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## **From STEAM to SENSORS : Socio-Economic Repercussions of Industrial Revolutions**

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If you look at human history you will notice that mankind has made tremendous progress after the dawn of industrial revolution (IR). It resulted into the development of many gadgets giving more comforts. It also resulted into development of transportation providing convenience of travel to long distances. Most important outcome of the industrial revolution has been the economic growth. The industrialized nation could produce things of daily needs more accurately and at a faster rate. Exporting these artefacts to other countries fetched good income to those countries. The Industrial Revolution made many countries strong enough so that they could think of colonizing other countries. Thus, IR has played a vital role in building the modern society. This paper deals with the stages of Industrial Revolution and its Socio-economic repercussions on human society.

The historical evidences show that industrial revolution began in Europe in the middle of 18<sup>th</sup> century. Somewhere near Birmingham (a city in United Kingdom located north west of London) people found coal on the surface of the earth. It was in the form of a black rock. But unlike other rocks it burned and produced both heat and light. As compared to the coal made from wood this fossil coal burnt steadily and gave a lot of energy. The British Engineering mind decided to make use of this fuel to heat water and produce steam. Steam, in turn, was used to run the machines. This is how the first rail engine was developed by Newcomb. This machine had some problems that were overcome by James Watt. The first engine made by James Watt is still displayed in "Think Tank" a science museum located in the city of Birmingham. Making of the steam engine resulted into the safe and cheap transport. More than that the steam engine could be used to run the machines in the factory. That resulted into good quality products in large numbers.

As the European people were reaping the fruits of first industrial revolution, they were given another tool to fuel the second industrial revolution. It took shape with the production of electricity in large amount. It was Michael Faraday from the Royal Society in London who made the first prototype of the generator. The work continued to provide a reliable supply of electricity and use it to run machines. Thomas Alva Edison in USA came out with Tungsten bulb that could



give out light using electricity. This invention enabled people to work for longer hours leading to higher production. Slowly electricity dominated all walks of life like transport, entertainment, communication, etc. Big thermal power stations were constructed throughout Europe to fulfil the growing demand of electricity. Now a days appreciable number of Hydroelectric power stations are also functioning. Recently Atomic Power stations and Solar Power stations are erected to augment the production of electricity. The present society has now so much dependence on the supply of electricity that one cannot imagine life without it.

The second World War began in 1937. Germany that started the war was making headway in all directions. United Kingdom was the worst hit country. Devastations in the city of London and around was phenomenal. There was a need to work out a new strategy to change the course of war. British decided to break the German Code. It was learnt that Rudolf Hitler gave orders to his military officers on the borders using the code language. This message was transmitted through radio signals. They decided to catch these signals and decode them. The data collected was huge and was difficult to analyze. A young mathematician from Kings College Cambridge named Alan Turing came to the rescue. Working at the Secret Office in Bletchley Park he designed the machine that could handle the data. This is how the first computer was born. It was a huge gadget made with the help of valves. The replica of the original computer made by Alan Turing is still displayed in Bletchley Park, Milton Keynes, United Kingdom.

The invention of Computer gave rise to the third Industrial Revolution. The valve computers were then replaced by Integrated Circuits (IC). This change brought down the size of the machine and increased the capacity to storage and process the information. The capacity to convert information into digital form resulted into Information Revolution. As the computing technology developed huge information could be stored and accessed whenever required through search engines. As the email facility was developed communication became fast and reliable.

We have five sense organs: Ear, Eye, Nose, Tongue and Skin. They provide information about sound, light, smell, taste and touch. The engineers wanted to mimic human sense organs and designed sensors. Discovery of sensors resulted into the fourth resolution. Our sensor organs give signals to our brain which analyses the information received and take the decision. An attempt has been made to mimic this natural process also. We are now at a stage where many production units are managed by a few workers with the help of robots. Internet of Things (IoT) is yet another technique based on the use of sensors. It is being practiced in different areas.

Can computers think? was a question raised by Alan Turing. He could not get the answer to his question in his life time. Nonetheless, technocrats pursued his line of thinking and taught computers to think by developing necessary computer programming. This is the beginning of an era of Artificial Intelligence (AI). Machines are taught to mimic human intelligence and take



decisions. There is of course a limitation to the capability of the machine as it has to act as per the instructions given to it. Nonetheless, it can achieve many things as a large number of decision-making processes can be conveniently encoded. One sees the use of AI in banking, rail/air reservations, disease diagnosis and space flights. Social media has started making use of AI in a big way. Hence when you mention the name of certain city in your message you get intimation about hotels in that city. ChatGBT is being launched as a search engine equipped with AI. The originators of this app claim that you will get a feel as though you are talking to an intelligent person.

Industrial Revolutions has a lasting impact social life. Successive developments have given rise to comforts and conveniences. Here are a few illustrative examples.

1. **Transportation:** The earliest mode of transport was by walk. Mankind then started taking the help of animals for transport. Horses and bulls were mainly used for this purpose. From that stage onwards we now have a luxury of choosing the mode of transport based on our urgency and our financial situation. You can travel by road using a car or take a train if the place is connected by rail network. You can use sea route if you wish to cross the sea. Air service has now become available in many cities if you can afford.
2. **Faster Communication:** Personal messaging was the only mode of communication available to the human society in the past. Messengers had to reach the place personally to give the message. There have been many developments in this area. The technological developments made available telegram, telephone, email, mobile phones, etc. to us. This development has resulted into fast communication. Now we are all connected. The entire world has now become a Global Village.
3. **Household Facilities:** Just look at the gadgets that we gave in our houses. Fan, Air-conditioner, Washing machine, Electric bulb, etc. are a few to name. If you peep into the kitchen, you will find a large number of gadgets like Microwave oven, Mixer and grinder, refrigerator, OTG (Oven, Toaster and Grills), etc. I have been often saying “My daughter’s kitchen is very different from my mother’s kitchen”. Availability of these instruments have simplified the tasks required for preparing food.
4. **Medical Diagnosis:** Earlier the medical doctor had to resort to the information given by the patient to diagnose his/her illness and decide the line of treatment. The doctor now has a large number of gadgets to help not only for the diagnosis of the ailments but also their treatments. Stethoscope, Thermometer, Blood Pressure Monitor are some of the gadgets that are handy to any doctor. In addition, hospitals make available gadgets like NMR Machine, ECG Machine, X-Ray Machine, CT Scan, etc. to aid the diagnosis.



An important outcome of Industrial Revolution has been the Economic Growth. The European countries that reaped the benefits of this revolution experienced a massive growth in their GDP. Even other countries that adopted growth model based on science and technology witnessed noticeable economic progress. This development had manifold effects on socio-political scenario. Firstly, it resulted into the polarization of human societies. The classification of countries as Developed, Developing and Underdeveloped, in my opinion, is a direct outcome of Industrial Revolution. The developed countries, in order to establish their supremacy, resorted to colonization of other countries. This resulted into a mass scale exploitation of underdeveloped countries.

One can see numerous benefits of industrial revolution. At the same time industrial revolutions resulted into some negative effects also. It would be appropriate to discuss some of them.

- 1. Human Relationships:** Industrial Revolution has resulted into the increase in longevity. People in general are now living longer. But the social bonds are getting broken. Families got broken as some members had to go to work in a factory. The social media and the Gadgets like television have created a barrier in personal relationships. Many families experience lack of dialogue among the members of the family and society. This is resulting into boredom for old people. Old age homes are to be established in large numbers to tackle this problem.
- 2. Pollution:** Every industrial development demanded fuel. To begin with it was coal. Then the dependence increased on oil and natural gas. These fossil fuels are being withdrawn from the earth's crust in large amount. There is a fear that these reserves would soon exhaust. Scientists and technocrats are looking for alternative sources of energy but there is no guaranteed solution in the problem yet. To fulfil the energy needs of the industry and houses these resources are being burnt in large amount. Burning of these fuels produce Greenhouse gases which in turn result into Global Warming. As the surface temperature rise the ice in the polar region melt increasing the level of water in the sea. It is feared that the towns and cities located on the sea coasts may get submerged if the same situation continues.
- 3. Ecosystem:** The industrial development had a lasting impact on the ecosystem. This planet is not made for only humans. It is the house for a variety of animals and plants. The forests are being destroyed to fulfil the need of mankind. It has resulted into the extinction of many animals for whom forest was their place of residence. The factories that were built in large numbers has been dropping their waste products into water bodies like lakes, rivers and oceans. Due to these toxic materials a large number of marine animals are dying. Establishing the proper ecosystem for all is a big challenge to face in modern days.



**4. Consumerism:** The production and availability of various items in the market has led to widespread consumerism. The items that are sold are to be beautifully packed to enhance their salability. In doing so a large amount of packing material are being used. There is no problem if this material is degradable. But usually, a non-degradable plastic is used for packing. This plastic is often thrown out irresponsibly. Collection of tons of dry waste is creating a big problem for local bodies. Many times, the plastic goes into the fields and water bodies causing further problems. At many places the single use plastic is banned. The law needs to be made applicable forcefully if one wants to achieve a positive result in a reasonable time.

In this paper we have tried to take a short journey into the different stages of Industrial Revolution and their positive as well as negative impacts on society. It must be remembered that we are not the owner of this planet. We are the trustees and we have a big responsibility to hand it over to next generation in a good condition. Hence, we need to look for methods of Sustainable Development. The United Nations Organization (UNO) has recently worked out Sustainable Development Goals (SDG). It has three main foci: Economic Development, Social Inclusion and Environmental Protection. Every citizen has a moral duty to follow the guidelines of SDG suggested by UNO.