

Navigating the Future: The Dual Impact of Automation on Industry Efficiency and Employment

Debabrata Das

Research Scholar, Department of Information Technology
Sunrise University, Alwar, Rajasthan, India

Abstract: *It is difficult to say if industrial automation will benefit or hurt business and workers. We cannot fathom industrial life without automation and technology. Today, many developments are taking place in industrial sectors to increase productivity and efficiency in daily operations. Automation is crucial to the industry's ability to adapt to globalization, but it also has the potential to replace humans in the job. Therefore, this study paper attempts to focus on both the features of industry automation, including job insecurity, new task handling skills upgrading in accordance with automation requirements, and technological advances in the industrial sector. While automation can be a boon by making processes simpler, quicker, and faster with a minimal chance of death, it can also cause stress, worry, and despair, which can endanger employees' health and safety at work. Therefore, is it a curse for workers to understand the effects of automation and how industry may balance the usage of human-machine interaction for all such things? This study is crucial.*

Keywords: Industry, Automation, Positive Impact, Negative Impact, Employee

I. INTRODUCTION

One of the most crucial elements of production, operations, manufacturing, and process control is industry automation. Just as it is hard to imagine a modern world without multimedia, it is also impossible to imagine a corporation or an industry without automation. Automation and robotics improve efficiency, security, and usability, but they also have an indirect impact on worker wellbeing and the human workforce. In the 19th century, automation advanced to the point that it would eventually replace human interaction in industrial processes. Based on that scenario, we can forecast the day when the office would be completely occupied by machines. Managing the significance of both people and machines in the workplace is the most difficult assignment. For example, according to research by Oxford economists, automation might result in the loss of up to 47% of all US jobs.

Automation is spreading quickly across many industries, which affects both employers and workers. Highly qualified and skilled executive and supervisory staff may benefit from automation on occasion since it may enable them to finish tasks before the management deadline. Workers can also benefit from automation, robotics, and other technologies and devices when doing high-risk tasks including handling huge, necessary materials, working in furnaces and foundries, and assembling goods. Automation can improve worker safety and reduce physical strain. Employers can gradually lower wages, productivity demands, and hazards in dangerous areas like accidents and safety. They can also work more efficiently to achieve the objective or target and to survive in the competitive, globalized world of today. Productivity and output can be increased with well-designed automation. (2019, Scott Technologies Ltd.).

Definition:

Automation:

The Oxford English Dictionary (2006) defines automation as "automatic control of the manufacture of a product through a number of successive stages; the application of automatic control to any branch of industry or science; by extension, the use of electronic or mechanical devices to replace human labor."

Automation, according to the encyclopedia Britannica, is "the application of machines to tasks that were previously performed by humans or increasingly, to tasks that would otherwise be impossible." Automation typically refers to the incorporation of machines into self-governing systems, whereas mechanization sometimes refers to the straightforward substitution of machines for human labor.

Employees

According to the Fair Labor Standards Act, "any individual who is employed by an employer" is considered an employee. According to the Act, "employment includes to suffer or permit to work." According to the American Heritage Dictionary, an employee is a person who works for another in exchange for pay or other benefits. (English Language Dictionary, American Heritage, 1978).

That's what the Black's Law Dictionary said. Whether stated explicitly or implicitly, employment contracts define an employee as "a person in the service of another where the employer has the power or right to control and direct the employee in the material details of how the work is to be performed." Campbell, Henry

II. LITERATURE REVIEW

Dauth, W., Findeisen, S., Wößner, N., & Südekum, J. (2017) The Impact of Industrial Automation on Employees They claimed that workers with lesser levels of education and skill must survive in order to find employment, and that automation of manufacturing may have an impact on jobs.

"The workforce of the future should need to focus on new ways to apply leverage skills so workers can add greater value," writes B. Rossi in *Man vs. Machine: Productivity, Creativity, and Job Creation* (2015). This generation of workers may be characterized by occupations that use and analyze data and intelligent devices. It all comes down to altering our understanding of what is most crucial and crucial for us to concentrate on throughout our lives. According to him, automation has the most impact on workers' mentality, which can lead to stress since they feel less valuable and less capable of utilizing new technologies.

The 2017 paper "Advanced industrial robotics: Taking human-robot collaboration to the next level" by Carlos Hinojosa and Xavier Potau. The author of this research looks at how human-human conflict is replacing human-robot conflict as a result of the increasing use of robots in industry. Workers must adapt to changes such as human-robot collaboration and the impact of "botsourcing," or the replacement of human labor by robots.

In the 1980s, President Kennedy expressed concerns that computers would lead to job losses when he stated that "automation... is replacing men" (Keynes, 1930; Economist, 2017).

According to Arntz, Gregory, and Zierahn (2016), just 9% of OECD jobs are automatable on average and human oversight was necessary for every task. Automation has a direct and indirect impact on employment in terms of pay, benefits, and other compensation plans.

Companies still need human labor to supervise automation, even though they may adopt job rotation, job enrichment, and other strategies to keep workers engaged (S. Kiesler and P. Hinds, 2004).

III. METHODOLOGY

Using secondary data and a descriptive research design, this work attempts to draw attention to the problems and effects of automation on a number of areas that have been brought to light by earlier academics and practitioners. The research method included authors from a variety of businesses, nations, and publication years, and many articles have been assessed for their scholarly contributions on the effects of automation.

Automation's Effect on Industry

The sector makes significant investments in business automation, and the use of these technologies significantly affects how companies operate, how human resources behave, how organizations are structured, and how effective and profitable they are (Nikhil Kumar, 2014). Robotic automation has a big impact on economic growth. A 1% increase in robotics investment is linked to a 0.03% long-term improvement in GDP per capita. Ceber (2017). Yield enhancement is one advantage of automation, although the extent of this advantage varies greatly based on the user (McKinsey 2017a).

According to PwC (2018), new technologies are creating a wide range of new jobs, some of which are directly or indirectly tied to them. Automation and technology will increase wealth, earnings, and productivity. Additionally, it results in income expenditure and labor demand. The following are some of the ways that automation is affecting different industries:

- Productivity
- Yield & Quality

Productivity & Profitability

Zierahn, Gregory & Arntz (2016), stated that production plays a vital role in increasing wages, overall employment, demand, affecting overall sector economy. Due to Robotics and automation productivity gains not only at company level but at both industry and national competitiveness.

Even after financial crisis in US manufacturing industries both production and productivity steadily risen with the growing robotic and automation (PwC 2016). According to (Graetz and Michaels 2015), there is a relation between productivity, Company competitiveness, increased demand for which automation and robotics plays a significant role. During the time period of 1993 & 2007, microeconomics research had carried out by using data from 17 countries of 14 industries, the study found that, Robot utilization in the industry for this country results average GDP growth rates by 0.37% points and productivity growth rate by 0.36% points. These numbers show that 12% of total GDP growth and 18% labor productivity growth for those 17 countries where robotization is used. Hence it is found that robot and automation have positive impact on productivity and GDP growth.

Yield & Quality

Automation and technological innovations and advancement leads to the improving long term increase in efficiency and productivity which leads to the improve yield and quality. Technological adoptions result in dropping of cost of transport and communications, logistics and global supply chain become more effective and faster all these will open new market and beneficial in economic growth. Industrial revolution also lead to yield great inequality due to net displacement of workers by machine (Schwab, 2015).

Due to digitization growth, low skilled and low job workers will be replaced by higher skilled and higher paid job which results in improving quality of life also it lead to social tension (Wolf,2015)

The fourth industrial revolution in manufacturing sector is having impact both positive as well as negative, it can raise income level by new innovative technological ideas, it will also helpful in improving quality of life by satisfying consumers demand by new innovative ideas implementation by using fourth industrial revaluation. It is quite easier task to improve quality and yield of industry and improve employee efficiency and performance around the world (Jee,2017).

Impact of Automation on Employees

According to McKinsey Global Institute it was found that, work activities and task due to the implementation of automation and advance technologies almost 46% of time spent on work activities due to the employees for completing particular task can be reduced. While on other hand it will affect employment, wages and salary of people in the labour market, as coin has two sides similarly automation impacted employees as well as employer in both the manner. Automation might contribute to work load on employees but it can be also helpful in reduction of physical exertion and repetitive task (Levert and Hery, 2018).

Job

Employment and wages are mostly affected by industrial robotics, the evidence for that U.S local labour market that were relatively exposed to industrial robotization resulting in great falls in employment and wages level between 1990 & 2007 (Acemoglu & Restrepo 2017). Where Berg et al. 2017 developed a model, which generates short run gains for skilled worker and capital owners but in long run, impoverished those who are unable to invest in labour and automation. Bessen (2016) has argued in his research, automation leads to the job and task reallocation instead of job substitution in which robots are just a complement for a human, labour for performing routine, hazardous, dangerous

task. Due to automation impact higher skilled employee gets a premium in the sector, while lower skilled labours get a new job in other sector. Finally, he proven in his research that automation doesn't cause net loss of job instead it results in substantial re-allocation of job from one sector to others. There is a positive co relation between Automation and job (Gregory and Arntz 2016).

David Autor (2015) quoted that, automation is a great substitute for higher labour demand. Human labour and automation combination are complementing to increase productivity and rising earnings of the industry. Labour oriented, labour intensive and cognitively labor demanding task are quite eliminating and diminishing due to robotics and automation adaptive nature of industry for comparative advantages (Ford Martin 2015)

Health and Safety:

Construction industry have countless dangerous and clumsy environment everywhere which leads to poor and unsafe working condition at site. Also due to the workers fatigueness caused by physical exertion and human errors may lead to construction accidents. Hence in order to avoid health problems and safety issue various types of robots are developed (Li, R.Y.M 2015). Handling a heavy material with accuracy is difficult task and have ergonomic issue, so Sigma ergonomics suggested to design such ergonomic tool arm to move easily heavy material. The arm relies of spring tension to balance the tool weight for sanding, riveting, drilling etc. For example, the EKso Bionics Zero G arm can hold the weight up to 19kg and balance, so it allows to operate accurately, freely and safely easy movement with load in any direction without Robots and automation are used on site for structural, maintenance work, window panel installation and under water construction work, which can do high hazardous work and save labor cost. Wearable robotics fastens reduce workers lower body stress which make them to work more efficiently and avoid accidents due to fatigue. (R.Y.M.Li and D.P.L.Ng.,2018)

Skill and technical knowledge

In a recent trend decrease in middle skilled, middle-income jobs which integrate with wage inactiveness. Due to those chances of increased in inequality income. A Economist Maarten Goos, Alan Manning & Anna Salomons (2014), in his study of labor market polarization in selected OECD countries in 1993 & 2010 found decline in hours worked by middle skilled labor by 5-15% points. Automation results in increasing demand for higher skilled category as compared to lower skilled labor. However, the Category of Middle skilled, middle income covers a wide range of jobs & associated skills sets & although jobs in the category are diminishing overall. For example, middle skilled jobs in health care, mechanical maintenance and repair and some services are frequently growing as are skill needs within traditionally unskilled jobs. For that employer struggling to fill demand (Holzer 2015).

Economists Guy Michaels, Ashwini Natraj & John Van Reenen (2014), quoted that there is a positive correlation between growth in ICT (Information & communication technology) use & demand for high skilled labour.

Deloitte LLP (2015) stated that, many high skilled jobs order a wage premium, for instance in UK higher skilled jobs replaced by lower skilled ones by paying £10,000 more per annum, results in addition of £140 billion to the UK's economy.

Positive Impact of Automation

Major two reasons for acquiring technology & Automations are increasing productivity and improving occupational safety by handling hazardous task at the workplace. Technology and automation are able to defend the technologically driven job loss, numerous growing inequalities in skill, education, income & investment capability. (Berg, A., Buffie 2016).

Technology mainly focus on change in task content perform by labour instead of job displacement, it tries to create new job for maintaining balance in labour market. (Vivarelli, Marco 2012).

According to International institute of substantial development automation not only provide employment but yield employees health & safety benefits. For example, in the mining industry it is accepted that automation provide safety benefit to labour working in the mining industry (2016).

International federation of Robotics 2017 quoted that due to Robotization in automotive industry in the U.S. 52000units of operational industrial robots were added in between 2010 and 2016, during the same period 260,600 jobs were

added in the same sector. Similarly in German automotive industry, which is well known for its robot density (300 per 10,000 workers) and 72313 jobs were added between 2010 & 2016 (date from EUROSTAT, 2018).

New technologies are a creator for many new jobs. Some are directly related while some are the result from increasing productivity, income, wealth, profit, yield demand which rises due to new technologies (PwC 2018). Automation could increase productivity globally by 0.8 to 1.4% annually (McKinsey 2017a). Small increase in robot productivity can increase the output tremendously when robot and human are close substitute (Berg and Zanna 2018).

Negative Impact of automation

Worldwide in manufacturing and service sector automation replace routine task job content while on other hand it creates non-routine cognitive manual task jobs. (Michaels, G. 2014). By various study it is found that the most likely negative impact is on employment, lowering of wages, opportunities for low skilled worker. As technology eliminates and displace millions of jobs in manufacturing sectors and services (Rifkin, J. 1996).

An intermediate product is produced by machine and unskilled workers and the combined for final output with skilled labour. However, machine and unskilled workers are relatively convertible compared with intermediate product and skilled workers. An increase in machine productivity can replace the unskilled labour and reducing its wage. Finally result in improvement in machine productivity in turns creates effects for the things that occur at same period of time and future young that are remarkably bad for the chosen parameters. (Zeira, Joseph 1998).

A small innovation in machine technology (e.g. improved software) increases machine productivity which results in reduction in marginal productivity of low skilled workers while increasing the marginal productivity of high skilled labour. It has effect on not only increase in the income gap between skilled and unskilled workers but also has a generational effect, increasing the income of older generation while lowering the income of young. this effect occurs because old have gather physical and human capital while young are endowed with unskilled labour. For employer generation distribution has a knock-on effect on national savings, workers, and increased investment in capital intensive technologies. (Kotlikoff, L.J and Sachs, J.D. 2012).

Technology and automation affect the labour by changing the job mix and skill demand. It should be noted that technological acquisition under Industry 4.0 in advanced industrial economies has been driven by cost benefit analysis of accessible technology and high skilled labour force. (Vashisht, P; and Dubey J.D. 2018). Skill gap across the labour force suggested that significant re-skilling and up-skilling require by acquisition of cyber physical system to meet the potential shortage in highly skilled professionals (Chandrasekhar C.P. 2008).

The potential displacement impact of automation and technology will increase global incidence of physical and mental health issues that are connected with unemployment and job anxiety. (Lafrance, Andrienne 2015).

Many companies won't be able to acquire automation through business-as-usual approach to skill development. Automation and technology require a shift in mindset. To manage a shifting labour market and technological landscape, companies will have to increase dexterity. For that companies have to commit continually reskilling their workforce, installing a lifelong learning mindset and digital skill development by using digital resources. These changes require not only by automation but also because of shifting labour demographic. (Accenture 2017).

Journalists and even expert stated that Automation does indeed replacement of labour. And extent of machine substitution for human labours and ignores the strong complementarity between automation and labour that increase productivity, gain earnings, and increase demand for labour.

Automation Forecasting Effects on Industry and employees: -

Since from 1998, it has reported by ICRIER on the manufacturing task content in the jobs of Indian industries has been rapidly automated. Which can create a big tension, pressure and built a stress on employees, resulting disturb individual wellbeing. With past decade, it was observed that routine and non-routine task which were mainly depends on dexterity is decreasing with the increase of analytical and cognitive task. "World Economic Forum 2016" predicted that, as many as 2 billion global jobs can be replaced by automation by 2030. It can be a curse for the employees which are lower paid, lower skilled & less educated. Automation impact is uneven on different sectors, different level employees as every sector and every automation technology skill requirement is different for different task. Hence the impact can't be analyzed or predict by studying one sector or single kind of automation. Thomas Frey (2012), stated that 2 billion

jobs could be automated by 2030 worldwide. McKinsey (2017b) illustrated the jobs automated number should be 400million to 800 million.

Graetz & Michaels (2015) reported that, there is no link in between the use of robots and job loss for the studied countries in 1996 & 2012.

III. CONCLUSION

We cannot expect industry growth in this digital age without automation and digitization. Nothing will be a curse for employers and employees when technology and automation are used in conjunction with human skill and expertise. In this innovative environment, automation can be utilized to increase worker quality and efficiency, prevent dangerous and risky tasks, boost production, and assist in achieving industry goals. One can increase one's knowledge and abilities to keep up with globalization and competition rather than lamenting one's disadvantage. Employees, employers, and the industry are all greatly impacted by automation, but how individuals respond to it depends on their perceptions. Lastly, because automation is designed, programmed, monitored, and managed by humans, it cannot fully replace the human labor; rather, it can assist manpower in increasing productivity and preserving work-life balance while allowing industry to expand in response to market demands.

REFERENCES

- [1]. Acemoglu, D., and Autor, D. "Skills, tasks and technologies: Implications for employment and earnings." *Elsevier Handbook of Labor Economics*, 4 (2011).
- [2]. Acemoglu, D., and Restrepo, P. 2017. "Robots and Jobs: Evidence from U.S. Labor Markets." March 2017.
- [3]. Accenture. "Harnessing Revolution: Creating the future workforce." Accenture (2017).
- [4]. Autor, D. 2015. "Why Are There Still So Many Jobs? The History and Future of Workplace Automation." *Journal of Economic Perspectives*, Volume 29, Number 3.
- [5]. Berg, A., Buffie, E. F., and Zanna, L. F. "Robots, Growth, and Inequality: Should We Fear the Robot Revolution?" *Finance & Development*, IMF (2016).
- [6]. Berg, Andrew, Buffie, E. F., and Zanna, L. F. "Robots, Growth, and Inequality: Should We Fear the Robot Revolution?" IMF, 2017.
- [7]. Bessen, J. "How Computer Automation Affects Occupations: Technology, jobs, and skills." *Law & Economics*, Boston University School of Law, 2016.
- [8]. Black, H. C. *Black's Law Dictionary*. St. Paul, MN: West Publishing Co, 1991.
- [9]. Centre for Economics and Business Research (Cebr). "The impact of automation – a report for Redwood" (2017).
- [10]. Chandrasekhar, C. P. "Revisiting the Policy Environment for Engendering Employment Intensive Growth." Background Paper prepared for the International Labor Office, New Delhi (2008).
- [11]. Deloitte LLP. "From Brawn to Brains: The Impact of Technology on Jobs in the UK" (2015).
- [12]. Executive Office of the President. 2016. "Artificial Intelligence, Automation, and the Economy." December 2016.
- [13]. Ford, M. *Rise of the Robots: Technology and the Threat of a Jobless Future*. New York, 2015.
- [14]. Frey, T. "2 Billion Jobs to Disappear by 2030" (2012).
- [15]. Goode, L. "Everything Is Connected, And There's No Going Back." *The Verge*, 2018.
- [16]. Goos, M., Manning, A., and Salomons, A. "Explaining Job Polarization: Routine Biased Technological Change and Offshoring." *American Economic Review*, Vol. 104, issue 8 (2014).
- [17]. Graetz, G., and Michaels, G. "Robots at Work." *Centre for Economic Performance*, 2015.
- [18]. Holzer, H. "Job Market Polarization and U.S. Worker Skills: A Tale of Two Middles." *Brookings Institution*, 2015.
- [19]. IBA Global Employment Institute. "Artificial Intelligence and Robotics and Their Impact on the Workplace" (2017).
- [20]. International Institute for Sustainable Development (IISD) and Columbia Center on Sustainable Investment Center. "Mining a Mirage" IISD and Columbia Center on Sustainable Investment, September 2016.

- [21]. Jee, Y.-S. "Exercise Rehabilitation in the Fourth Industrial Revolution." *Journal of Exercise Rehabilitation*, 13(3): 255-256, (2017).
- [22]. Kamath, A., and Sharma, R. K. "Robotics in Construction: Opportunities and Challenges." *International Journal of Recent Technology and Engineering (IJRTE)*, ISSN: 2277-3878, Volume 8, Issue 2S11, September 2019.
- [23]. Kotlikoff, L. J., and Sachs, J. D. "Smart Machines and Long-term Misery." *NBER Working Paper* 18629 (2012).
- [24]. Kumar, N. "Impact of Business Process Automation on Human Resource Management," Vol. 3, Issue 3, ISSN 2250-1991, (2014).
- [25]. Lafrance, A. "Self-driving Cars Could Save 300,000 Lives per Decade in America." *The Atlantic*, 29 September 2015.
- [26]. Levert, C., and Hery, M. "Will Technology Improve Health and Safety at Work?" (2018).
- [27]. Li, R.Y.M. *Construction Safety and Waste Management: An Economic Analysis*. Springer, Germany, 2015.
- [28]. Li, R.Y.M., and Ng, D.P.L. "Wearable Robotics, Industrial Robots and Construction Worker's Safety and Health." *Advances in Human Factors in Robots and Unmanned Systems*, vol. 595, pp. 31–36, 2018.
- [29]. McKinsey Global Institute. "A Future That Works: Automation, Employment and Productivity." McKinsey Global Institute, January 2017.
- [30]. McKinsey Global Institute. (2017a). "Jobs Lost, Jobs Gained: Workforce Transitions in a Time of Automation."
- [31]. Michaels, G., Natraj, A., and Van Reenen, J. "Has ICT Polarized Skill Demand? Evidence from Eleven Countries Over 25 Years." *Review of Economics and Statistics*, 96(1) (2014).
- [32]. Oxford English Dictionary. "The Oxford English Dictionary." *Oxford University Press*, URL: oxforddictionaries.com.
- [33]. PwC. 2016. "Upskilling Manufacturing: How Technology is Disrupting America's Industrial Labor Force." Price Waterhouse Coopers in conjunction with the Manufacturing Institute.
- [34]. PwC. "Will Robots Really Steal Our Jobs? An International Analysis of the Potential Long-term Impact of Automation" (2018).
- [35]. Rifkin, J. *The End of Work: The Decline of the Global Labor Force and the Dawn of the Post-market Era*. New York: Tarcher/Putnam, 1996.
- [36]. Schwab, K. "The Fourth Industrial Revolution." *What It Means and How to Respond*, 2015.
- [37]. SigmaErgonomics. *Zero G Ergonomic Tool Arm* (2017).
- [38]. U.S.C. §§ 201-219 (1994). "The Fair Labor Standards Act contains four major requirements: a minimum wage, an overtime standard, restrictions on child labor, and equal pay."
- [39]. Vashisht, P., and Dubey, J. D. "Changing Task Contents of Jobs in India: Implications and Way Forward." *Indian Council for Research on International Relations* (2018).
- [40]. Vivarelli, M. "Innovation, Employment & Skills in Advanced and Developing Countries: A Survey of the Literature." *Institute for the Study of Labor*, Discussion Paper No. 6291 (2012).
- [41]. World Economic Forum. "Digital Transformation of Industries: Societal Implications." *World Economic Forum White Paper*, January 2016.
- [42]. Zeira, J. "Workers, Machines, and Economic Growth." *The Quarterly Journal of Economics*, Vol. 113, no. 4, November 1998.
- [43]. Zierahn, U., Gregory, T., and Arntz, M. "Racing with or Against the Machine? Evidence from Europe." Discussion Paper No. 16-053, *ZEW Centre for European Economic Research*, 2016.