

Impact of Automation on Society

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Abstract: Automation is the technology by which a process or procedure is performed without human assistance. The objective of this paper is to enhance the understanding of automation, its impact on society and changes in our daily life. The paper emphasizes the affect of robotics and automation on availability of jobs, demand for new skilled workers and the sectors affected due to automation. The upcoming era of automation has a high level of uncertainty in labor markets across countries as well as human evolution.

Keywords: Automation, robotics, Artificial Intelligence, jobs, skill changes, era of automation, data security, human evolution

I. INTRODUCTION

Automation is defined as the technique of making an apparatus, a process, or a system that can operate without human assistance [1]. It can also be defined as the creation and application of technology to make the work easier and precise than a human resource.

The world is continuously and rapidly automating. On one hand it is proving to be highly beneficial, however, on the other hand, a threat to existing jobs, increasing vulnerability of data security and system. It might be possible that one day all the tasks would be fully automated.

Advances in artificial intelligence (AI), machine learning (ML), and natural user interfaces are making it possible to automate many tasks that once were considered as impossible or impractical for machines to perform [2]. Like some AI systems can answer questions that are posed in ordinary language, rather than precise software queries, so without any specialized training one can get the required information on their own.

The paper further discusses the impact of automation on different sectors of the world, the factors affecting the rate and extent of automation and some discussion on major sectors of work and enhancements in the near future.

II. CLASSIFICATION OF IMPACT ON DIFFERENT SECTORS

Based on the types of system that can be automated, they are classified into 3 categories: [3]

A. Most Susceptible to Automation

The activities and tasks that are most susceptible to be automated are the ones which involves more physical device along with algorithms and programs. It also includes sales, customer service, agriculture, mining, retail trade, accommodation, food services and transportation.

B. Partially Susceptible to Automation

The activities and tasks that are less susceptible to be

automated are the physical work in unpredictable environment, utilities, finance and insurance, wholesale trade, real estate, arts and entertainment and also stakeholder interactions.

C. Least Susceptible to Automation

The activities and tasks that are less susceptible to be automated are the educational services, professional expertise, health care and social assistance, getting information, administration and management are some of the sectors which are currently least susceptible.

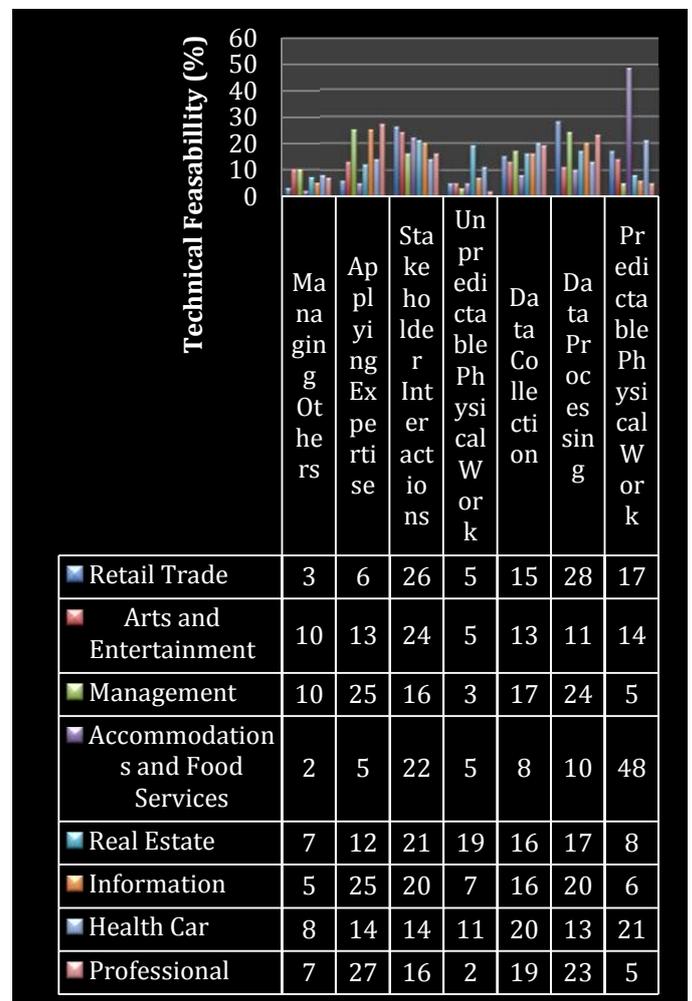


Fig 1: Technical feasibility of different sectors versus different activities.

III. FACTORS AFFECTING THE RATE AND EXTENT OF AUTOMATION

It can be divided into five broad factors that can influence the rate and extent of automation of work activities.

A. Technical Viability - Technology has been automating human activities for centuries, but these changes require energy and applied research which takes time to make things commercially available. For example, there was a lag in the development of automobiles, between Germans patented the engine (the compressed charge, four-cycle engine) in the 1870s and production of automobiles on a commercial scale some 15-20 years later [4]. So invention of a new device and time taken to make it commercially available with a good efficiency greatly affects the rate of automation.

B. Cost of Development - The cost of automation technologies will affect when and where they are deployed. Developing new technology requires capital, for physical technologies to be developed it takes a lot of physical capital, these costs can be recurring or non-recurring as industries have to be set up, the machines will cost hundreds of crores which are non-recurring but hiring labors/technicians/experts are the recurring costs which in turn increase the total value of the product developed[5], for example replacing a heavy duty vehicle with a self-driving vehicle will have high deploying costs and it is likely to be more expensive than the vehicle it replaces. These deployment prices are lower for software based advancements, as its most of the capital goes in hiring talents. All these costs affect the business cases for where and when automation is adopted.

C. Economic Benefits – There is a great potential of economic benefits in automation, as performance gains include increased profit, throughput and productivity, improved safety, and higher quality, which are harder to quantify than labor costs but no less tangible. The eloquence makes it sound very easy, as humans will be replaced, therefore the technology must be more cost effective. As full substitution is unlikely, it renders the economic equation slightly more complex, especially as higher profits can be re-invested in new areas and thus create new work.

D. Labor Market Uncertainties - The labor capital associated with work activities that could potentially be automated are another factor that will affect the rate and extent of automation. These costs are affected by the complex dynamics of labor markets. It is a dynamic system; supply, demand, wages vary all the time which affects the industry as well as the total market. Somewhere if the workforce is less or the labor cost is high, the employers are forced to turn to technology whereas in some industries there are many employees ready to work even at low wages which affects the rate of automation in that area.

E. Social, Legal and Ethical Acceptance - This is likely to be one of the most important factors, certainly in determining the pace of change. Technologies might be technically and economically ready but it might take a lot of time to be socially accepted because one accident could trigger stringent regulations. If many workers lose jobs and are unable to find new ones, the social and political pressures against automation could become significant. Humans may not want to adopt new technologies or work with automated products due to fears about job security.

IV. IMPACT ON THE MAJOR INDUSTRIES

A. AUTOMATION AND TRADING

Automation trading, also known as mechanical trading or algorithm trading. It creates particular software with the help of rules and algorithm and then it is provided to the wholesaler or the retailer. The software allows to trade according to existing market strategy [6]. It also checks the historical data of the company and which can be taken as reference for future investment. By doing so the risk of heavy losses is minimized. It also helps in minimizing human errors [7]. For an example the purchase of 100 shares will not be incorrectly entered as the purchase of 1000 shares.

As there is no such trading, in which 100% gain is achievable, but automated trading provides consistency according to the existing trading strategy and helps in minimizing losses [6]. It also allows the trader to trade various accounts and multiple strategies at one time.

B. AUTOMATION AND PROFESSIONAL EXPERTISE

Robots and machines have replaced humans in variety of fields and automation requires laborers with a higher skill set along with proper guidance. Today computer can do all the work smartly and precisely, but to check the algorithm, and correcting the errors, experts still need to interpret result and set proper goals [8]. The potential of automation is lower for the professional expertise, where people require direct contact with the experts. For example while consulting a lawyer for a court case the person needs to be in direct touch with the lawyer since robots can't express or understand emotions [9]. Rather than robots or machines replacing professional experts, we should see that how professional experts can better guide the implementation of automation.

Since the automated era is created by humans only, so if on one side there is fear of losing jobs then on the other side there is a valid necessity for the humans for the future automated era, as all the algorithm and rules which together makes a software is designed by a human, and for that

purpose expert advice (related to a particular field) is always needed.

C. AUTOMATION AND ARTS AND ENTERTAINMENT

The world of entertainment has grown tremendously, technically. Technology has not only influenced the IT sector, but it also has a great impact on areas like music, film making and entertainment related field. For example shooting flying sequence from drone is a primary element [10]. High-tech camera has improved the quality of films and documentaries. Not only the entertainment sector, but our daily lives are influenced by automation. Today people behind the screen are more good friends than the people in front of the screen. Different platforms on social media have brought the people of the world more close despite of being miles away.

The upcoming twist will be the artificial intelligent industry which will be good at writing novel code. It will be able to create virtual and visual experiences for individuals or groups; for example it will be writing movies and games for you [11].

D. AUTOMATION AND CUSTOMER SERVICE

There have been different saviors in the different eras of time. First there were stock brokers then came the era of computers and now is the age of data scientists. As the data scientist and engineers together create the automation age the upcoming era is of customer service empathy. In this era of automation empathy (the capacity of mutual understanding) is one of the most important things to keep in mind. Automation has created opportunity for humans to capitalize on empathy [12]. The involvement of empathy along with automation is of great advantage to everyone, no matter whether they are customer or retailer [13]. For instance, rather than making an appointment with your financial advisor, you can now rely instead on software algorithms for investment guidance at a fraction of the cost. Automation has the power to turn the customer's bad experience and can improve the interaction with the brand.

E. AUTOMATION AND MANAGEMENT

No doubt the upcoming era automation will be ruling the society, but still some sectors can't be fully automated like that of management. For the management purpose human brains as well as emotions are needed. For an instance in a company, 20% of the CEO's work can be reduced by automation and only 35% is of the managing people can be replaced by robots and machines [14]. Still there would be a vast reduction in the number of traditional employees as most of teams would be self managed. Some will benefit out of automation which have a fixed routine so they'll be having a more efficient managing system but if the routine

changes with the need or demand then there would be managers or mentors required to guide and teach the machinery to work or change the course of work according to the needs.

For high level of automation some prototypes have been created, for example iCEO (an automated management system) which automates the complex tasks by dividing it into small individual tasks, it then assigns these micro-tasks to different workers or machines. So scope of automation in management is also good but still the industries that were setups many years ago which still believe in human workforce for management.

F. AUTOMATION AND HUMAN EVOLUTION

Automation will be having a major impact on the evolution of the human body. For example, today CEO can monitor his employees sitting on a chair from his phone using GPS and camera. These adaptations are greatly affecting the eyes, neck and the spinal cord. Continuously sitting for longer period of time and looking at computer or mobile screens puts enormous strain on the eyes as well as pressure on spinal cord and vertebrae which in the longer run will result in rounded and short spine and our eyes may be more enlarged or bulging out [15]. The system powering the vision might undergo minor changes because of the augmented reality or virtual reality infected world.

With these problems human memory would be affected the most, in these automated environments the capability of retaining information will become extinct. For example after developing mobiles to stores contacts, the need for retaining phone numbers is no more needed. So eventually the processing that's required to memorize things will become weak and the brain functions that govern memory will adapt accordingly.

G. AUTOMATION AND CYBER SECURITY

These days, cyber attacks are really common, and fighting against these attacks is a great challenge. On one side where automation has made the work easy, on other hand it has challenged the security of the data the most. The more the data is stored in particular software, the more it has chances to be hacked, which can prove disadvantageous for the company [16]. If we can think of creating software which requires a higher skill set, then definitely other person with the same skill set can think of an algorithm which can hack it. The hackers will exploit the network until the data is crashed and different combinations of password are used to crash a particular website. The really good attacks manage to stay inside the software and notice the behavior before crashing them.

Today is the need of advanced threat detector. Even the best malware consists of data and algorithms, which can be detected. The cyber crimes are continuously developing and deploying. To fight against this, we need to fight intelligence against intelligence

V. CONCLUSION

Based on the research from the available resources and individual understanding we can conclude that automation has a great and positive impact on the society. Many people are afraid to enter into the new era of automation due to risk of losing jobs but jobs for humans can never become extinct as creation and maintenance of new technology will always need humans, only the skill set required changes with time and advancing technology. The era of automation will make the life easier and better for the people and will create more job opportunities which will just require a higher skill set. With the increase in automation around us, the risk of losing our data, money and privacy also increases, but if proper precautions are taken then it will decrease the extent of getting hacked a lot. The main issue of concern with the upcoming technologies will be our health and fitness, but these factors are in the hands of people. With the advancements around us, one must not forget that technology can only make our work easier or better but cannot make us better.

VI. FUTURE SCOPE

We can see that automation has vast scope in the near future in almost all the sectors. But still we can see some sectors can't be automated because robots can't replace humans everywhere. With reference to figure 2, the economy of India will be vastly affected.

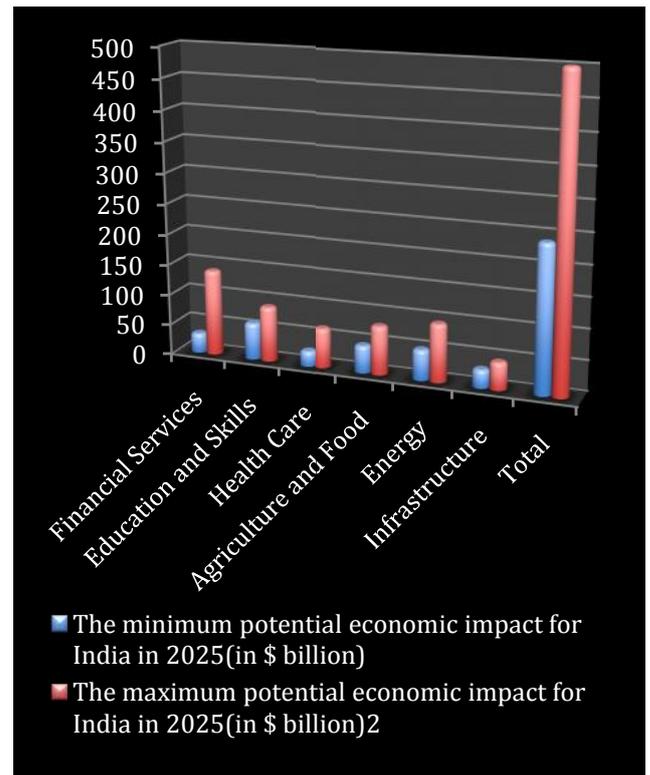


Fig. 2: Potential Economic Impact of Automation for India in 2025

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