

FOURTH INDUSTRIAL REVOLUTION: Its Role and Contribution in Employment Generation and Skills Development

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ABSTRACT

The first three industrial revolutions were all about the mechanization of production using water and steam power; electric power; electronics and information technology respectively. The Fourth Industrial Revolution (FIR) is the off-shoot of the digital revolution [the third revolution]. Exponential expansion through merging technology is what leads to the revolution at the fourth level. The effects of such revolution can be seen at all levels of production, governance and management systems. The work environment around the world is rapidly changing because of technological breakthroughs achieved in terms of the industrial revolutions. Therefore, the present study is trying to find out the role of the fourth industrial revolution towards employment generation and skill development across the world economies. Further, it evaluates the significance of the fourth industrial revolution in the present situation of the COVID-19 pandemic.

Key Words: Fourth Industrial Revolution, Employment, Skills, Sustainability, COVID-19

JEL Classification Code:

J21; J 24; O39

INTRODUCTION

The 18th century had been marked as the beginning of the industrial revolution with the invention of mass production through machine manufacturing tools and techniques and other developments like electricity, transcontinental railroad and cotton gin and steam power. Around the 1830s, the revolution of industries started in Britain and extended to other economies around the world. Further development to industrialization came in to effect during the 19th and 20th centuries and was referred to as the Second revolution in the form of advancement in automobile, steel and electric industry (History.com Editors,

2009). The Third revolution is on in a digital way while the fourth one is underway in the form of developments like big data analytics, robotics, artificial intelligence (AI), cloud computing, and the virtual world. Exponential expansion through merging technology is what leads to the revolution at the fourth level. The effect of such a revolution can be seen at all levels of production, governance and management systems (Mpofu and Nicolaidis, 2019).

Advancement of technology leads towards providing a golden opportunity for all kinds of economies around the world whether emerging, developing, or developed. It helps to achieve more and grow growth at a higher pace in a very short period of time. Though, there are some concerns associated with such advancement i.e., labor displacement due to more mechanization, increase in conditional work, and amplification of income and social inequality. Such concerns are always there since the inception of the industrial revolution but with the fourth industrial revolution, it can have some serious issues as rightly said by Robert Atkinson, founder of the Information Technology and Innovation Foundation (2016).

“Although artificial intelligence has become commonplace—most smart phones contain some version of AI, such as speech recognition—the public still has a poor understanding of the technology. As a result, a diverse cast of critics, driven by fear of technology, opportunism, or ignorance, has jumped into the intellectual vacuum to warn policymakers that, sooner than we think, AI will produce a parade of horrible effects: mass unemployment, abuse from “algorithmic bias,” the end of privacy, an atrophying of human agency, and even the destruction of humanity, as “Skynet” like machines decide the world is better off without us. Indeed, these voices have grown so loud, espousing a message that a click hungry media eagerly amplifies, that we are very near the point where these narratives may be accepted as truth.

But AI is like a shovel or a tractor: It is a tool in the service of humans, making our lives vastly better. And given the promise that AI holds for economic growth and societal advancement, it is critical that policymakers actively support its further development and use. The cost of not developing artificial intelligence or developing it more slowly will be enormous: lower growth in per-capita incomes, slower progress in areas such as health and environment, and reduced improvement of quality of a wide array of public and private goods and services.”

The fourth industrial revolution has led to the advancement of production processes, software and artificial intelligence leading to automation

of most of the tasks associated, signifying that the workforce can be replaced by machines like robots in industries, making displacement of jobs, the worst fear of the fourth revolution (Broy and Precht, 2017).

During the present situation of the pandemic COVID-19, all the countries around the world are getting affected socially as well as economically (UNDP, 2020). The numbers of cases are rising day by day with the rapid spread and there is no definite cure for the disease. The virus has changed the way in which people are living and working because of the restrictive movement measures such as lockdown conditions or social distancing (WHO, 2020). However, technology has come out as a savior in this pandemic situation as people are able to work from home or continue their businesses. Artificial Intelligence, Advanced designing Software, Internet of Things and other digital manufacturing technologies are some of the tools of the fourth industrial revolution that made the survival of the people and economy possible (Javaid et. al., 2020). Therefore, in the light of the above discussion, the objectives of the present study are to give an overview of the evolution of the industrial revolution from first to fourth; to find out the role of the fourth industrial revolution towards employment and skill development around various economies. Further, the study will highlight the significance of the fourth industrial in the present pandemic situation of COVID-19.

PERSPECTIVE FROM VARIOUS LITERATURES ON FOURTH INDUSTRIAL REVOLUTION

The work culture around the world is rapidly changing because of technological breakthroughs achieved by human beings. Various studies have been done to study the impact of the fourth industrial revolution on the work culture, future impact on organizations, societies, governments, etc. Manda, and Dhaou, (2019) found that there will be both opportunities as well as challenges at the economic and social level during the fourth industrial revolution. The role during the whole transformation will be very crucial. Also, digital transformation if applied correctly will lead to an inclusive growth (OECD, 2018). The accomplishments of this revolution for all the sectors of an economy will depend on the leadership shown from them while utilizing the opportunities and tackling the challenges. For instance, political leadership will play a significant role in achieving an environment that is conducive for innovation and digital transformation, while social leadership will play a vital role in building a think tank for business leadership and making society ready for the change.

In addition to the above, they suggested that collaboration will be a critical factor to ensure the triumph of the fourth industrial revolution (Renjen, 2019; Cortellazzo, Bruni and Zampieri, 2019). Rabana, (2018) said that the fourth industrial revolution has the prospective to develop inclusive and sustainable growth with the equal possibility to deteriorate the economic prosperity. The author suggested that at the national level the government should try to dynamically alleviate the adverse impact of the revolution and through coordinated efforts leverage opportunities in both short as well as long-term. Further, the fourth industrial revolution can no longer be ignored; it is going to affect everyone. Human beings have to persistently enhance their skills to survive as there will be a shift in knowledge, wealth and power during the fourth industrial revolution.

The fourth industrial revolution will rapidly adopt automation through robotics, artificial intelligence, and machine learning advances leading to change in the demand for workforce and forcing the displacement of jobs (Brynjolfsson, McAfee, 2011). The growth of the fourth industrial revolution is sprouting at a high pace and it will change the way people work, communicate and live. To survive in this changed and competitive environment, people have to be deliberate towards acquiring and learning knowledge about the technological skills (Marr, 2018; Hinton, 2018). This will help them to survive in the competitive environment created by the fourth industrial revolution. The technological advancement, in high income economies, leads to income realignment with gainers and losers as there will be an increase in demand for the skilled workforce (gainers) and demand for lower-skill workforce (losers) will decrease. The structure of the job market will change as there will be a great demand for jobs at low and high ends, while those at the middle will see slow disappearance (Schwab, 2015). During the fourth industrial revolution, estimated by the Organization for Economic Cooperation and Development that 50 to 70 percent structure of various tasks will get changed and this will lead to automation of 9 percent jobs and change in the structure of 25 percent jobs significantly.

Further, technological advancement will result in putting risk to various cognitive, white-collar analytical jobs, and intellectual jobs (Arntz, Gregory and Zierahn, 2016). Cantor (2016) finds out that the introduction of new technology has led to an increase in aggregate productivity and standard of living of the people around the world, however, its advent always brings some issues to be concerned in relation with the unemployment generation. For instance, in the past, about 80 percent of the workforce in the United States is in the primary

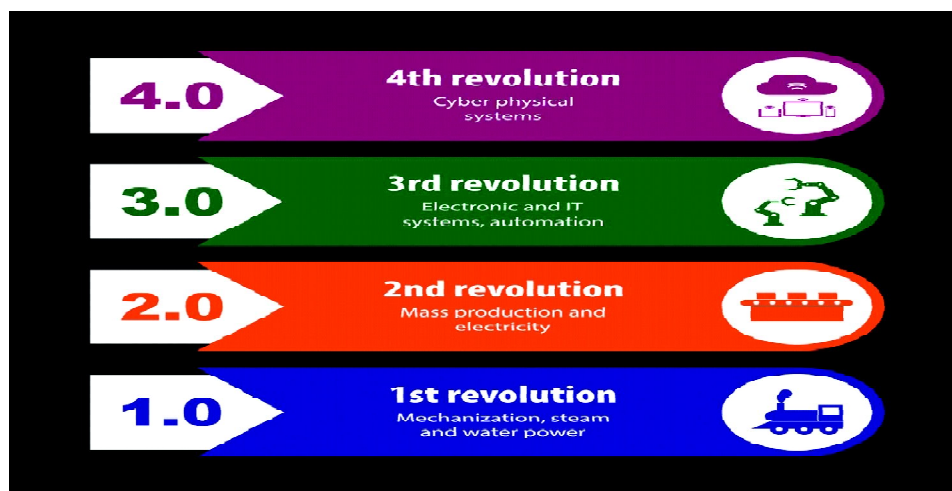
sector but presently its share has declined to 2 percent because of the technological advancement in the sector leading to better growth over the time with more variety and improved level of productivity. The outcome of the technological advancement will mostly depend upon the humans in terms that how they are going to handle the change. The utmost responsibility will lie upon the policy makers and developers in minimizing the risk involved for the society at a large. Therefore, the significance of the present study is explained in terms of the origin, progress or advancement, and impact of the industrial revolution in the subsequent sections.

INDUSTRIAL REVOLUTION: FIRST TO FOURTH

The industrial revolution is the process of change from the primary sector (agriculture and handloom) to the secondary sector (industrial) which is highly influenced by production through machines.

The process of mechanization is the emergence of the first industrial revolution (1760 to 1830), which replaced the primary sector with the secondary sector and leads to a change in the fundamental economic structure of various activities in the society. A new type of energy was created with the invention of the steam engine and coal extraction. In this revolution, there is a further development of railroads. Mass extraction of coal along with the invention of the steam engine created a new type of energy that trusted forward all processes,

Figure 1: Industrial Revolutions (18th to 21st Century)



Source: Encyclopedia Britannica © Vectimus/Shutterstock.com

thanks to the development of railroads and the stepping up of human, economic and exchange of material.

The second industrial revolution started during the late 19th and 20th centuries. In this the industries started utilizing various natural and synthetic resources like oil, gas, and plastics, also tools and machines started getting in an advanced form. Further, there has been the development of computers which lead to the automatic factory. There has been an increase in the demand for steel leading to the development of the steel industry. A revolution has been also seen with the invention of the telephone and telegraph; automobile and plane at the starting of the 20th century (Sentryo, 2017). With the discovery of nuclear energy and the rise of electricity in the mid of 20th century, there has been an emergence of the third industrial revolution. In this revolution, 3D printing, advance computers technology, biotechnology, and space research also developed.

Table 1: The Five Patterns of Fourth Industrial Relation

Autonomy	self-driving vehicles; drones; space exploration; blockchain
Hyper connectivity	internet-of-things; social media; wearable technology
Adaptability	app computing; virtual/augmented reality; 3-D printing
On-Demand	cloud computing; ubiquitous mobile search; streaming media
Renewability	clean energy; smart cities; electric vehicles; organic/fair trade; circular (recycling) and greener economy

Source: Dane Rook , Adam Salvatori , John van Moyland , and Paul Rosa b (2017) as cited in Lekhanya (2019)

Presently, the fourth industrial revolution (Table 1) is leading towards digitalization with the growth of various technologies such as internet of things, cloud computing, 3D printing and artificial intelligence, biotechnology, genomics, etc. In this, the main aim is to have a real-time interaction through connecting all production activities. The impact of all the industrial revolutions has shown both positive and negative sides to various stakeholders around the world.

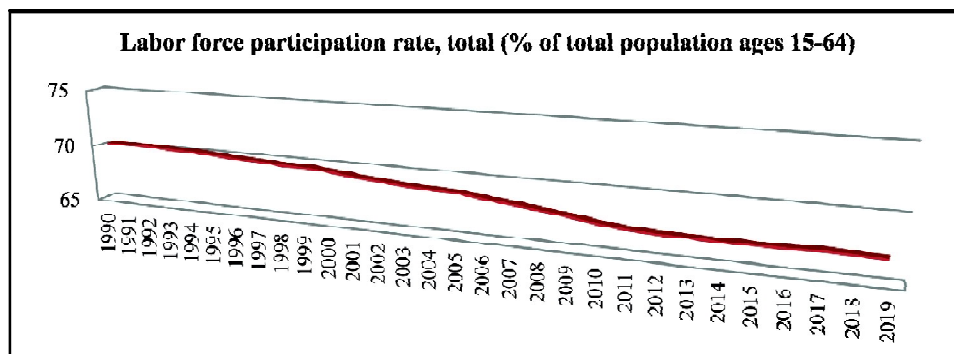
Industrial revolutions have helped various nations in coming out of poverty and become richer; however, there are certain global challenges that aroused due to the unfair distribution of the associated advantages (Schwab, 2015). The fourth industrial revolution has presented opportunities in the form of productivity enhancement, surplus to consumers through cheaper goods availability, increase in demand, further capacity development, and employability. However, loss of some specific kind of jobs, spreading inequality in terms of

being beneficial for skills and capital owners are some of the challenges of the fourth industrial revolution (AfDB, ADB, EBRD, IDB, 2018).

IMPACT OF FOURTH INDUSTRIAL REVOLUTION ON EMPLOYMENT AND SKILLS DEVELOPMENT

As the work environment, today is technologically advanced, jobs now require new and more advanced skill sets and competencies. Fourth Industrial revolution make the job prospects a little more complex through the evolution of technology-enhanced work which will require the future workforce to have proficiency in lifelong learning and digital capacities. Till now, the areas in which the automation has not been achieved or is tough are persuasion, capabilities, creativity and intuition (Frey, Osborne, 2013). Table 2 shows the labor force participation rate during different phases of industrialization. It indicates a declining trend in the participation of the workforce from 70 percent in 1990 to around 66 percent in 2019.

Table 2: World's Labor Force Participation Rate



Source: World Bank Database (2020)

According to the report by the World Economic Forum (2016), the technological advancement leading to the changes in the labor will lead to a loss of more than 5.1 million jobs from 2015 to 2020. It further says that 7.1 million jobs will be lost in white collar office functions which are of the routine like administrative and office jobs while there will be an addition of 2 million jobs in mathematical, architectural, engineering, and computer-related jobs. One of the main concerns of the job loss is it leads to an increase in social and economic inequality. Other than the loss of job, the digital divide and weaker social mobility will also lead to inequality (OECD, 2017). The Fourth industrial

revolution in terms of digital technology will affect the retailing and media industries in the same way as handlooms were affected by the cotton mills (The Economist, 2012). It will spread the office culture more than the factory floor culture by providing opportunities to professionals, creative designers, IT experts and other similar jobs, where more advanced skill sets will be needed. Not only the growth of things but also the location where the thing is to be developed will be affected by the fourth revolution same as the third revolution.

According to a study by OECD (2017), the fourth industrial revolution has shifted the demand for the workforce to services sector from manufacturing in advance economies. Further, various studies through empirical analysis shows that the fourth industrial revolution has not led to the high amount of unemployment rather it resulted in restructuring as the decrease in the cost of information technology decreases the demand for output per unit, however, it continuously provided new products at lower cost leading to increase in aggregate demand and increased employment. Therefore, in a short run there might be job loss but in the long run because of the productivity spillovers and gains of aggregate income, there will be an increase in job opportunities (Gregory et al., 2016; Autor and Salomons, 2017; Dauth, et al., 2017). In the past revolutions, change leads to the growth of income and the demographic structure helped in the strengthening of the fiscal arrangements and growth of the emerging or developing economies. However, the scenario is changing with a decline in the need for workforce and most of the skills needed at the medium level are at the fear of automation. So, if the economies wants to achieve the best out of the fourth industrial revolution, the concerns in the forms of risks like digital media misinformation, unemployment, cybersecurity threats, economic and social inequality should be recognized in time and policies should be framed accordingly (Schwab, 2015).

FOURTH INDUSTRIAL REVOLUTION AND COVID-19

Towards battling against the pandemic COVID-19 for millions of people around the world, the fourth industrial revolution has emerged as a blessing in disguise (Walsh, 2020). Globally, when all countries are getting affected health wise along with financial devastation for sectors like travel, hospitality, and retail, there are still segments of businesses which are making possible the concept of work from home. The impact of coronavirus has less effect on a certain types of jobs linked with automation, cloud computing, internet of things, and artificial intelligence (Miller, 2020).

Further, many economies around the world have relied on the technologies of the fourth industrial revolution as a tool to handle the situation of COVID-19 (JLL Research & Strategy, 2020). For instance, Taiwan has applied tools like mobile tracking, extensive screening protocols and big data analytics to predict and track the spread of the virus. Similarly, South Korea, Singapore, China, and some other economies are also using Artificial Intelligence models for clinical, personal, and travel assessment to keep track and diagnosis of COVID-19. Challenges in the array of socio-economic, epidemiological, and biomedical can be addressed with the help of the versatility of the AI or machine learning. However, ethical concerns can be raised in the form of lack of public trust, privacy, inequality in the form of discriminatory or biased outcomes, civil liberties, and autonomy (Leslie, 2020). Therefore, the proper execution of the fourth industrial revolution's tools will be the key to have a better response against COVID-19 (Walcott, 2020).

CONCLUSION

Therefore, the first three revolutions are all about the mechanization of production using water and steam power; electric power; electronics and information technology respectively. Moreover, the Fourth Industrial Revolution is evolving from the digital revolution which started in the third revolution. The fusion of digital, physical, and biological subjects will be visible in the fourth revolution. The impact of the fourth industrial revolution will affect the employment level in the same way as the previous three revolutions, however, the nature of skills set required in this revolution are of more intellectual and creative types of jobs in the areas like quantum computing, nanotechnology, biotechnology, autonomous transportation, AI, genomics, aerospace, robotics, etc. There are various factors like demographic structure, the structure of the economy, international trade scenario and openness for adaptability, which will define the sustainability of an economy in the fourth industrial revolution. Further, the organizations should create an environment in which they should be able to provide facilities for skill enhancement of their present employees and build an edge for strategic competitiveness.

To know whether the benefits of this revolution are more than the costs involved in terms of employment generation and equality at both social and income level, the reforms taken and policies framed by the leaders (government, organizations and developers, stakeholders) of a particular economy will play a significant role. There are multiple dimensions associated with the outbreak of

an infectious disease like COVID-19 at global, national, and regional levels which leads to building the base for various transformations in the health as well as technological developments. The evolution of various techniques under the fourth industrial revolution has already come out as a savior with effective tools to fight the virus from both social and economical aspects. Additional positive results of the industrial revolution in the future will mainly depend upon the effective the utilization of the tools and techniques by the concerned system.

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