first as job challenge, he also stated: "***burden of finding work for youths and those displaced by machines***" February 15th 1962, The New York Times, page 14. Technology displace millions of farmers, railway, telephone operators' workers, thousands of jobs have died and yet we didn't run out of work. It is easier to see that it is possible for machines to replace you. All of that happened in is just history, the question to be asked here is what will happen in the future?

1.   METHODOLOGY

The objective of this thesis is to find out if the automation will be a threat to human's jobs. I will use different articles, videos, books to get into what other people think about the future of automation in the work places, demonstrating the examples, both quantitative and qualitative research will be conducted and the concrete plans on how the machines or robots are integrating the workplace nowadays. Like a mention, technology is changing rapidly, at the point it is hard to keep up, I will use technology to get all the information needed to get to what I want to show in this paper. After collecting all the necessary points, digging deep on what is already happening in automation word, I would conduct interviews with different people, either those who work in IT area, or those who aren't very familiar with it, and those who work in automation. I will also use the survey which was already made that calculate if someone's profession will be replaced or not. After all this research then I will analyze from the interview and from the survey to describe if really, we should worry about the future of automation, the impact it will have and the kind of jobs are luckily to be replaced and the news jobs which has already been created.

CHAPTER 2.   HISTORY

Automation is a different way control system are used to operate machines, stabilization of ships, aircraft, switching in telephone networks and other application which are able to perform on its own without human's intervention. (Groover 2019, P. 1) IBM define automation as a process which is done by performing boring or unnecessary task to skim the surface. These machines are able to make decisions which provide free time to the workers. The History of Automation goes all the way back and that's what will be provided in this chapter.

2.1   EARLY DEVELOPMENT

There is first time for everything they say, so as the Automation. There is a rich historic record of what we would describe as automation or control systems that we see in 21st century. When it comes to machines, it can be a little hard to predict the first machine but if you look at where here 200 years ago. It started by giving humans a way to produce something within seconds or a specific time. The very first device was an ancient water clock of Ktesibios in Alexandria, Egypt around 250 B.C. This clock was designed to fuel and regulate an exact timekeeping machine. This clock was the best and there was none like it until the pendulum clock of the 17th century. (Groover 2019, p. 2)

We find the word automata in different forms as those who invented were trying to capture the movement of living things in machines. The first automata go back to 400 B.C. Archytas was a Greek mathematician, philosopher and strategist who designed a bird-shaped machine, it could fly using a wire and it was called the pigeon or wooden dove automation. Dancing automata began to take shape as an actual device that could do or accomplish something or any movement. (Kerrigan 2018)

The very first tools were made into stones which shows how men tried to direct their own physical strength under the control of human intelligence. A lot of years were required in other to develop a simple devices and machines like wheel, the lever and the pulley. In this case the power of human muscle could be praised. After this stage of development of machines and devices, the next step was to extend the development of powered machines that did not require the strength of human in other to work. Those machines were waterwheels, windmills which was introduced during the middle ages and East in Europe and simple steam-driven devices. 2000 years ago, the Chinese introduce trip-hammers

powered by flowing water and waterwheels. Around 1335, the mechanical clock with its own power source built in, was introduced in Europe. (Groover 2019, p. 3)

2.2   MECHANIZATION AND RATIONALIZATION

In 18th century was the beginning of the mechanization of machine tools for production and during the industrial revolution which was at the end of 18th century where Watt steam engine were introduced together with the Jacquard loom, the lathe and the screw machine. The Jacquard loom idea of a programmable machine was another important development in the automation history. (Groover 2019, p. 3).

Fig. 1 Jacquard loom [Encyclopedia Britannica, February1 1st, 2019,

[source: https://www.britannica.com/technology/automation]

"At the top of the machine is a stack of punched cards that would be fed into the loom to control the weaving pattern. This method of automatically issuing machine instructions was employed by

computers well into the 20th century." Encyclopedia Britannica, February 11st, 2019, https://www.britannica.com/technology/automation.

The introduction of Watt Steam Engine, powered engines and machines have been devised that receive their energy from steam, electricity, mechanical, nuclear sources and chemical. This machine or in other words mechanization took place of humans and animals that were doing the job before then, those machines facilitated their work and also controlled by the factory workers. Big factory replaced the old work organization, where workers who were skilled produced small quantities of various products. (Groover 2019, P. 2)

Frederick W. Taylor in the late 19th century introduced the principles of scientific management. He looked at the human body as a machine that could be rearranged so that they can increase the minimum time required to finish every task at the same time increase the productivity. Scientific management separated strictly mental work from manual work. Managers were supposed to prepare detailed instruction for the workers to follow. This way of working led to a new managerial class and a big office bureaucracy. Professor at the University of New York Wrote (Baumann 2020)

In 1913 the Ford Motor company introduced a moving assembly line which gave a severe order on production by imposing workers to keep pace with the motion of conveyor belt. The Ford assembly line became a sign of efficiency of American manufacturing, for social critics as well as for workers, but it shaped the monotony and relentless pressure of mechanized work. History editors including (Onion 2009).

2.3 AUTOMATION OF PRODUCTION

In 1947, the first automation department were established in the Ford company, charged with designing electromechanical, pneumatic parts-handling and hydraulic which increased the rate of production. In 1950 they started to operate with the very first automated engine plant. Even though the automation in that period were hard, this idea developed a great public enthusiasm for unmanned factories controlled by buttons that push themselves, which cause concerns about the prospects of mass unemployment. In the early 1950s they developed a technology of Numerical Control (NC) of machine tools. NC was the beginning of soft automation, which made it possible to be changed for every new product style. In the middle of 1950s, the Commercial NC machines for batch production started to appear. It was mainly designed for military specifications, NC equipment in that time proved too complex and for

that reason unreliable as well as prohibitively expensive, for that reason it was used only in the state-subsidized aircraft industry. NC technology permitted managers and engineers to exercise a big control over the production process. (Groover 2019, P 12)

2.4   COMPUTER-AIDED MANUFACTURING (CAM)

In 1959, the first digital computers were installed, they were designed for plan process control. The applications in these periods were the first ones and they were open-loop control systems, their use was to put together data that come from measuring devices and sensors throughout the plant. The computer was tracking the process of the technology, performed calculations and print out the operator guides the next adjustment were performed by human operators. In the 1960s they came up with what we call closed-loop feedback control systems. Servo-control valves were connected directly to the computers and they adapt automatically. In the late 1960s, Numeric Control were changed to Direct Numeric Control (DNC) of a central computer. DNC systems proved vulnerable to frequent failures due to manufacturing of the central computer and the interference of factory power cables with data transmission cable of DNC system. (Groover 2019, p. 18)

In 1970s, microprocessors were introduced, incorporated DNC system in manufacturing were replaced by Computer Numeric Control (CNC) system with distributed control, that means that every NC machine was monitored by its own microcomputer. This mixture of information technologies created a new machinist programmer who could operate CNC equipment generating and debugging NC programs, which caused the breakdown of tradition distinction between white collar and blue-collar jobs. The first Robots appeared in the early 1960s, together with NC techniques and remote control to take the human place in the place of work with numerically controlled mechanical manipulators. Robots proved that they can perform very well and very fast especially in the case where it demanded high precision or had to be done in dangerous environments. Robots provided the same approach as human level of flexibility, and with sophisticated techniques of feedback vision and reasoning capability. In 1980s, there was a slowdown in industrial applications of robots because of the increase of complexity which caused the increase in costs and insufficient reliability. (Groover 2019, P 12-15)

2.5   COMPUTER-INTEGRATED MANUFACTURING (CIM)

In 1980s an integration of automated factory and the electronic office started. In CIM there were found flexible automation such as robots, numerically controlled machines and flexible manufacturing

system. CAM systems were used to construct an integrated production system the cover the whole operations of a manufacturing firm, together with purchasing, logistics, maintenance, engineering and business operations. CIM had a connection between various organizational units of a firm and gave the easiest way to share data and computing resources, which made it possible to destroy the traditional institutional barriers between departments and build flexible functional groups to execute different tasks rapidly and efficiently. (Groover 2019, P. 18)

2.6   SOCIAL AND ECONOMIC DIMENSIONS OF AUTOMATION

There were two categories of the way automation were viewed (Lowry 2019, p. 122-126) - first were the optimists, which means they believed in technology, they imagined how machines will help people and do all the hard work by providing prosperity to humankind. The second category was the pessimists (someone who believe that the worst will happen), they were threatened by machines and they view them as instruments which will dominate people and control them. If you look at it this way then you would agree with them because automation leads to the degradation of human beings and represent the future as a very serious technological dystopia. These two categories of people viewed automation as an autonomous force deciding the way of human history. According to the article wrote by Michael R. Lowry, he states that "*Automation is a social process shaped by various social and economic forces. This process may take various directions and may have diverse consequences depending on the socioeconomic and organizational choices made during automation*."

2.7   THE PRODUCTIVITY PARADOX

Automation grow rapidly in the USA in the 1950s and 60s which also increased the productivity in big industries, however the growth decreased in 70s, in the time of computerization of the factory and the office. The connection with computerization and productivity is still a problem. (Rotman 2018).

The advantage with computer-aided manufacturing include

- the growth in production rates,
- good quality of the product,
- more ways of using materials which is efficient,
- saving time,
- reducing the hours of work,

- improved safety at work.

The disadvantages

- high cost of designing, building and maintaining computerized equipment.
- vulnerability to downtime.
- relatively low flexibility compared with humans.
- worker displacement.
- emotional stress.

All these disadvantages lead to a low productivity. Though, it can be hard to compare how was the productivity before and after the computerization, since it came with technological and organizational change which changed the whole nature of production and brought with it the most benefits and losses.

2.8   MODERN DEVELOPMENTS

During the 20th century they are a lot of significant development in different fields or department, for example like the improvements of data-storage Technology and software to write computer program, the digital computer and advances in sensor technology to say the least. All these developments have had a big impact in the progress of automation technology in different fields and workplaces.

If you still remember the computer back in the day, they were big with a small screen, with the development of integrated circuits in the 60s, made a progress toward machines that are much smaller and less costly than their antecedent at the same time able to perform calculations at much greater speeds. This method is represented today by the microprocessor, a device which is able to perform all logic and arithmetic functions of a big digital computer. There was a big improvement in storage technology, example of some storages used in that time were tapes, disks, magnetic bubble and so on.

Artificial intelligence is another field of computer science which is used by computer to program different characteristics associated with human intelligence. (Rouse 2010). These characteristics provide the ability to learn, to reason, to solve problems, to render expert diagnoses etc..... Artificial intelligence developments are supposed to give robots and other intelligent machines with the ability to communicate with humans and to agree on a very high-level instruction rather than step-step programming statements required of programmable machines today.

In most of the industries in our days, machines are the ones doing the hard jobs, assembling objects, accepting and executing the command. It is so fascinating how easily and quickly those jobs are done by those machines or robots. Today's robots must be provided with a detailed set of instructions specifying the locations of the product's components. In the next chapter, at the different machines we have now and how they are used and the effect of this developments to human together with the positive side of it.

CHAPTER 3   ADVANCEMENT OF AUTOMATION

In this chapter, different machines we have now, how they been used and the effect of this developments to human together with the positive side of it will be discussed. A lot of things are changing everyday due to technology, people's lives are easier and quicker, if you look at five years ago and now you can see a lot of differences. You will hear people say that everyone is busy in our days which is totally true. With our smart phone, which can help us to store date, remind us of meeting we have later on during the day, quick replies and so on... we have machines that can cook, wash our dishes, wash and dry our clothes, coffee machines, chairs that can-do massage, all you have to do is to sit on them... is just amazing.

They are new innovations every year like robots which are mostly used in industry for what are considered heavy jobs that will take hours and maybe days for human to do and it is proven that the use of automation has understandably accelerated in recent years. All of these in order to work it require intelligence and cognitive capabilities that few years ago were considered as impossible. It will be hard to deny that it makes our life easier than it was for our grandparents, there is also a concern about Artificial Intelligence's long term has a big impact on jobs as well as our life. We will look at the impact later on.

3.1   INDUSTRIAL AUTOMATION

(Thundera 2013), Industrial automation is defined as the use of control systems, like computer, information technology and robots. They all handle various processes and machines in an industry in the place of humans. This is the second step beyond mechanization in the scope of industrialization. The main focus of industrial automation was to increase the productivity, since these machines can work 24/7 without break, and to decrease the cost when it comes to wages and benefits that humans demand. But today the aim has changed, industrial automation is focused on the increase of the quality and flexibility in manufacture process. When it comes to how pistons are installed into the engine, it used to be done manually which provided an error of 1.5% and now done by the machines the error is 0.0001%. (Daron 2018). There has been a big impact on employment because of the machines. Computers, ATMs, telephones, online commerce etc....in the United States there are millions of manufacturing jobs which are lost. Regardless of that they have been an increase of 84% of employment in the service sector even though the wage is low. The figure below demonstrates different

machines such as PLC, PC etc. which perform different task without human intervention however they depend on human decision making.
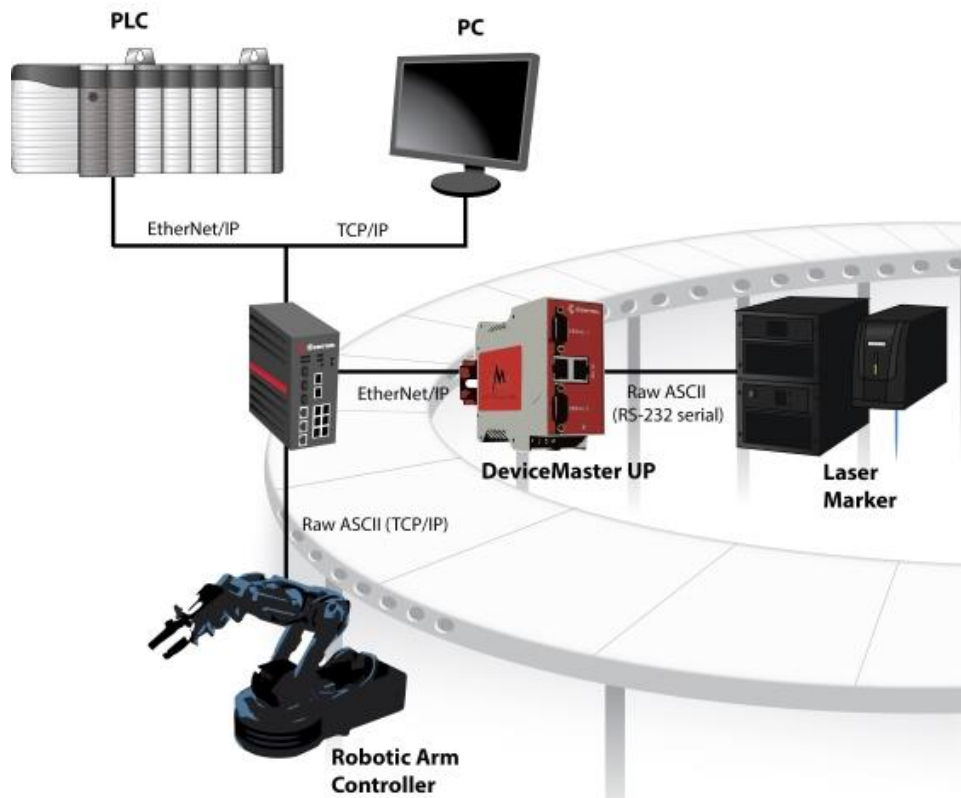
Figure. 2 Machines replacing human tasks

(source:http://peeplautomation.blogspot.com/2017/06/what-is-importance-of-industrial.html)

Now there are companies promoting different machines which they think can contribute much better to the productivity of the organization. IBM believes that the use of automation in organizations brings man and machines together to integrate different systems and work together to execute functions across an organization. Supporting more complex process that rely on unstructured data, it helps with knowledge management and decision support work requiring levels of expertise. The automation ecosystem also helps to re-imagine different ways to designs and create new ways of working. Plant Automation Technology list few Industrial Automation Companies in the world, which are found below:

Siemens is one of the best and largest engineering companies in Europe. Their activities include energy, automobile, industry and infrastructure. It is also standing for innovation, reliability and

engineering excellence. It provides laboratory diagnostics, medical imaging equipment and clinical IT. Some of the products manufactured by Siemens are:

- Turbo compressors
- Steam turbines
- High-voltage switchgear
- Switchboards
- Remote monitoring system

There are many other companies such as ABB, leading technological and automation company that provide innovating digital and they are quite popular for manufacturing robotics. Their products range include:

- Drives
- High voltage products and systems
- Medium voltage products
- Mechanical power transmission products
- Control room solutions
- Measurement and analytics

INTER-SOFT – Automation is another private company located in the Czech Republic, they design, construct and manufacture electrical control cabinets for industrial automation and 85% of their product is for customers with in European Union and Switzerland.

3.1.1 WHY INDUSTRIAL AUTOMATION?

The main reason or advantage of industrial automation is to increase the productivity, it was mentioned above. Automation of factories improves production rate by a better way of production. This helps with a very big production by extremely reducing assembly time per every product with a bigger production quality. Thus, for every given labor input it gives a large amount of output. (Clover Digital 2016) Industrial automation fulfills the target of the company by allowing the company to run a manufacturing production for 24/7 in a week and 365 days a year.

Fig. 3 Example of Industrial Automation

(source: Clover Digital. What is Industrial Automation. Retrieved from

https://cloverdigital.com.my/2016/06/15/what-is-industrial-automation-types-of-industrial-automation/

The second advantage is to give the best cost of operation. To introduce different processes in an organization with automated machines. Reduce the cycle time and the effort, in that case the need of human assistance is reduced.

The third advantage is to provide the best quality for a product. Humans can make a mistake and they are allowed to do that however the machines are very programmed at the point where mistakes cannot be made, robots do not get tired or do not need a coffee break or to get a cigarette. This give a company a good quality of products manufactured at different times. So, in this case the human involvement is decreased day by day.

The fourth advantage is the need for manual checking of different process parameters are reduced. Organizations should take the advantage of automation technologies.

The fifth advantage is the safety; safety is the most important thing for employees because let's be honest no one can be able to work if there aren't feeling well. This costs companies a lot, the need to find the insurance for employees especially those working with machines. With automation, the level

of safety is high to employees. Industrial robots and devices are executed in a very high-risk environment.

3.1.2   HIERARCHY OF AN INDUSTRIAL AUTOMATION SYSTEM

Big number of machines working together with automation technology can be a very complex for the nature. The figure 4 shows the hierarchical arrangement of automation system divided into different levels of hierarchy found in Sincrologic article.
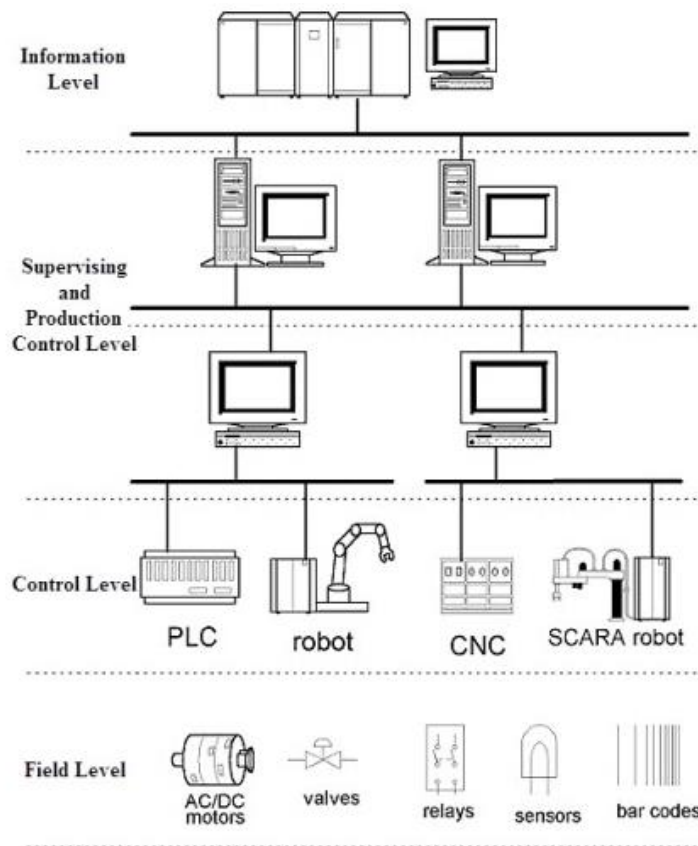

Figure. 4 Hierarchy of an industrial automation system

[source: Sincrologic. Industrial Automation. Retrieved from https://www.sincrologic.com/industrial-automation/]

INFORMATION LEVEL

The level on the top of the industrial automation hierarchy is information level which is also call enterprise level. Its role is to manage the whole system, making sure all is going smoothly. Some of

its function include planning, market and customer analysis or sales, so it focuses more on dealing with commercial activities and less with technical aspects.

Industrial communication network is important in industrial automation which send information from first level to the second one and it continues like that. These can be found in all the levels to give a repeated flow of information, though, sometimes the communication network cannot be the same to one level to another.

SUPERVISING AND PRODUCTION CONTROL LEVEL

This level shows automatic devices and monitoring system which makes it easy to control and step in as Human Machine Interface (HMI), making sure different parameters and working very well, production targets, and historical archiving and so on.

CONTROL LEVEL

In this level, we can see different devices such as PLCs which is mostly used to robust industrial controllers which can send automatic control function depending on what they put in from sensors. It has different modules which also allows the operator to program a control strategy to execute a particular automatic operation on process. These devices along with others need to process parameters from different sensors. The automatic controllers take the device to operate based on the processed sensor and program.

FIELD LEVEL

This level is the last and the lowest of them all, it includes sensors and actuators. The important work for these field devices is to send the data of processes and machines to the following level, high level for monitoring and analyzing. The second include the how process parameter through actuators are controlled. Sensors change the actual time parameter such us pressure, flow, level into electrical signals and then late on they send data to the controller. We have thermocouple, flow meters are so of the sensors which are included.

3.1.3   TYPES OF INDUSTRIAL AUTOMATION SYSTEMS

- Hard automation is a machine which repeat different operations so that it can obtain a high production. Its main use is to automate the fixed sequence putting together or executing an

operation. Once all of this is done, it is hard to change how the product is designed. This machine is not flexible in providing a different product however, it increases the efficiency with a very high production rate and it decreases the cost.

- Programmable automation, this is the opposite of a hard automation, because it can be changed with the modification of control program in the automated equipment. This automation is best fit for all the product produced at once and lead to where product volume is medium to high. The only difficulties here is because it can be hard to be changed and reconfigure the system for a new product. That is why a long setup is required for a new product. Example of programmable machines are paper mills, industrial robots and steel rolling mills to name the least.

- Soft automation provides the automatic control equipment. This equipment provides a very good flexibility for changes to be done in product design. These changes can be done fast depending on which commands the are given by human operators in a form of codes. With this automation thee manufacturers can produce a lot of products with a different range as a combination process rather than separate. Examples are automatic guided vehicles, multipurpose Computer Numerical Control (CNC) machines and automobile. (Ravi 2019)

3.2   AUTOMATION IN EDUCATION

I grew up in a very small country and I remember when I started primary school, which is called basic school here in Czech Republic, we learned how to write on a hood, we will use the wood to learn to write letters and be able to write a sentence very well in a way people can read it, we didn't have computers, well they were some but not for students. It was a different back then but after few years it developed to what we see today, children use tablet, no need of having the actual book. Teachers no longer use chalkboards; we have online course where students can get a degree from another country without even setting his or her foot in that country. Education is faster, cheaper in some countries and less wasteful. Things have shifted in a good way thanks to technology. Young boys and girls can create different application which can be used in our daily life. Automation is changing the nature of education and how people learn, we are now using online systems, most of the material can be found online, our works are submitted online. what seems like a dream back in the day are now reality.

It all started to shift when the formal education process becomes embedded in the internet. Now days people literally choose whatever they want to study the way they want to study it, no need of human interaction. It is easier to learn what you need to know to make a good leaving in this modern world.

YouTube has a lot of thing to offer, you can learn a lot by watching few videos on YouTube. It is hard to say if this is an issue or not. some people like BOB RESELMAN are concerned. (Reselman 2018) mentions in one of his blogs where he talks about the Education in the age of automation, he says "*I have a concern about increasing the role of technology and automation education and the emergence of tech-focused boot camps as the post-secondary educational experience for many.*" Bob Reselman, September 7, 2018, https://devops.com/education-in-the-age-of-automation/.

Another concern maybe, if these new ways of technology will replace teachers. As Harvard psychology prof. Skinner (p. 26): SKINNER, Burrhus Frederic. Teaching machines:" *Will machines replace teachers? On the contrary, they are capital equipment to be used by teachers to save time and labor. In assigning certain merchandisable functions to machines, the teacher emerges in his proper role as indispensable human being. He may teach more students that heretofore that is probably inevitable if the worldwide demand for education is to be satisfied, but he will do so in fewer hours and with fewer burdensome chores. In return for his greater productivity he can ask society to improve his economic condition.*"

3.2.1　GENERAL EDUCATION MODELS

Nowadays we have different way of learning like it mentioned above and different models are applied every single day. Now, they are smart learning, adaptive learning and agent-based learning. Smart devices are mostly used for the growth of learning performance, plus adaptive learning systems. We have different categories of smart learning like Smart pull, Smart prospect, Smart content and Smart push.

ROBOT-BASED LEARNING

In some schools they have been using robots to teach or educate students, especially in China where robots are used to teach in the kindergarten. Robot-based learning is somehow related to pedagogical model like the smart learning, adaptive learning and agent-based learning. Some robots are used to teach languages and increase learning performance on a good level. Though for example at home they are used to assist.

Founder of Szhou Pangolin Robot corp. Makes robots that can be used in the kindergarten. These educational robots are acting in the place of teacher. These robots tell stories, challenge children with a logic problem and so on. This must be exciting for children, because it would be exciting to be taught

by a robot. At Yiswind institute of multicultural education in Beijing, the children were given a task to help a prince find its way through a desert, they do it by putting together square mats that shows a path taken by the robot, one part is storytelling and another part problem solving. Every time their answer is correct, the robot reacts with delight, its face flashing heart-shaped eyes.

Figure. 5 Teaching robots

[source [Unknown Author] Robot teachers invade Chinese kindergartens (2018, August 29) retrieved 4 May 2020 from https://phys.org/news/2018-08-robot-teachers-invade-chinese-kindergartens.html]

According to the principal of the kindergarten XIE YI (PHS.ORG, 2018), states that it will take a long time for robots to take over the teacher's job. Robots can be amazing and children may follow because the intention it brings into room but there is more to eat when it comes to education, there have to be some interaction, some emotion involve, eye contact, all this things robot do not have them yet. This robot costs 1,500$ other cost more than that, which is way more than what actual teachers are getting paid today.

Even though it may be strange for many of us to be taught by robots this may have a positive impact to children, this method can influence young children to want to know more about technology. University of applied science technique in Vienna offers robotic classes at a kindergarten for pre-school children of age five to six. Basically, all the movement of the robot are documented by them. Robots in education add another advantage by eliminating certain barriers that children with special

needs face. The challenge is still there for teachers who uses this robot as their assistance because most of them do not have background in educational robotics.

There are two categories how robots are used, first is the interaction between the robots and the children, in this case the performance of the robot should be very well programmed, but in other to make sure of the interaction between a child and a robot is going well, the robot require to be programmed with a high and related software that should be enough to handle all the possible situations. The hardware and the artificial intelligence that is used make the Development costly which is one of the negative impacts of the major drawbacks for robots learning. (Jeong 2014, P 2-6)

The second category is with the use of smartphone as an assistant system for robot learning, this can be the answer to the first category. Then we can have children in a classroom with a robot and their teacher as an assistant. In this case the teacher is controlling whatever the robot has to do with a smartphone, then the intervention can be applied without the children noticing which can boost the performance of the learning system. Here smart learning and agent-based learning are provided.

(a) Robot-only system

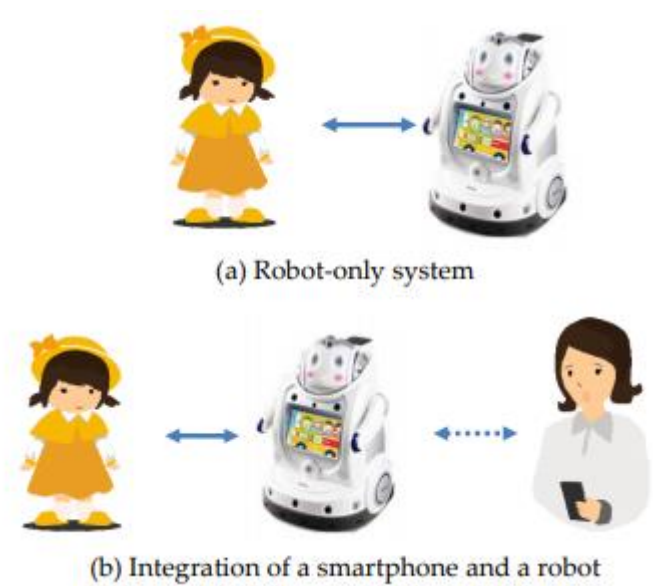(b) Integration of a smartphone and a robot

Figure. 6 Two categories how learning robots are used

[Source: Gu-min Jeong, Chang-woo park, Sujeong you and Sang-Hoon ji. 2014. A study on education assistant system using smartphones and service robots for children. 19th February. SAGE Journals. [Online]. Available from: https://journals.sagepub.com/doi/pdf/10.5772/58389]

THE PROS OF USING ROBOT-BASED LEARNING

- **Intelligence**: the appropriate content is played at the right time and with a remote the robot is controlled.
- **Safety**: most robots have a camera to monitor the behavior of the children, in that way any collision is avoided.
- **Performance**: we can give Feedback; the reaction of the children is checked and the explanation of the answers is displayed using the smartphone.

It is still early to say if this method could have a negative impact on children in school, what we have so far are negative feedback. We all grow up playing with toys and some toys could even talk or dance, even though a robot may differ to those toys, the advantage of it, is that it could actually teach a child a specific thing depending on how it is programmed.

For disabled children or children who are hospitalized, **telepresence robots** are used to virtually attend classroom at school by taking control of tele-operated robot. (Olson & Ahumada-Newhart 2019, P.2-3). In some schools there are robots that assist professionals in their daily tasks via collaborative approach. For example, robots taking attendance, welcoming the students in the classroom calling them by name, this approach help a lecturer to focus on their pedagogical objective. Though there still a lot to be done or correct we can agree that robots are a motivating tool for students to want to study science and everything else connected to technology.

Robots:

- Give power to technological and scientific culture in schools
- Make easy to send the knowledge through transdisciplinary activity-based projects
- Can help students to use scientific thinking

In Korea, 3,000 robots are found at pre-schools and it has been 6 years. In South Korea, they held a competition dedicated to robotics, The Russian Association of Robotics possess more than 1,000 educational robots that can teach children and there are 53 universities that teach robotics. In Switzerland, Polytechnic federal of Lausanne create cheap educational robotics platform associated with educational material and teacher-training program project. And there are 214 teachers who are trained on how to use these robots. These are not only limited in Europe or Asia alone, there is The African Robotics Network which launched 10$ robot design challenge, the aim of this competition

was to create a design that will be cheap enough so that the schools are able to afford it, then they can be used for educational purposes around the world.

Park EUNIL & Kim KI Joon & del POBIL, Angel P. (2011). The effects of a robot instructor's positive vs. negative feedbacks on attraction and acceptance towards the robot in classroom conducted a research on robots being used as instructor, they state that '' *human feedback was more effective that the robot's feedback. The context of robot instructor indicated greater attraction towards the instructor when received a positive feedback, but the context of human-instructor did not indicate any significant differences in their attractions. That is, people are more willing to accept and listen to human feedbacks regardless of the feedback type while showing greater acceptance to the robot giving positive and negative feedbacks yet still unfamiliar with the idea of receiving negative feedbacks from non-human agents.*''

DISADVANTAGE OF ROBOT-BASED LEARNING

- Jay Lynch in his article, demonstrate how Artificial Intelligence is a threat to humanity. Artificial intelligence may be a good idea but if you look at another angle you would notice that these robots can only give answers to the questions a child asks, it cannot tell us we have the wrong educational goals or learning outcomes.
- Affect for efficiency, the whole purpose of the robot-based learning is to remove teachers from learning process. This issue can be a big deal for teachers who feel they are being replaced.
- The part of learning needs to include emotions, replacing emotional teaching and learning activities will have a negative impact on student outcome and learning will be compromised.

3.3   TRANSPORT

There has been a shift in transport as well, they are fast cars now and automated vehicles are considered the safest in the whole world. it shows how the development of automation in all areas is going fast. Self-driving technology together with advanced driver assistance system could have a positive impact on everyone, that means the number of people dying from car accidents could decrease. Even though it is still a dream but car manufacturers and specialists in IT are locked into a multi-billion-dollar race to make this happen. Though, there is still a debate on the kind of effect it will have on people. In Barcelona, Budapest, Paris, Shanghai and Singapore have the automated systems, in this country driverless transit systems are being adopted and it is going fast. (Beaudoin 2017)

There are automatic train, they work every single day, in London underground's Victoria line has been using automatic train since 1965, we also have the world's longest automated transit line called The Sky Train in Vancouver, Canada which has been in service since 1980s, in the capital city of France there are three automated metro lines and in Japan and other big cities in Asia have driverless train. The pros of driverless or self-driving systems are a lot.

- To be able to provide a lot of line capacity.
- Optimize the running time of trains and there is a growth in average speed of the system.
- Trains to run more regularly (metro in Moscow works at a frequency of 90 seconds, carrying nine million passengers using it every day. You can imagine in Asia.).
- Of Course, because it is driverless, the costs of operations are low.

Well for human understanding it could be dangerous for a train to drive itself, I would freak out myself, even though these train they are very well programmed, and they make sure that nothing really happens. There are some cases where the intervention of human driver has prevented an accident from happening. In Delhi, a driverless metro train went into a nearby boundary wall during a trial run because of the negligence of people who worked in maintenance, but like I mentioned earlier this metro were designed to be driverless, and the statistics shows that when it comes to safety it is excellent. In these train there is a Communication-Based Train Control system to secure the security and other subsystems which include information equipment for passengers and public address, this somehow fulfills the security and safety standards of passengers.

A HEAD START FOR PUBLIC TRANSPORT

We already have metros that are controlled; thus, robots' drivers need to crunch different parameters that are required to move through dense mixed-traffic streets. They are new business models and technology which are coming out with brilliant ideas and they are involving quickly. In Singapore they are texting new Robot-taxis and Uber has introduced an autonomous car project in USA. All this will enable public transport the power to manage and expand beyond. Somethings in technology are no longer a dream but it is a reality, people are increasing in the world other there are a lot of technique how to facilitate the transport of this people especially in developed countries. For the automation in public transport to be safe there have to be a lot of intervention a lot of studies because life of people is involved. In order to be safe, this journal from Ireland mention that platform door screen has to be added to avoid any person from having any contact with the track. (Groover 2019, P. 20)

they already exist one in Paris. The second option they mention is a track-intruder detection system but also having a limited access it can be another solution. Communications-based metro is also another key that can reduce risk of any accident or the headway between trains on the same line. Metro being monitored all the time, it will include the train location which is knowing because of the use of on-board data which is sent by a wireless to a central control facility, which supervise all the other trains in the system. This facility can be easily modified depending on the changes in other to respond to the delays or accommodate crowds and also allow for good real time information. The change from a normal metro system to an automated one is a very big project which require time and a lot of upgrades to ensure the safety of people in it. There are more than 53 automated metros around the world and they have been seen the safety, reliability and flexible they provide to the passengers. We are going to see more of those in the future. Mentioned in article (railway technology 2018)

CHALLENGES TO DRIVERLESS BUSES

The public transport is not limited to metros, in buses they have been a big improvement, at the buses stop you will usually see real-time updated schedules and voiceovers. It is not common to see the driverless buses; we may hear about it very soon. There seems to be some difficulties so far and some of them is the street in city which are very complex. Citymobil2 is EU-founded project which focuses on testing automated road-transport systems, they're focusing on how they can improve mobility in some cities. They use GPS, cameras, radars and obstacle-avoidance technology, which will allow them to work using the infrastructure that already exists.

It has to be texted or if it is possible to create an extension road which will be used by buses only, otherwise that will be very hard project, but nothing is impossible really, they will soon figure it out the best way to do it. CityMobil2 will use twelve cities within the EU, together with automated services supporting the existing public transport with collective, semi-collective and on-demand shuttle services. That means it cannot be mixed with traffic but it can still work in devoted areas and private sites. Including testing the technology, obviously a lot of money will be used and also, they are considering behavioral research, like how people will react to a driverless bus, what would be the attitude of people on automated road transport, which is considered as a very big barrier. How do they attend to fit the new systems into the existing one? Without forgetting the legal aspects of certifying autonomous transport. (Alessandrini, 2016, P. 18-20)

They are self-driving electric shuttle which came out in February 2019, it is powered by electricity, this is considered as the future of transport, it has been experienced by Canadians. Easy Mile is the

company which produce this electric automation cars, it is a very known automated company, these driverless shuttles have been introduced in more than 20 countries around the world. These shuttles use a combination sensor, video cameras and computer to understand their surroundings. They are considered the safest because they eliminate human error which often leads to collisions. The battery can last over 14hours, the speed is up to 40 km per hour and the maximum is 12km per hour and it hold 12 passengers. (Shepert 2019).

Figure. 8 Autonomous shuttles in Vancouver

[Source: Elana Shepert, Jan 18th, 2019, "you can ride this self-driving shuttle in Vancouver", accessed May, 4th, 2020 from: https://www.vancouverisawesome.com/vancouver-news/autonomous-shuttle-vancouver-surrey-1941970]

Mercedes Benz developed an automate bus, which they called the future bus with City Pilot. The bus can recognize the traffic and pedestrians and also stop at the assigned bus stops automatically. These buses are programed with a software that will allow them to brake when it senses it is necessary, the software platform is for autonomous driving traffic. The first try was made in Amsterdam's Schiphol airport and Haarlem and the journey was 20km. What is necessary for automated public transport system required a lot of innovative process in order to make a pleasant journey for those who use public transport whether is via trams, buses, or shuttle buses.

Look at China's straddling bus, that was a really bright idea, if you look at it looks like an old 1950s popular mechanics were created. Because of the traffic which is China, that would be a great solution

to bit the traffic and be at work or in the meeting at the right time. This bus will benefit people who lives in big cities where traffic is horrible all the time (BBC, 2016).

Figure. 9 China's straddling bus.

[source: BBC China, August, 3rd 2016, China's elevated bus: Futuristic 'straddling bus's hits the road, from https://www.bbc.com/news/world-asia-china-36961433]

3.4   COMMUNICATION

Communication among people has completely changed during these last 20 years. No need of sending postcard through post when you can just take a picture and a person who is in another continent receive it with in a second. That's marvelous, we have video call, a lot of social sites which help us to stay in contact with our friends and loved ones, for business view. They are conferences, people do not need to travel from one place to another, they can just have a conference call or a Skype and the meeting will go as if they were in the same room. Interviews about work are made online, through a call or Skype, hiring people through internet became easier, it is great to be alive in century. However, nothing is just white, there is always a black side to every situation or even the negative impact all of this can have on the users. Before getting into that, let's first focus on the positive side. They are a lot of amazing things you can do with your smart phone, it can be used as a remote, as a phone, as a mini

laptop, as a camera and list go on. they are more innovations, companies like Apple and Samsung are giving all in other to make a really smart phone.

Even though this is all marvelous, people are still concerned if the ability of communication will be lost in the year to come. We still have old generation who are not really caught up with modern technology for example a small child sitting with his or her grandparent, instead of having a discussion he/she is just on the phone and grandparent is just there waiting for a child to interact this is one of many examples of the impact technology is having on society. In companies Communication is one the key factor in every area of our lives even in different companies. Talking an accounting firm, if they aren't a good communication both external and internal, they are a big chance that different difficulties will arise, it is very important for any cooperation to remember that even though automation will be used to facilitate communication, it will never replace communication.

INTERNAL COMMUNICATION

(Campbell, 2018) explains how automation does not replace communication. A lot of organizations use an automated workflow tools which allow those who write critical comment to enter review notes for tracking those review note as they are addressed. This tool can make a communication between those who prepare and those who review much easier, but reviewers prefer to use this tool because most of the time they do not want to be in contact with the staff members. Automated review can facilitate the transformation of paperless model and streamline procedures, but what they cannot be used as an excuse to side step talking to the people who are being supervised.

EXTERNAL COMMUNICATION

This has been changing for the last few years, there have been different tools which automated the process of collecting client's documents, getting people's signatures and many more. Even though data collection and processing may be automated but there have to be a lot of expertise, using judgement and building relationships especially with clients is not. There are a lot of people with a great communication skill that can allow you to change relevant financial information for example to executive teams and CEOs.

Today you can access any information, but we also need people with the ability to communicate effectively. With automation in every sector, it can help us to work less, saves a lot of time, but it is not about the job which are done fast. It should give us the opportunity to connect with clients in this way they feel valued. Organization tend to use email a lot, when they are asking to change something

or when they are introducing their new product, for example, some companies have a lot of clients that can be very hard to be in touch with them all the time. It is all about the understanding. It is all good and exciting but it cannot totally replace the human element, whenever a person has a communication skill, he or she should add a relationship skill. In order to develop a skillset that cannot be automated, you need to stay relevant. Machines will remain excellent but catering to the need of someone is a human ability.

3.5   HEALTHCARE

Healthcare is different in every country, it is growing and changing so fast depending again on the country, legal framework, individual organization, political agenda. The aim is to increase patient experience in hospitals or clinics and also the workforce is improved to a new way of care. the reason of using automation in every aspect of our life especially in health care, is to reduce some disasters that happens every day because of a poor system or doctors and nurses working for a long time or other things.

Years ago, Hospital used to store patient's information on papers, but nowadays it is not very common, papers re still used but not much, most of the things are done on computer, the difficulties can occur in case of a breach, it may take time to access the information of the patients, or operate the patients, which shows the negative impact new technology. The automation is Healthcare is very important because the help on the development of repeatable, rule-based processes and definable. It is a great advantage to use these automations in some areas however, it does not mean that it will replace humans in the care-giving process, it just helps them to focus more on the treatment on another level. The main areas where robots in healthcare can be beneficial are:

- Precision surgery
- Repetitive tasks, for example blood sampling
- The assistance of robots in case someone needs care

They are a lot of old people now who are more than young people especially in developed countries, according to a report published by the United State Census Bureau in 2016, people over 65 years old will be more than those who are 5 years old and in 30 more years it will be twice, that means those who are at age of 65 will need Healthcare. In order to provide a good service, the industry has to come up with new resources and new trend, which is a use of machines. Like in other areas like transport,

industry, communication and other, there have been a change in health care as well, the use of different machines in the hospitals, in operation, the use automation in healthcare has facilitated some task within the clinical workflows.

It is not about robot operating on a human being, I think we still have a long way to go on that, but it is about operating basic tasks whether it is in administration, or in other area which can make an experience of a patient to be better and the quality of service and improved project implementation. The use of machines in healthcare simply help to improve clinical outcomes. When using machines or computers people can easily recognize the design in unstructured data, turning it into structured data in a way that permit automation. (Josh Gluck, 2018) his article on "*How automation in Healthcare is boosting the bottom line*", He mentions 4 ways automation in healthcare can make a different.

- Data which are fast in other to improve Electronic Heath records
- Improving ordering
- Smarter billing.
- Hospitals started to use machine to adjust staffing to support fluctuating emergency department patient volumes and eliminate waiting time in ambulatory services. By investing in some historical data across different sources, organizations can understand when to staff up to handle in influx of patients for upcoming viruses. All of this to make sure patient have a good experience in the emergency room.

3.5.1 THE BENEFITS OF AUTOMATION IN HEATH-CARE

Healthcare can use automation to receive the profits of an efficient process

Normally it takes a long time for some drugs to come to market, but with automation in pharmaceutics, software can be used to look for some facts needed. If there is a combination of automation and emerging technologies, it will be easy to diagnose and treat an illness.

 Interpreting patient's information depend on human input not on high-volume, the experts in this are aware of highest degrees of accuracy, repeatability and reproducibility will save lives. If automation is used properly in every area, organization have the profits of using an efficient process, simplified product lifestyle, cost savings throughout, faster time to market. One of the examples is low-code which help employees in healthcare sector to construct their own applications that can avoid those kinds of problems and brings the drugs to the market fast. Robotic Process Automation can work

together with emerging technologies and Artificial Intelligence to make a smooth running of drug development process that can inform lifesaving decision making.

The benefits of Artificial Intelligence in voice recognition and enterprise image management

We have seen the increase of AI in healthcare these last few years and it will continue to increase even more, we have also seen the benefit of using AI in both recognition and enterprise image management. The purpose of this is to reduce the amount of working hour, and allowing more time to be spent on treatment and complex cases.

Packaging that works with the robots

There have been challenges like budget cuts, medication shortages, these challenges are putting a lot of pressure on pharmacies. These may cause reduced time to spend with customers and limited storage space. Automation give a solution to this; pharmacy robots are used to streamline the dispensing process. The use of automation helps to store more stock faster, a great way to pick a prescription, the pharmacist can only make the final check because the process is automated. The use of pharmacy robot can decrease the errors that human normally do. The other challenge may be how to work with robots, but they normally have a remote or a manual demonstrating how it is used and Valley Nothern has introduced a selection of tablets cartons that are compatible with pharmacy robots, driving cost.....According to Dale, Sale director in the article written by Charlotte Edwards, 8 August 2018, *Expert views on the benefits of automation in the health care industry*". https://www.medicaldevice-network.com/features/expert-views-benefits-automation-healthcare-industry/

Automation is safe for staff and patients

They are a lot of errors every year that people in Healthcare are responsible for, this is the same of every drug mistake, for National Health Service there is no excuse, but automation can prevent all of that from happening, even though it's hard to give it 100% because they are human involvement in same area but at least automation can decrease the errors. The flow of a patient is mention through trusts, how nurse and pharmacist are focused on clinical services and the quality of care. For those in Healthcare team who are at burn of National Health Service cuts or who try hard to take care of their patient it provides a safety net. There is a reassurance that the right medicine is available for those who are attended to get it at the point of care when using an automated medicine cabinet.

Automation in a healthcare care saves time and costs

It is very obvious that the number of machines in hospitals or in healthcare sector in general are increasing, people need a be taking care of without a high cost. That is why in most of countries there are medical insurance paid by the government, so this pressure to give a better care on a low price can be a big challenge. We already seen some of the benefits of motivation in the last four points. If you look at it, the number of machines may be more than the one of skilled professionals, who are, after all in short supply. For Different organizations or hospitals, it will make better way of using different resources which decrease the hours of work for some so that they can do other valuable tasks. In Japan they are a lot of robots, one of the main reasons of building robots nurse is to save money, and according to Ksenyia Charova, Cameron Schaeffer and Lucas Garron, 2011, Computers and robots, https://cs.stanford.edu/people/eroberts/cs181/projects/2010-11/ComputersMakingDecisions/index.html , the country can save up 2.1 trillion yen in Healthcare every year if they use robots for instance to check on or monitoring older people. They are already a lot of robotic companies which are creating robots that can act as human or look and speak like humans, they are also a big number of robot nurses which assist doctors by communicating with patients. What they haven't been able to do is to make a robot nurse that can work on their own.

3.5.2   EXAMPLES OF AUTOMATION IN HEATH-CARE

- The use of wheelchair for people who can walk or older people, these people do not need people to pull them around, wherever they want to go. A person can just conduct and move it. It is used a lot in Hradec Kralove than other cities, there is also what they call Smart Wheelchair, it helps to prevent pressure ulcers (*ulcers is an open sore on external or internal surface of the body, caused by a break in the skin or mucous membrane which fails to heal*.) and promote a good posture. The smart chair is built with different sensors that a help a patient to sit properly and also to have energy during the day. https://www.youtube.com/watch?v=auat61DCswY

- IBM has created a machine or a robot through Watson technology. This infusion of cognitive solution and process automation is able to automate manual activities like efficiency and productivity to increase patient experience. Also, it does offer to answer end user questions and to resolve help desk queries.

- The famous medical robot which is called da Vinci surgical system made by Intuitive Surgical, this robot-assisted has been used to operate on millions of patients since it was launched by US Food and Drug Administration back in 2000. It is in invasive thoracoscopic, cardiac, urological and gynecologic procedures. according to this article by Tanya M. Anandan, November, 23

2015, robots and Healthcare saving lives together, https://www.robotics.org/content-detail.cfm/Industrial-Robotics-Industry-Insights/Robots-and-Healthcare-Saving-Lives-Together/content_id/5819

Teleoperated robot-assisted surgical system for minimally invasive procedures. (Credit: Intuitive Surgical, Inc.)

Figure. 10 Robot assisted surgical system

[source: Tanya M. Anandan, November, 23 2015, robots and Healthcare saving lives together, https://www.robotics.org/content-detail.cfm/Industrial-Robotics-Industry-Insights/Robots-and-Healthcare-Saving-Lives-Together/content_id/5819]

- Robot-assisted device it's another machine used to cut bones using a laser. It is called Cold Ablation Robot-guided Laser Osteotome, it made in Switzerland. KUKA LBR IWA robot is used to show the laser beam the exact location for the bone ablation procedure. This robot-assisted proved to be working very well by reducing the thermal damage, soft tissue damage, it promotes faster healing and enable for complex 3D reconstruction geometries, this procedure

is only done by robots. This method will start to be in use in osteotomies, starting with craniomaxillofacial surgery.

Robot-guided laser bone-cutting device under development.
(Courtesy of AOT AG)

Figure. 11 Robotic bone-cutting devices

[source: Tanya M. Anandan, November, 23 2015, robots and Healthcare saving lives together, https://www.robotics.org/content-detail.cfm/Industrial-Robotics-Industry-Insights/Robots-and-Healthcare-Saving-Lives-Together/content_id/5819]

- ARTAS robotic Hair Transplant system, this machine helps people who are bald or who have other types of hair loss. It was launched in 2006 by a Swiss company called Staubli. They did hair transplant with a six-axis robotic arm, but it that time they had some difficulties with it plus it wasn't safe nor a good performance as a robotic arm. But after they worked on it and come up a good and safe machine which remove scarring and speeds healing time.(Anandan 2015).

Robotic hair transplant system eliminates scarring and speeds healing time. (Courtesy of Restoration Robotics, Inc.)

Figure. 12 Robotic hair transplant system

[source: Tanya M. Anandan, November, 23 2015, robots and Healthcare saving lives together, https://www.robotics.org/content-detail.cfm/Industrial-Robotics-Industry-Insights/Robots-and-Healthcare-Saving-Lives-Together/content_id/5819]

- The Accuracy Cyber Knife System is another example of machine used in OR; this is a big robot compare to other small, lightweight robots. This machine requires an external sensor such as vision systems and others to be certain that the machine is running at the right speed and everything is operation correctly. It has a person monitoring it, it has a camera which monitor the speed of the robot, if for instance it goes too fast, it slows it down or stops it (Anandan, 2015).

Robotic angiography system for 3D mapping of blood vessels during vascular surgery. (Courtesy of Siemens AG)

Figure 13 Robotic angiography system

[source: Tanya M. Anandan, November, 23 2015, robots and Healthcare saving lives together, https://www.robotics.org/content-detail.cfm/Industrial-Robotics-Industry-Insights/Robots-and-Healthcare-Saving-Lives-Together/content_id/5819]

- In Japan they are some robots that work as nurse, they are called robot nurse or RIBA (Robot for Interactive Body Assistance), they work as assistant to the human nurse, they are not able to work on their own, this robot nurse is able to carry a patient who has up to 60 kg, and they are able to move them in a different location. Its arm is strong with an advance tactile sensor that prevent a patient from falling, it has two cameras and microphones so that it can follow the cue from an operator (Jon 2017)

Figure. 14 RIBA robot nurse

[source: Jon EMONT, March 1st, 2017, Japan Prefer Robot Bear to Foreign Nurses, from:

https://foreignpolicy.com/2017/03/01/japan-prefers-robot-bears-to-foreign-nurses/]

Another example would be the patient care devices like pill boxes, this device would help to identify if the patient took his or her medication. The device can be show that it was not opened, automated reminder cab be sent via phone or text, if there still no answer it can go rapidly, so that it can alarm the patient and also decreasing noncompliance. This kind of monitoring reduce the time of clinical staff to have more time to frontline care. There are a lot of examples when it comes to how machines are used in Healthcare, we have seen the advantage of it, we still have a long way to go where they will really take over. These robots still need the assistance of people to be able to perform very well. They are now different kinds of smart bed in hospitals where a patient who is able to sit can sit and or chat with his or her visitors and so on.

3.5.3 HEATH-CARE AND DIGITAL TRANSFORMATION CHALLENGES & CONSIDERATIONS

The digital transformation in Healthcare is not just about technological evolution, it is about the challenges that are needed to fix in the healthcare sector in every country by changing and building a new reliable healthcare in the future. Even though there is a big change going in this sector there are also different challenges that arise every day as they drive digital transformation technology.

The challenges that are very common in creating robots which are used in Healthcare is the issue of programming a machine which is reliable.

- Security and patient data challenges: there are some side effect that need to be look at. Security is quite important for every organization and also personal data; privacy is quite important.
- The improvement of patent's lives and people: healthcare is about patient, with new technology, people who have lost their arm and legs can have a new controlled arm, but, these controlled arms required a lot of effort from patients in a way close that it can work as a real one.
- Aging population: in some developed countries they are more older people than young ones. That means more old people, the chronic diseases will also increase which is quite normal for older people.

Like in every aspect in life, they will always be some difficulties and challenges and those challenges cannot be a threat in contrary people can always find a way to improve that and improve automation in general to improve the quality of health care. If for instance a robot nurse asks a patient to take his or her medicine and the response is negative. The robot nurse must be able to determine that the answer was negative depending on how it was designed. For human are able to assess a situation based on data that it directly receives through its senses and by looking at someone and determine if this person is alright or not, humans are also able to weight the good against the bad. Robots are not able to make a decision on a such level; we still have to wait when this will be fully integrated in robots in the future.

3.6   ARMY ROBOTS

Country send a lot of soldier to war; their families do not have a hope of their loved ones to come back. Looking at different war that has happened in the history and looking at many people who lost their life, there is a big number. With automation that can change a lot of things and save people's lives, an army of robots would be a great idea. People at war they tend to make the wrong decisions because of fear, anger and vengeance, in this case robots may reach a point where they make an ethical decision on the battlefield than humans can in a short time they are given. But maybe that's a bit of a fantasy, but they are different way how automation is being used in army, as the technology is advancing you would say that people are no longer safe behind some weapons like it is used to be before.

In this category there is no doubt, that automation and machines may replace human being, where computer will decide to pull the trigger or not. Another question would be if really, we can trust machine to have such responsibility, but it may be different opinion for everyone.

This idea of robots and machine in the army is no longer a fiction but reality. Even though when you look closely machines has been used for decade, it just changes the form every time, with a new design or a new way of how military are working. If you look at of the nuclear which are being built in Russia, America, China even Iran and so many other countries, a person can easily conclude that the machine can easily destroy the human kind. They are different kinds of missiles which are controlled by a computer, it is about locating the target and then eliminate it without putting in danger the soldiers or without using a lot of resources to get to that place. They are also small robots which they send to the field especially the dangerous one, to detect or where the soldier can see everything through the cameras without being in that place. Also, the driverless planes. They are so many examples nowadays when it comes to how machines or robots are used in the army.

CS Consulting Channel on YouTube, whose name is not mention was doing a presentation about Killer Drone Arms, these Drone are very small but able to penetrate in any house and kill the target. Depending on how they are programmed they kill a specific people because they have a smart phone facial recognition, smart swarms. https://www.youtube.com/watch?v=TlO2gcs1YvM, here is the video. This may cause a lot of problems, what is they are in the hands of the bad guys? They will use this to take away their enemy. According to (Matt O'Brien 2018), he explains that the robots which the army need are not for fighting, but to help those who do.

TYPES OF MILITARY ROBOTS

They are a lot of types of army robots which exist today, Robots. Net mentions few of them (Joseph 2019)

- Intelligence, surveillance and reconnaissance is one of the big applications where military satellites are used. Army sector around the globe do not use scouts anymore but they use small robots, which are invisible to the enemy's eyes. They are used for collecting the information also monitoring what the enemy forces is up too, by sending videos, images of the place using GPS.
- Search and Rescue Robots is also an application where a robot can save lives. In case the help is taking long to get to where it is needed. It is very useful during the war, they are able to

search, track and rescue even in nuclear, biological, radiological and chemical environments. https://www.youtube.com/watch?v=irvDKCszJxk

- Army robots can move in combat support application for fire support or strike missions or other cases. They also play a very important role in critical missions because of the degree of autonomy they process. They are able to fight in urban areas against widely dispersed forces and they are also bale to minimize the damage. They have a weapon which is used in combat mission, together with the intelligence to make the right decision without human intervention.

- Mine clearance is also an application which is use to move army robots for mine reconnaissance and area clearance operations to identify and remove landmines and sea mines. This robot reduces the risk of unexploded mine or other dangerous objects in the area. Land robots are used for mine clearance operations. According to (Anuj & Kumari 2018) "*in 2016, Russian military used a high-tech robot soldier known as Uran-6 robots to clear the historic world heritage site of Palmyra of explosives after the area was liberated from Islamic state rule. Uran-6 defused almost 3000 explosive devices including mines*."

Figure. 16 The Uran-6 (MRTK-R)?

[source: Army recognition. 2019. Https://wwwarmyrecognitioncom/. 01st February. URAN-6 MRTK-R unmanned multifunctional demining system. [Online]. [4 July 2019]. Available from: https://www.armyrecognition.com/russia_russian_unmanned_aerial_ground_systems_uk/uran-6_mrtkr_unmanned_multifunctional_demining_system_robot_data_sheet_specifications_pictures_video_10901163.html]

- Explosive ordnance disposal robots are used to detect fireworks, improvised explosive devices in close areas, cars and buildings. They are integrated into bomb detection systems; they are able to carry different payloads depending on the mission.

Figure. 17 Explosive ordnance disposal robots

[source: Anuj Mishra and Simpy Kumari, May 23, 2018, Military Robots Play a Pivotal Role as a Tactical and Operational Tool for Armed Forces, from: https://blog.marketresearch.com/military-robots-play-a-pivotal-role-as-a-tactical-and-operational-tool-for-armed-forces]

CHAPTER 4.   FUTURE OF AUTOMATION

For the last two chapters, we have seen how robots and machines are used in every aspect and how quick it is developing, what robots and machines can do without the human interventions. It was shown how technology is used in all sectors. Automation and Artificial Intelligence have one thing in common. It makes our lives easier in so many ways, different applications, different machines helping us to do some job, sometimes all we have to do is to press the buttons and then in few minutes or seconds the job is done. It is natural for humans to think about the future, imagining what could happen, finding new ideas, building new stuff, and also the possible consequences that may occur because of the innovation. The same goes for automation.

It can be a concern if really, the future of automation is good or bad, they are so many jobs now days which have already been replaced by machines, multiple industries from manufacturing to banking are adopting automation to drive productivity, safety, quality and profits. We looked at different examples of different machines and robots in the workplace. The question is will it affect human labor? That is what will be discussed in this chapter.

(Norman, 2018), show some ways technology will change the world in few years to come.

- Quantum computing: will help us to process more data about ourselves, the planet we live more than before. It's hard to say what we will do with that kind of data, but the answer will be there.
- Autonomous cars: the world in 2118 will be another world, improvement on infrastructure and better ways of moving around. We have already driverless cars, and many other smart cars and it will be possible that electric cars will be able to drive themselves. now the automotive industry is changing the game, looking at Tesla alone aimed to achieve what we call level 5 autonomy. Cars driving us. We see different cities using a high technology system, looking at China, a solar-powered highway could one day charge electric cars as they drive. They are a lot of engineers, who are busy designing self-concrete structure and potholes that fill themselves (street healing themselves without any reconstructions).
- Changes on how people work: technology are changing everything around us. There is no doubt that AI will automate some jobs, especially those on assembling lines or data collection. To prevent any difficulties that may rise because of that, some countries may use Universal Basic Income (UBI), it is a system which pays citizens a small amount every month with no

requirement to work. In Healthcare, it will not be possible for robots to take fully responsibilities, what some experts says is that AI will increase the work experience for humans even physically. Wearable Exoskeletons can offer support to an employee, and can reduce fatigue, this help an employee to be stronger and reduce the risk.

Figure. 18 Wearable exoskeletons

[source: Eliza Strickland, November 10th, 2017, Ford Assembly Line Workers Try Out Exoskeleton Tech to Boost Performance, from: https://spectrum.ieee.org/the-human-os/biomedical/bionics/ford-assembly-line-workers-try-out-exoskeleton-tech-to-boost-performance]

Even though, they are more inventions and more ways to make humans to work less and let the machines or robots to do our jobs or let me say facilitate us to do our job, this will only take few years for the robots/machine to replace us for good. (James & Kevin, 2018) explain the impact of Automation in the labor market. We cannot deny that it will have a very big impact on people. Amazon and FedEx started to use delivery robots, these devices are delivering letters, couriers, packages throughout the neighborhood in USA, they can climb the stairs and so on. https://www.youtube.com/watch?v=dagjQW_jgtE or a Robot taking over the luggage duties in one of the hotels in Los Angeles. ,https://www.youtube.com/watch?v=bsXRfZPo3Mw. Even though the door men are still there but there is no guaranty that they will still hire them in few years to come. As for the delivery, people who used to deliver those packages, what are they doing? All of this show how robots will surely affect people's jobs.
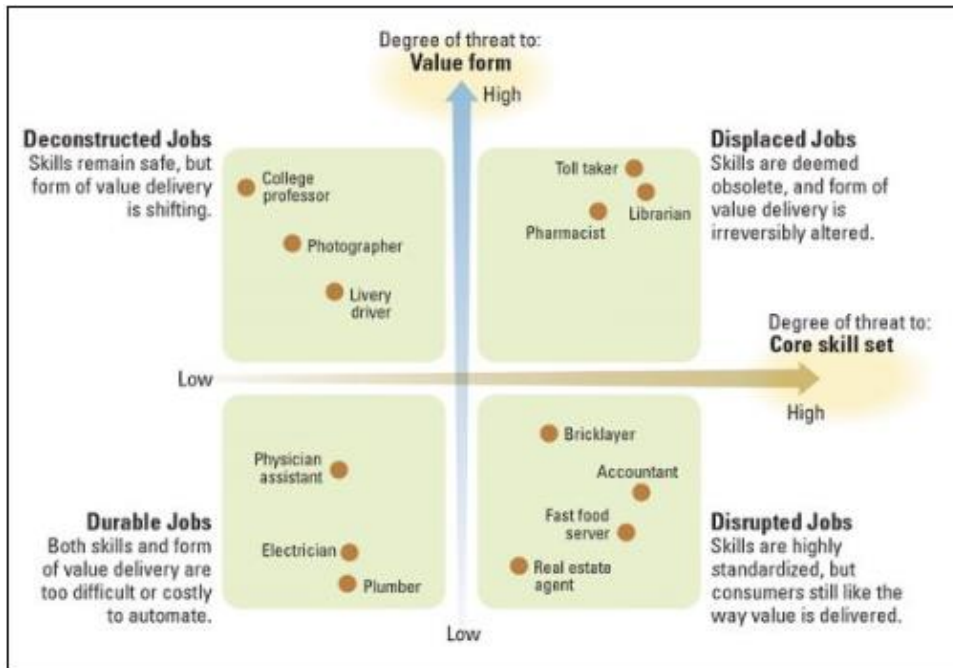
Figure. 19 Ways of how robots are affecting jobs

[source: Scott Latham and Beth Humberd, August 24, 2018, Four Ways Jobs Will Respond to Automation, From: https://sloanreview.mit.edu/article/four-ways-jobs-will-respond-to-automation/]

Automation technologies will also do much to increase the global economy and prosperity since aging and falling of birth rates is going up. We have seen different economic crisis the past few years and they believe the use of automation and AI can change that, and the productivity growth will maybe get to 2% annually over the next decade. On their analysis they are 2000 work activities across more than 800 jobs shows that some categories of activities are more and easily automatable than others. That give an explanation of the robot taking over the luggage duties. That same thing goes on the other sectors. Most of the jobs will be affected by automation no doubt, but only 5% of jobs could be automated 100%. This means that from welders to mortgage brokers to CEOs will work together with machines, what will change is the nature of these jobs.

Table 1 Automation impact on the global workforce in 2030

Technical Automation Potential	They are now 50% of jobs nowadays are automated.	6 out 10 nowadays jobs have more that 30% of activities that are technically automatable		
Impact it will have by 2030	Work potentially displaced by the adoption of automation, by adoption scenario	**Slowest** 0%	**midpoint** 15%	**Fastest** 30%
	Workforce that could need to change occupational category, by the adoption scenario	**Slowest** 0%	**midpoint** 3%	**Fastest** 14%
Impact of demand work by 2030 from 7 select trends		**Low**		**high**
	Trend line demand scenario	15%		22%
	Step-up demand scenario	6%		11%
	Total	21%		33%

The technical part of automation is what seems to be an easy factor. We have different factors like the cost of deployment, labor-market dynamics, wages, social norms and acceptance. It will depend on each country but the main factor to focus on here in labor-market dynamics (which is the changes of jobs in the labor-market). In some countries like France, USA, Japan the automation may increase to 20% to 25% of the workforce by 2030 and go even beyond. Even though some workers in some positions will be replaced, there will be growth in demand for work which will result jobs.

They will be an increase in incomes, in spending on Healthcare, energy, technology development and deployment. Millions and millions of jobs will be created in 2030, which will be more than the number of jobs lost. Some of the largest gains will be in emerging economies such as India. Where the aging population will not be a problem in the future. They will be other new occupations which we have no idea about now, as you know many jobs has been created for the last 20 years ago or even more for semiconductor makers, for software and app developers of all kinds, customer-service representatives, information analysts and so many more. with so much confidence that technology will continue to create even more in years to come.

We still have or see the automation incomplete; it's going spread around even more in few years to come. They are AI algorithms that can read diagnostic scans with a very high degree of precision will help doctors diagnose patient cases and be able to give a suitable treatment to the patient. Jobs which has repetitive tasks could change toward a model of managing and troubleshooting automated systems. On the CNN business they show a different kind of robots which are already used in the warehouses or in different companies https://edition.cnn.com/videos/business/2019/04/02/boston-dynamics-handle-robot-orig.cnn-business?.

4.1   TRANSITIONS AND CHALLENGES

The studies show that they will be enough work to ensure full employment in the future, a lot of things will change occupations as well as skill and educational requirements. People will have to learn how to work alongside the robots. Demand for advanced technology skills will be needed like programmers and other technical positions and high cognitive skills like creativity, critical thinking, and complex information processing will also grow. For couple of years there have been a high demand of basic digital skills and it will continue to be like that and accelerate even more. Demand for physical and manual skills will decrease a lot in developed countries. The existing workforce has already a lot of pressure so with that it will be even more and also the need for a new process of creating the qualifications of licensed medical professionals and their background and legitimacy. They are already a lot of innovative solutions that can help solve all these challenges.
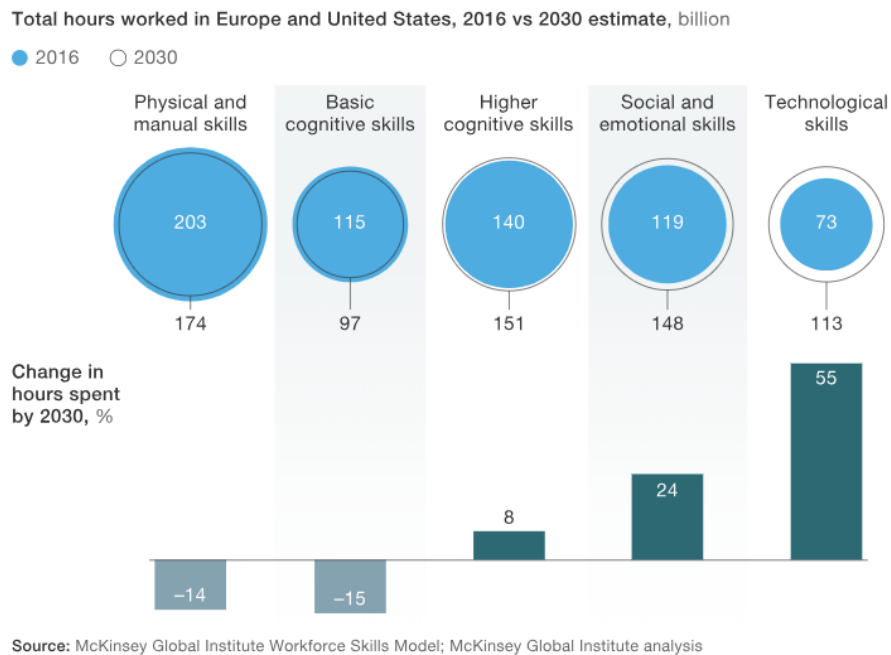
Total hours worked in Europe and United States, 2016 vs 2030 estimate, billion

● 2016   ○ 2030

Physical and manual skills	Basic cognitive skills	Higher cognitive skills	Social and emotional skills	Technological skills
203	115	140	119	73
174	97	151	148	113

Change in hours spent by 2030, %

−14   −15   8   24   55

Source: McKinsey Global Institute Workforce Skills Model; McKinsey Global Institute analysis

Figure. 20 Worked hours in Europe and United States by skills

[source: McKinsey Global Institute, June, 2018, AI, Automation, and the future of work: ten things to solve for, from: https://www.mckinsey.com/featured-insights/future-of-work/ai-automation-and-the-future-of-work-ten-things-to-solve-for]

The main concern here is that automation could make wage division even worse, income inequality and not having an income advancement that has characterized the past years across advanced economies, stoking social and political tensions. At some point workers will need to change their jobs or learn more in order to be on a good standard. McKinsey & company research suggests that around 3% of the global workforce will have to change their jobs by 2030, these shifts will maybe take place within organizations and sectors. Jobs which are physical or manual or in data processing and collection will see declines. Jobs which will grow rapidly are the ones which will include those with difficult to automate activities such as managers and those in unsure physical environments like for example plumbers. Teachers, nursing aides, tech and other professionals will see an increase in demand for work.

Workplaces will also change and flows as well as people alongside machines, the more intelligent machines and software we have in workplaces the more workflows will continue to develop gradually to allow humans and machines to be able to work together. They are thousands of robots which are being used in stores, they are also people who help answer questions or troubleshoot the machines. For

warehouses, the design may change because some parts are made to assist primary robots to help the interaction between human and machines.

4.2   HOW TO ADDRESS THIS CHALLENGES?

One thing for sure is to look at the good side of it and work hard to not let the negative affect us even tough that is hard to say that done, we should not seek to roll back or slow diffusion of technology. Governments and organization should equip automation in a way to benefit from increases performance and productivity contributions together with social benefits. With no doubt automation will create the economic surpluses that will support the transitions. However, there should be a way to make certain that the people or employee's transitions are as good as possible. Here are some of the solutions that companies should use:

- For economic growth, there have to be a productivity growth, therefore, embracing automation for its productivity contributions is critical.
- Creating an educational system and learning for a changed workplace.
- Investing in human capital.
- New workplaces will need to be designed, and people will have to get used with working with machines and creating certain rules or policies and also a safe environment.
- If the use of machines results in a big decrease in employment or a bigger pressure on salaries, then some ideas could be considered and tested. The important solution is to find the best solution that are economically workable for different roles that work and plays for employees, which include income, purpose and dignity.
- Embracing automation safety, even though we are profiting from these rapidly growing technologies, it is necessary to guard against the risks and prevent any dangers that could occur. For example, the use of data must always be taken into account, tech and other organization will have to find an effective way to handle this.

They are more work for everyone and they will be more work for everyone in the future with automation. Work will be different, with new requirements and skills but more fascinating and far greater adaptability of the employees than we have seen until now. They will be a lot of training and new generations will learn a lot at school which will enable them to face the challenges, for government, private-sectors leaders and innovators will have to work together to make sure everyone

fits. Which include making the right motive to invest more in human capital. The future will be challenging but also fascinating, it is exciting if you look at what has already happened.

So here is the link where you can test if robot will take your job. https://gigaom.com/quiz/.

CHAPTER 5.   RESEARCH

Working on this project, talking to my classmates, friends and strangers, it was clear that most people are not concerned but rather excited about it. The digital world is growing more than we can imagine, and we now see a lot of online businesses opening up in every area, people seem to get along with it very well. The purpose of this paper was to find what are the thoughts of people if they are negatives or positives and also to be able analyze and see if people should be concerned or not.

During my exchange program in Taipei I was able to volunteer for Tech star, they help startups companies with different ideas, bringing speakers or CEOs from around Asia to conduct some workshop where they give ideas to the future entrepreneurs. Most of the startup's businesses where Online businesses, different ideas that can facilitate or help people in a different way without having to move from one place to another. It was a really nice experience to have as a student interested in the use of Automation.

CEO of KIWIBOT (https://www.kiwibot.com/about-us), KIWIBOT is a company in Colombia that do deliveries, this company uses robots to deliver food. He explained to me that the people are very open to the ideas of robots delivering their food and they also help when it is stuck in a way. Asking him about what he think of robots taking over the human jobs, he replied that this is one thing that people has to accept because it happening even if we like or not, the best way is to integrate and learn, about jobs I don't think it has taken anyone jobs, rather they have been many jobs which have been created thanks to the use of AI or automations.

It is true, the battle of automation has been around for decades and people seem to always find a way to work with this new machine and a lot of jobs have been created over and over again. CNN, defining Rob ethics, "who or what is going to be held responsible when or if an autonomous system malfunctions or harms humans?" The answer to this, is how they are created that's what should be the concern, or how human use them. It's not like in a movie "I, Robot". So far, the automation has been helpful in a different way and it has decreased the forces people use in their work depending on their area of expertise.

This summer when I was at home (Rwanda), I tried to pay attention on how they use these technologies. It was surprising to see how most of the things are done online, especially the transfer of money, people do not go to back anymore to withdraw or send money they use different apps or machine to do all of that, however they are still hiring the Cashers and it has created different jobs for locals to be an agent of a bank so that at a particular time when the back is closed the person can just use an agent if the ATM is not near.

The article on BBC shows different jobs that will decline between 2018 to 2028, it was surprising to see programmers in the list, it is likely to decline to 7.5%, (BBC, 2018) we surely live in time of uncertainty that is why self-improvement is very important in order to keep up with the labor market. The degree we get in school won't help much, it is all about the skills, the knowledge and the willingness. As for employers, my opinion is that they have to provide training for their employees, to help them be on top depending on their focus in the market.

5.1   RESULTS

Survey Monkey was used to extend the research in order to understand better what people think about the use of automation in a workplace as well as its future. this survey was sent to students, professionals (IT, medicine, human resources, finance, and so on) they all have different opinion but one thing they all agree on is that it won't be bad as we imagine, because they have been a lot of changes on how people work for the last 20 years and people are still finding job, they will be more new jobs and some of us will have to learn to be able to compete with others. The survey contained 10 question and 20 people answered.

QUESTIONS & ANSWERS

Q1. Do you think in years to come robots and computers will definitely do much of the work currently done by humans?
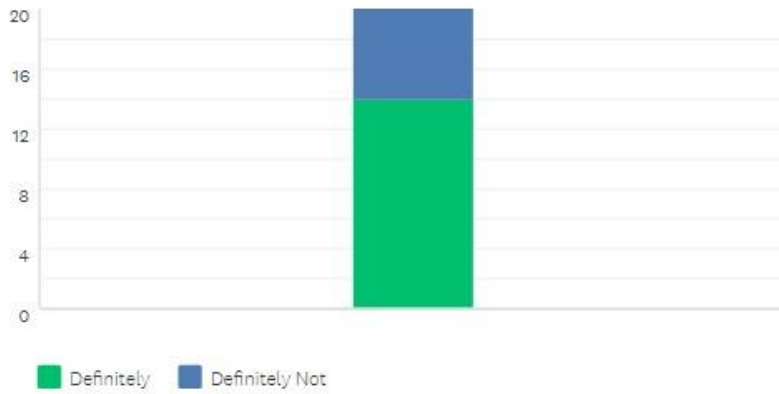
Figure 21 Graph of survey result

Q2. When it comes to workplace automation that has already occurred, do you think it has hurt workers or helped them?
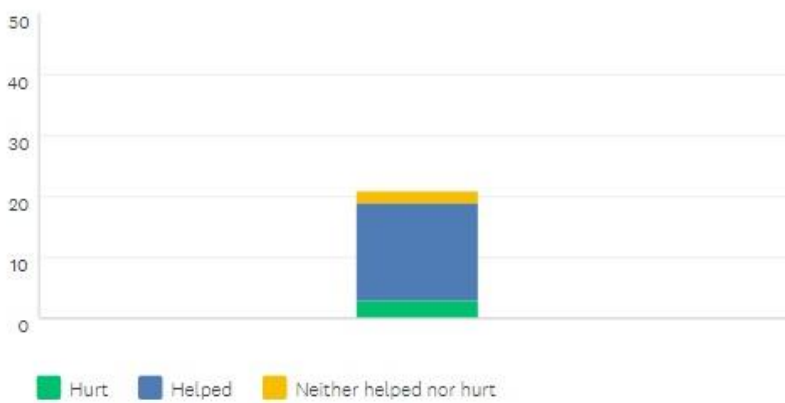

Figure 22 Graph of survey result

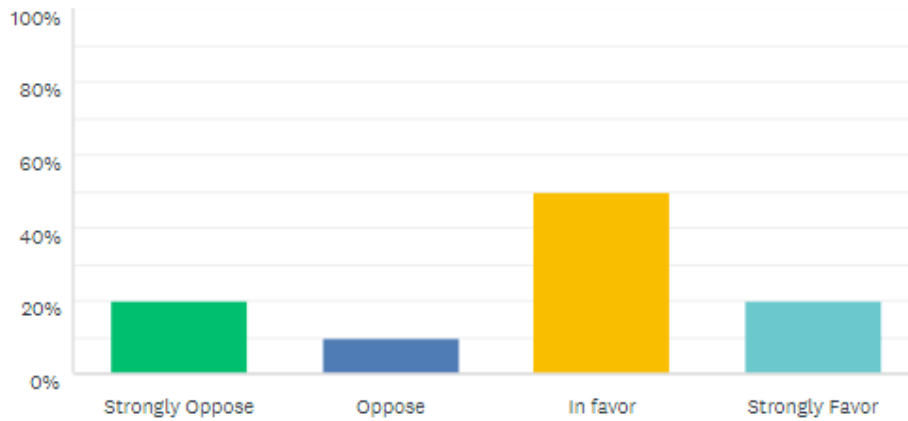Q3. Are you supportive of workforce automation being limited to dangerous and dirty job?

Figure 23 Graph of survey result

Q4. Most say workplace automation will lead to more economic inequality, what do you think?

Again, everyone had different opinions but they are the answers that describe it better or answer it in a better way:

- *Automation is for everyone. Economic inequality might be caused by lack of the capacity for implementation not the technology itself.*
- *I don't think it will lead to more economic inequality. There's this theory that while automation replaces old jobs, it also comes up with new jobs. An example would be quality control: the machines' performance still needs to be kept track of, and we can give this task to people. Tasks that are still too difficult for machines to perform but is intuitive for people, are then given to people. As long as corporations don't reward people only by the amount of physical effort they put in, but rather with the expertise they exhibit, there won't be an increase in economic inequality.*

Q5. Who do you think workers should rely on to improve their skills?
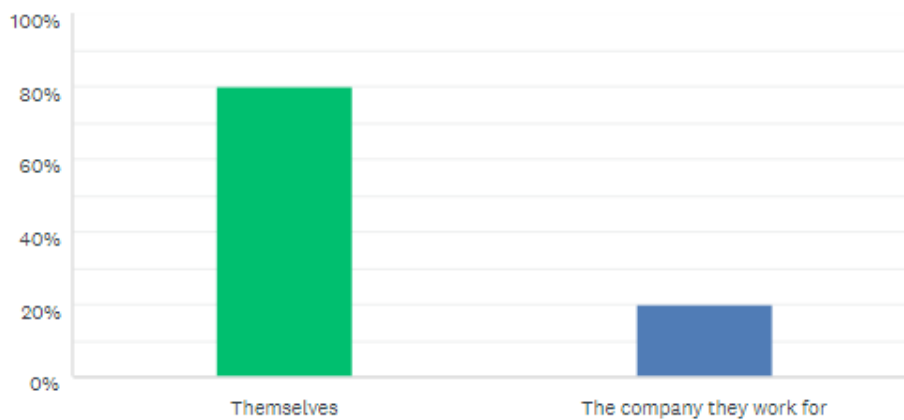

Figure 24 Graph of survey result

Q6. Organizations use automation primarily to reduce costs and minimize errors
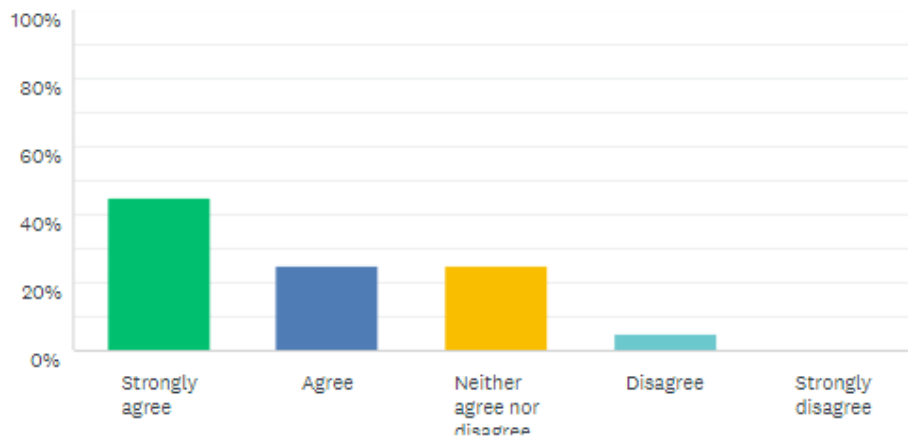

Figure 25 Graph of survey result

Q7. When you think about the future world of work as it is likely to affect you, how do you feel?
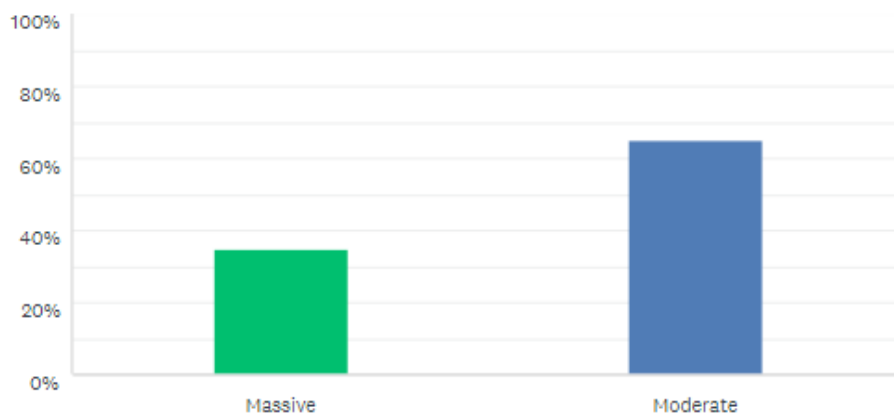

Figure 26 Graph of survey result

Q8. Which of the following best describe the scope of change the future of work will bring about for employers during the next five years?
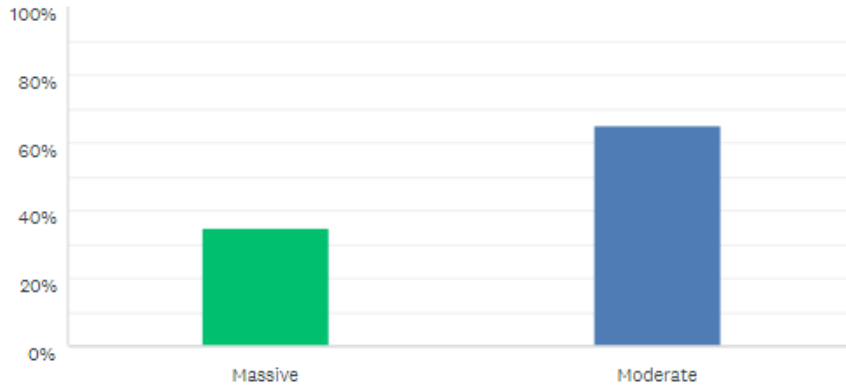
Figure 27 Graph of survey result

Q9. How is automation most likely to impact the size or the shape of your workforce in the next 10 years?
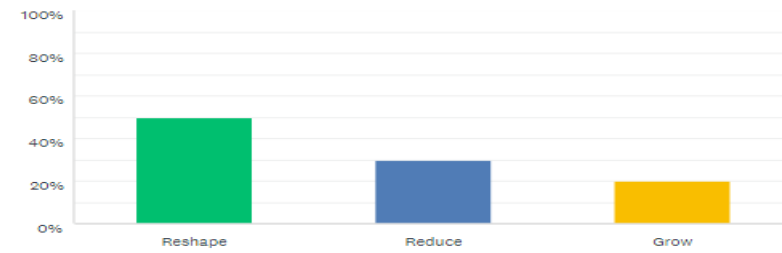

Figure 28 Graph of survey result

Q10. Which of the following poses the greatest workforce management challenge to you and your organization in the next 10 years?
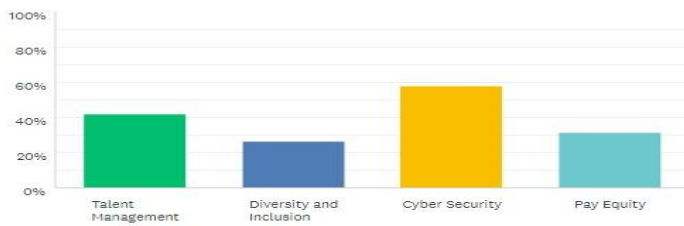

Figure 29 Graph of survey result

Looking at the figures, it shows what everyone thing of the future of automation and some of the people I talked to already have some experience with machines and automation. And the good thing about it is that they have a positive attitude towards them. It is helping more that it is harming, the number of accidents happening in the manufacture production have decreased, people are more creative than ever, it saves a lot of time. Nothing but positives. Plus 95% of people who answer the survey are all excited about the future of automation and what It will bring.

After volunteering in a startup event in Taipei, I also realized that so many startups are connected to automations or technology, using machines and also technology to get to the clients, we also know that IBM as a major IT companies in the world, one of their goal is to make the world smarter, they developed a software which is used in HR, to proof the right candidate without having to go through each one, some positions in Human Resource Department could be eliminated. In finance, we have the rise of Cryptocurrency, which could facilitate or promote decentralization, where a client deal with his customer without the third party getting involves. This will obviously take time for people to really understand it but that will definitely put some job at risk while the news ones are being created.

CONCLUSIONS

What will happen in the future is something we cannot change, what everyone does is try to be ready for it, and they are times that becomes really hard to plan or to be ready for it, hoping that we will adjust in whatever that will occur. For technology we have seen a tremendous change throughout the years in every sector, everyone agrees that it have made our life simpler, saves our time but yet makes us feel stressed, people seem to worry about the side effect if automation will take over our jobs and make us unemployed. I was realized that even in 50's people were concerned about automation or the use of machine but it has proved us that all is possible, it is like a support system, that makes our life easier and faster. Technology has created more jobs than it has destroyed, it has just reduced the hard jobs and dangerous jobs. Even though it is beneficial for all Companies requires to work harder now to try and protect their data, which create new jobs like cybersecurity, data detective, and many others. We also look at the new jobs such as social media manager, online marketers, virtual Assistant, data specialist, data analyst. These jobs were unheard before. This strongly prove that as humans we can adapt to anything.

After my research, It was realized that people are more excited about the future of automation, not only about flying cars and all other cool things we have seen in movies but also to be able to create something that can help other people, robots are doing that, providing assistance to employees, with our smart phone, we can order a taxi, food, buy groceries online, many other things without moving from our couch, we have online classes, you can learn from anywhere, you can work from anywhere, we have driverless cars, we have driverless trains, internet banking, we can now pay by phone, which eliminates the uses of cards, in health care we have seen a very big shift due to automation, in army and so many other areas. What is required from us is to stay relevant, to keep on educating ourselves, as for employers, they need to offer trainings to their employees so that they can stay updated to the last trend, other than that we can't resist, it is happening and it is clear that it is helping us in all walks of life.

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