

Impact of the COVID-19 Pandemic on Employment in Information Technology Sector in India

Tapas Sudan

Pb. D Research Scholar, School of Business, SMVD University, Katra, Jammu, Jammu and Kashmir, India. E-mail: tapasudan69@gmail.com

Keywords:

COVID-19 pandemic, employment, information technology, fourth industrial revolution, India, policy implications

Received: 16 August 2021

Revised: 28 September 2021

Accepted: 29 October 2021

Publication: 30 December 2021

Abstract: Several State governments have announced lockdowns and alternative regulations to curb the spread of COVID-19 infections, which also contributed to the loss of jobs. In response, several individuals working in various towns and cities have migrated to the hometowns. The subsequent decline in infections has also dashed hopes of a rebound in economic activity toward the end of 2021. But, still employees are losing their employment. For instance, around 5.46 million employees lost their jobs in both the formal and informal sectors in October 2021. However, there have been some job creations in sectors such as information technology, retail trade, and education. The Government of India also planned to create six million jobs over the next five years. But the primary research question arises: how will government-private collaboration mitigate the job crisis and unemployment in India specifically in the context of the Fourth Industrial Revolution (4IR)? This paper aims to provide an understanding of the current employment situation in India as well as how the 4IR can provide jobs and resilience against the COVID-19-induced disruptions in the future. This paper elicits the challenges in generating employment through development of the 4IR-compatible skills development for the information and technology sector (IT) sector in India.

The COVID-19 pandemic can speed the greater digital applications in work and the workplace. The 4IR technologies can mitigate the pandemic impacts on health and income of the people. Application of the 4IR technologies can speed up during the pandemic and post-COVID-19 recovery. However, greater digitalization of economic sectors and displacement of middle-skilled labourers can increase income inequality. It is likely that this trend will be continued in future too. This calls for robust skills development and training programs for displaced workers and relevant labour policy measures for new job seekers and future workforce. There is greater need to invest in speedier digital readiness not only to contain the infections from the virus, but also to carry normal economic activities. There is need to develop the robust infrastructure, digital cooperation, digital skills and digital education for rapid digital penetration. Public-private collaboration in digital skills development can facilitate greater digital readiness and faster digital transformation. Compatible regulatory policies are needed to incentivize the private players in skills development programs targeting

the low-skilled displaced workers, new entrants to the job market and future workforce. New vocational institutions should be started with public-private collaboration to train future workforce to meet the employment challenges of the 4IR technologies such as artificial intelligence, robotics technology, machine learning, data analytics and other emerging novel technologies and for speedier economic recovery from the pandemic crisis.

Introduction

The unprecedented COVID-19 crisis has altered the ecosystem of the various economies across the world. The pandemic has exposed vulnerabilities and disrupted the global value chains of the market ecosystem. These vulnerabilities influence economic activity from a medium-term perspective as well as the state of labour markets. Moreover, nation-wide imposed lockdowns and firms' unavailability to rescue have had an extremely substantial impact on the millions of workers across many nations facing a reduction in employment. Since the enterprises were compelled to halt operating processes, they followed diversified labour market strengthening schemes, including job retention schemes, income support schemes, and remote working arrangements. For instance, around 60% of employees in New Zealand shifted to work from home in early phase of the pandemic (Foucault and Galasso, 2020). Around 95% of enterprises in India maintain to pursue the work from home (BS, 2021). The Indian automotive industry experienced a loss of Rs 2,300 crore per day and job losses of 3.45 lakh workers amidst the COVID-19 pandemic (ETHRWorld, 2021). India lost seven million jobs during the initial period of the pandemic, which surged unemployment rate to approximately 8% in April 2021 (CMIE, 2021).

Several State governments have announced lockdowns and alternative regulations to curb the spread of COVID-19 infections, which also contributed to the loss of jobs. In response, several individuals working in various towns and cities have migrated to the hometowns. The subsequent decline in infections has also dashed hopes of a rebound in economic activity toward the end of 2021. But, still employees are losing their employment. For instance, around 5.46 million employees lost their jobs in both the formal and informal sectors in October 2021 (CMIE, 2021). However, there have been some job creations in sectors such as information technology, retail trade, and education. The Government of India also planned to create six million jobs over the next five years (GoI, 2022). But the primary research question arises: how will government-private collaboration mitigate the job crisis and unemployment in India specifically in the context of the Fourth Industrial Revolution (4IR)? This

paper aims to provide an understanding of the current employment situation in India as well as how the 4IR can provide jobs and resilience against the COVID-19-induced disruptions in the future. This paper elicits the challenges in generating employment through development of the 4IR-compatible skills development for the information and technology sector (IT) sector in India.

Review of Literature

There has been an intense debate on net impact of the 4IR technologies on jobs. The 4IR technologies can positively impact growth in output and productivity (Acemoglu and Restrepo, 2019). Automation can reduce employment significantly in both the developed and developing economies (Autor, 2014). The demand for labour can decline in physical tasks, which are repetitive due to surge in use of robot technologies in manufacturing industry (Acemoglu and Restrepo, 2018). Automation can reduce jobs in service sector too (Frey and Osborne, 2017).

In developing Asia, technological transformation has caused decline in employment by 66% from 2005 to 2015 (ADB, 2018). However, information and communication technologies (ICTs) significantly raised returns of skilled workforce (Autor and Katz, 1999). Certain jobs are hard to automate (Arntz et al., 2016, 2019), therefore, only a small proportion of jobs are at risk of automation (Arntz et al., 2016). Middle-skilled labourers engaged in routine cognitive and manual tasks are prone to displacement due to substitution of the 4IR technologies for tasks earlier carried out labour (Maloney and Molina, 2016) in developing countries (Fleisher et al., 2018; Dao et al., 2017).

Along with surge in supply of skilled workforce, the demand for skilled workers has increased rapidly due to the emergence of the new technologies (Autor et al., 2003). However, surge in automation, demand for labour has not increased much in developed countries like the United States due to slow growth of new jobs (Acemoglu and Restrepo, 2019). Therefore, it is difficult to estimate whether the 4IR technologies will create additional employment opportunities than the jobs these technologies will obliterate.

The COVID-19 pandemic induced lockdown and restrictions have impacted all sectors and jobs, but several industries and jobs have been affected considerable than others due to labor intensity, low skill jobs, and informality. The manufacturing, trade, real estate, and hospitality activities have been affected the most (ILO, 2020a). Low-skilled workers in service sector and retail requiring face-to-face interaction have been worst affected (Aum et al., 2020). Likewise,

the employment in informal sector has been seriously affected due to greater financial constraints in developing countries (Loayza and Pennings, 2020).

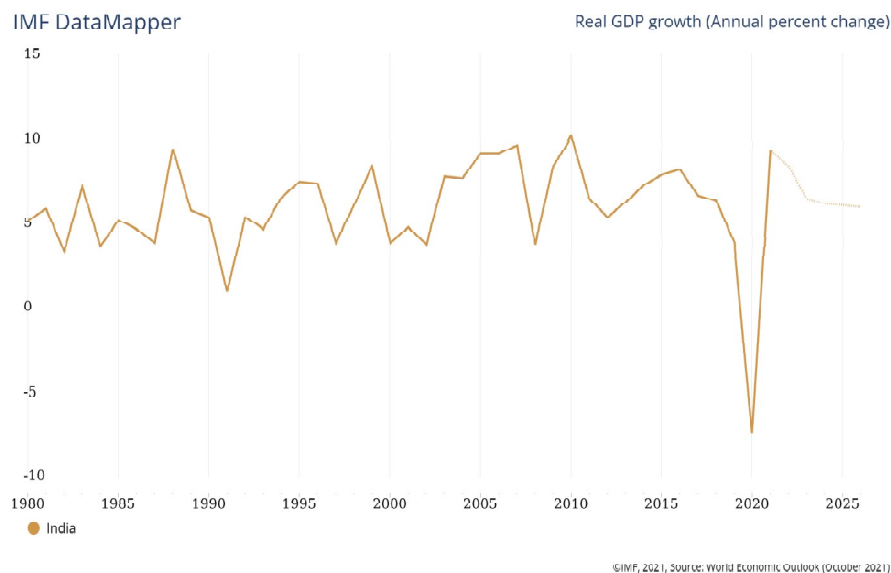
At the same time, employment in the technology and pharmaceutical industries has surged (Dingel and Neiman, 2020). Work from home has been facilitated by novel digital platform due to robust information and technology sector in some countries (Chiou and Tucker, 2020). Low-skilled workers also faced the constraint of remote work (Aum et al., 2020). Therefore, the pandemic crisis has significantly lowered the chances of jobs retention through remote work opportunities for low-skilled workers compared to high-skilled workers.

Besides the digital technologies, automation facilitated overcomes the problems posed by the supply chain disruptions due to COVID-19 induced restrictions and lockdown measures, which pushed the automation process. The pandemic can increase the automation of certain jobs. Therefore, automation can pose threat to routine and manual jobs (Khatiwada and Maceda Veloso, 2019). High-skilled workers in the service sector will be at lower risks of pandemic induced increase in automation (Egana del Sol, 2020). However, low-skilled workers are dominant in developing countries like India (ILO, 2018).

The demand for robots can substantially increase in e-commerce sector and health care sector, with significant displacement of low-skilled workers (Yang et al., 2020). The COVID-19 pandemic can reduce the jobs in service sector due to surge in outsourcing activities (Schlogl and Sumner, 2020). Overall, low-skilled workforce is likely to be more vulnerable to job risks due to disruption and the penetration of the 4IR technologies (Muro, Maxim, and Whiton, 2020).

Impact of COVID-19 on employment

Indian economic growth had slowed and unemployment was rising long before the COVID-19 crisis. There have been extensive reports from industry and manufacturing associations showing job losses due to demonetization and GST complications (Jha, 2019). The COVID-19 pandemic induced nationwide lockdown has deteriorated the job market in India. As a result of the lockdown, casual and self-employed workers, as well as regular employees without social security coverage suffered reduced working hours, layoffs, and income reductions. Figure 1 showed the slowing trend in economic growth. Economic growth declined from 8% to 4% over 2015-2019, and then further dropped to minus 7.3% in 2020 (IMF, 2022). In addition, structural transformation in India was slow and uncertain. For instance, in 2017-18, 85% of the workforce was



engaged in the informal sector, while 5% of labour force was employed in the formal sector, however, under informal conditions, workforce lacks social protection or other employment-related benefits (ILO, 2020).

The COVID-19 pandemic has affected many firms because of their lean and globalized business structures (Ivanov, 2020). Due to suspension of production and logistics, Most Indian firms have been less resilient during the pandemic, making firms more vulnerable to crisis. Consumer demand has slowed down with a longer lockdown, along with a reduced demand for labour, supplies, and delivery, severely affecting the firms without established recovery measures (Araz et al., 2020). Approximately 94% of Fortune 1,000 companies have been affected by COVID-19 as a result of disruptions in affected areas (Linton and Vakil, 2020).

About half of the salaried workers experienced wage reductions or didn't receive their wages, and three-fourth of the workers experienced enough money to buy only a week's worth of essentials. Most workers have no Jan Dhan account and not received any financial assistance from the government (APU, 2020). All India Democratic Women's Association (AIDWA, 2020) conducted a survey of 1,726 domestic workers across 11 States of India from 24 March to 4 May 2020, and found that 41% of the workers had lost all their income in March 2020, and increased to 61% in April 2020. AIDWA also noted that only 35% and 27% of domestic workers had received full wages in March and April 2020.

The pandemic-induced prolonged lockdown reduced both the demand and supply substantially, which required government assistance to overcome. The reversion to normalcy will require a strategy that restores and generates jobs while supporting the incomes of both companies and employees by re-establishing supply chains and building back demand while protecting the health, rights, and incomes of workers and their families, especially migrant workers and those in informal employment.

Figure 2 shows the unemployment rate trend between January 2020 and April 2021 in India. The Centre for Monitoring Indian Economy (CMIE) data shows that unemployment rose from 7.22% to 23.52% between Jan'2020 and April'2020. Furthermore, the national unemployment rate in May'2021 rose to 11.84% from 7.97% in April'2021 and 6.50% in March. As a result of 73.5 lakh

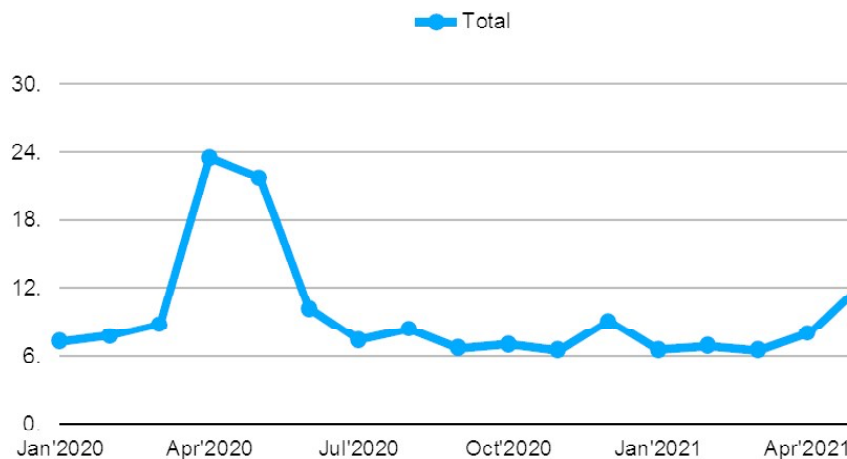


Figure 2: Recent unemployment rates in India job losses, the number of employees fell from 39.81 billion in Mar'2021 to 39.08 billion in April'2021 for the third consecutive month (CMIE, 2021)

An important reason why the youth faced disruptions in the labour market and job losses was that nearly half of the young people were employed in the four sectors hardest hit by the pandemic: wholesale and retail trade, manufacturing, rented and business services, and accommodation and food service (ILO, 2021). In its survey of 11,520 respondents conducted during the third week of May 2020, ActionAid India (2020a) found a significant decline in wages, a reduction in work intensity, and a loss of livelihood. The study found that during the lockdown, 68% of workers did not have work. Before the lockdown, 57% of manufacturing workers worked more than 40 hours a week.

During the lockdown period, 35% of respondents reported receiving a full wage, 48% had not received a wage, and 17% had only received a partial wage. During the last week of August and first week of September, ActionAid India (2020a) conducted another round of surveys and found that 48% of the respondents were unemployed in the second round and 42% were partially employed. Most respondents did not receive their wages during the lockdown, for instance, 48% in the first round and 64% in the second round of the survey.

IT sector, employment and the 4IR

In India, the information and technology sector consists of following sub-sectors: information and technology services, business process exports, engineering research and development, and software development. The information and technology sector provides employment to 3.86 million workforce directly and 13 million workforce indirectly (FICCI & NASSCOM, 2022). Despite global challenges of decline in employment opportunities in information technology sector, India is likely to experience positive employment growth over the short-term and the medium-term in information and technology sector (Government of India, 2017). India's population is likely to reach 1.461 billion by 2025 and expected population of the productive age group (15-64 years) to cross 68% by 2025 (Mari Bhat, 2022). By 2025, the information and technology sector is like to provide 6.5 million jobs (NASSCOM, 2017a). Keeping in view the size of labour market in India, the information and technology sector can provide employment to a very small proportion (0.65%) of the total productive labour force in 2025.

The 4IR technologies such as digital platforms and automation can drive most of the growth of information and technology sector in India (Government of India, 2021). In information and technology sector, the sub-sector of IT-BPM has grown significantly at a compounded annual growth rate (CAGR) of 13.7% from 2010 to 2016, which was three-four times higher than the global growth in IT-BPM. It is estimated that IT-BPM growth will experience a CAGR of 9.1% in 2025 to reach US\$350 billion mark. India's IT services increased at 7.8% in 2017-18 and about 9% in 2018-19. The export of the sub-sector of software increased in the range of 7% to 9% and the growth of the domestic market of software increased substantially in the range of 10% to 12% during the same period (NASSCOM, 2017b).

The market for engineering research and development was projected to surge substantially to US\$38 billion in 2020 from a level of US\$22.3 billion in

2016 (IBEF, 2017). The software sector has experienced substantial growth performance and additional revenue has increased from 14% in 2016 to above 20% in 2020 and likely to reach about 40% by 2025 (NASSCOM, 2017b). India has become a major destination of services sourcing business in the global market with substantial share of 55% in 2017-18 (IBEF, 2019).

IT-BPM firms from India have penetrated across 78 countries with about 670 offshore development centres. In 2016-17, India's IT sector surged around 11%, received 7% of the total FDI inflows and generated 1.7 lakh jobs against the target of 2 lakh jobs. Besides, indirect employment in India stood at 2.5 lakh in logistics and allied activities (NASSCOM, 2017b).

About 4,200 new startups were also created in 2016 to provide new employment opportunities. However, India's information and technology sector experienced serious risks of job losses due to rapid automation and emergence of the 4IR technologies. In the Parliament, the government also admitted the significant impact of the 4IR technologies on employment generation, skills requirements and the need of reskilling, however, denied the displacement of workers due to automation (Government of India, 2018).

COVID-19, IT-BPM Industry and the 4IR

Indian economy has experienced slow growth and less employment in 2020-21 due to the COVID-19 induced crisis in almost all sectors except for the IT &

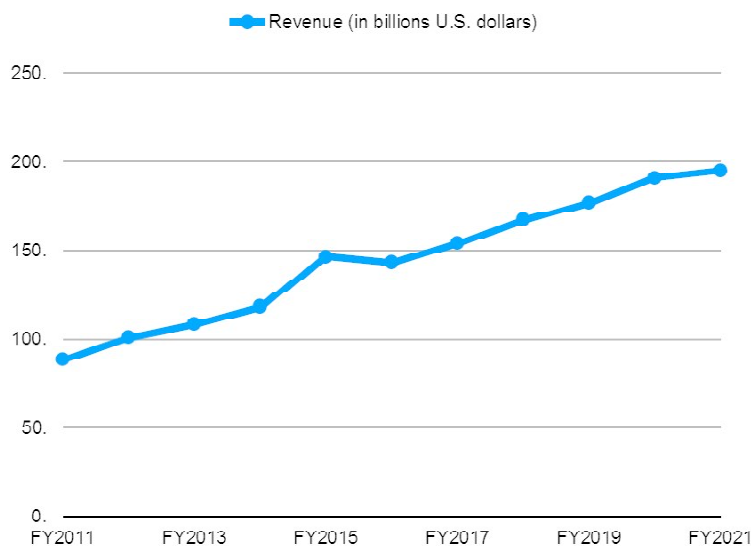


Figure 3: Revenue for IT & BPM in India

BPM industry. In India, the private sector employment has been dominated by the IT-BPM sector. According to NASSCOM, this industry employed 1.38 lakh new employees in FY20, taking the total number of employees to 44.7 lakh (NASSCOM, 2021). IT and BPM create one type of job - direct jobs - and another type of job – indirect jobs. These include positions related to software development. Indirect employment includes services such as catering, transport, and security. The Indian economy can be boosted by IT & BPM, with the Government of India expecting the economy to grow at 8.4% in the coming year. Figure 3 shows revenue for information technology and business process management in India from 2011 to 2021. In the fiscal year 2020, the IT-BPM sector contributed about 8 per cent to India's GDP (IBEF, 2022). Exports from the sector also grew steadily over time. Additionally, the country generated 4 billion dollars in revenue from the ITes and BPO segments in 2018. Moreover, the export value of the industry is more than triple that of software products and engineering services. India is the largest destination for system integration in the world. The industry has the potential to create huge employment and revenue opportunities due to its ability to harness new technologies.

It is estimated that the sector will contribute 10% to the GDP by 2025, making it the largest organized sector for job creation. India is estimated to contain 75% of the global digital talent. As of FY21, there were >1.4 million workers in the BPM sector and >4.5 million in the IT and BPM sectors (IBEF, 2021). Digitally trained workers are projected to constitute 12% of the workforce by 2021. Figure 4 shows the employment trend in the IT-BPM sector. According to the Ministry of Electronics and Information technology, employment rose from 3.86 million in 2016-2017 to 4.47 million in 2020-2021. Figure 4 shows the net addition in the IT-BPM sector. Despite that, employment is a big issue in India. As the unemployment rate increases from 8.20% in Nov'2021 to

9.30% in Dec'2021 (CMIE, 2022). It has resulted from several factors that have helped to bring about this growth in the IT and BPM sector such as increasing and encouraging demand for Indian IT services from other countries, emerging trends in IT such as healthcare, finance, big data, etc, adoption of ICT technologies in all verticals including Government sectors and projects such as Atma Nirbhar Bharath, the National Optic Fibre Network, Digital India Campaign, Software Technology Parks, etc [4], support and encouragement for startups in India including tax advantage policies, the SMAC (social, mobility, analytics, cloud) market future in India [5], the growing Research and Development in the IT sector in the fields of Artificial Intelligence, Big Data,

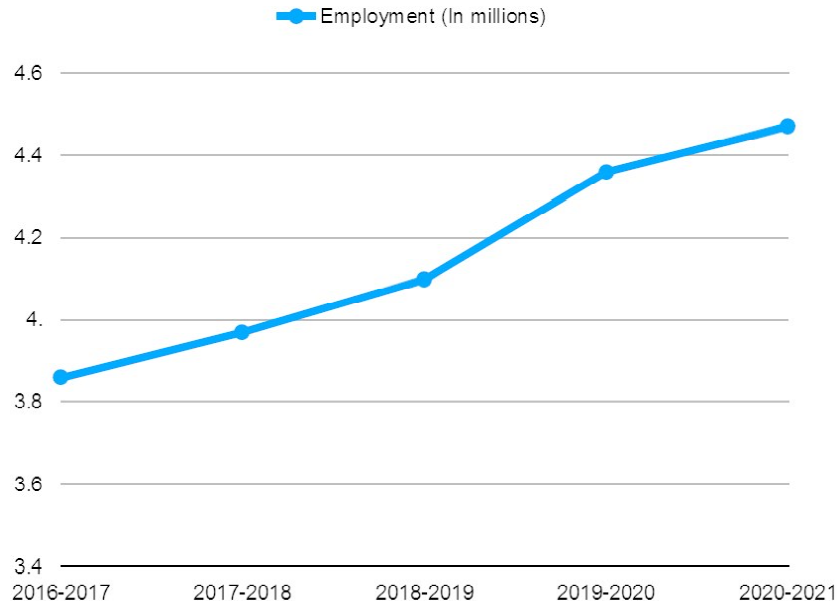
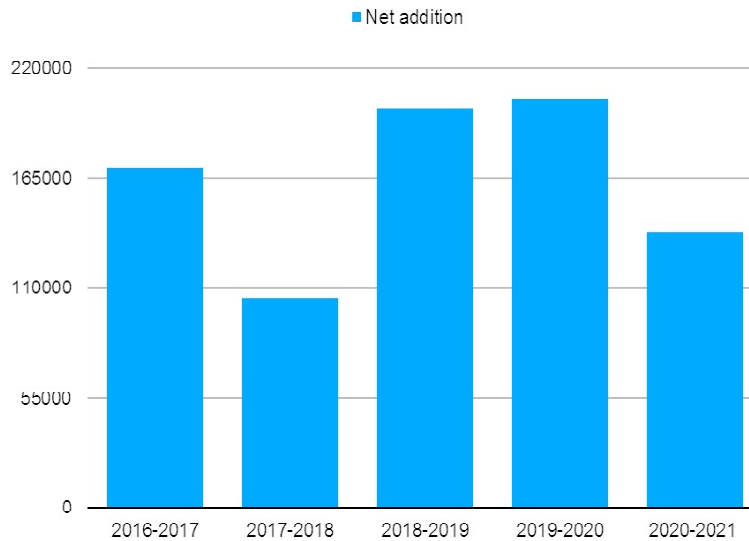


Figure 4: Employment trend in the IT-BPM sector

Cloud Computing. By successfully implementing Industry 4.0 in their operations and services processes, the IT-BPM industry can become a pioneer industry in creating opportunities for innovation. Cyient generates employment by integrating its INTELLICYIENT suite of industry 4.0 solutions to enable the digital transformation of industries such as manufacturing, industrial, aerospace, automotive off-highway, infrastructure and mining & natural resources. Furthermore, TCS launched at the new Google cloud garages for their enterprise clients. In addition to creating jobs in the IT-BPM sector, Industry 4.0 will also create jobs in the automobile, automation, and other prominent sectors. As of FY21, India ranked third in the world among all verticals, including technology, with 608,000 cloud experts. Japan's investments in the Indian IT sector have grown by four times between 2016 and 2020 which stood at US\$ 9.2 billion in the review period (IBEF, 2022).

Industry 4.0 with the IT-BPM industry can provide huge employment opportunities in the application development, data scientists, infrastructure management services, information security, sales and pre-sales, solution architecting, testing and QA, analytics, consumer relationship management, supply chain management, finance and accounting, human resource outsourcing, product development and documentation, project management,

**Figure 5**

transition, product packaging, engineering development and many more (Amazon AWS, 2014). Almost every professional is part of the potential talent pool in the IT-BPM sector, which requires graduate talent supply, not only limited to engineers or technically qualified talent but also in the BPM sector that involves finance, medical-legal. Indian IT-BPM companies are likely to encounter several challenges due to the lack of skilled labour in the country as they transition to Industry 4.0. Today's skills will not be as relevant in the future, and the workforce will need to possess new competencies in the domains of information technology, data analytics, and so on. In defining core work-related skill sets, cognitive abilities and system skills will play a greater role than physical abilities in the majority of the jobs. As the work environment has changed and the tasks workers will be expected to perform have also changed, the skills required will also change. Existing skills will not be replaced by new skills. In addition to the skills that are needed today, these new skills will be essential in the future. These new skills involve cognitive analytics (cognitive flexibility, creativity, logical reasoning, problem sensitivity, visualisation), content skills (active learning, ICT literacy, reading comprehension), technical skills (equipment maintenance, repair, operation & control, programming, quality control, troubleshooting, technology & user experience design), system skills (judgement and decision making, systems analysis).

Although, the Government of India has adopted various schemes to incorporate these skills in labour. This includes the National Skill Qualification

Framework (NSQF), which was launched in 2013. According to the NSQF, qualifications are categorized into 10 levels based only on knowledge, skills, and aptitude rather than on years of education. It is determined by the learner's ability to demonstrate the learning outcome regardless of how they acquired the knowledge. The National Employability Enhancement Mission (NEEM) has been launched by India to improve the industrial training scenario. Through NEEM, individuals pursuing their technical and non-technical degrees can receive on-the-job training to enhance their employability. These courses are also provided to people who have discontinued their degree or diploma studies. But the Government of India should also launch schemes related to awareness and skill development for industry 4.0 and also encourage the education institutions to adopt the courses related to the application and operability of Industry 4.0. India can do this by following Germany's dual training program, which involves vocational schools and companies offering apprentices for Industry 4.0. India is moving towards becoming the global leader and in due course of time, the IT & BPM industries will be among the frontrunners.

Policy implications

The COVID-19 pandemic can speed the greater digital applications in work and the workplace. The 4IR technologies can mitigate the pandemic impacts on health and income of the people. Application of the 4IR technologies can speed up during the pandemic and post-COVID-19 recovery. However, greater digitalization of economic sectors and displacement of middle-skilled labourers can increase income inequality. It is likely that this trend will be continued in future too. This calls for robust skills development and training programs for displaced workers and relevant labour policy measures for new job seekers and future workforce.

There is greater need to invest in speedier digital readiness not only to contain the infections from the virus, but also to carry normal economic activities. There is need to develop the robust infrastructure, digital cooperation, digital skills and digital education for rapid digital penetration.

Public-private collaboration in digital skills development can facilitate greater digital readiness and faster digital transformation. Compatible regulatory policies are needed to incentivize the private players in skills development programs targeting the low-skilled displaced workers, new entrants to the job market and future workforce. New vocational institutions should be started with public-private collaboration to train future workforce to meet the employment challenges of the 4IR technologies such as artificial intelligence, robotics

technology, machine learning, data analytics and other emerging novel technologies and for speedier economic recovery from the pandemic crisis.

References

- Acemoglu, D. and Restrepo, P. (2019). "Automation and New Tasks: How Technology Displaces and Reinstates Labor." *Journal of Economic Perspectives*, 33 (2): Vol. 33, No.2, pp. 3-30.
- Acemoglu, D. and P. Restrepo. 2018. The Race between Man and Machine: Implications of Technology for Growth, Factor Shares, and Employment. *American Economic Review*. 108 (6). pp. 1488–1542.
- Asian Development Bank (ADB). (2018). How technology affects jobs. In Asian development outlook 2018. Manila: Asian Development Bank.
- Arntz, M., T. Gregory, and U. Zierahn. 2019. Digitization and the Future of Work: Macroeconomic Consequences. *IZA Discussion Paper*. No. 12428. IZA Institute of Labor Economics.
- Arntz, M., Gregory, T. and Zierahn, U. (2016), "The Risk of Automation for Jobs in OECD Countries", *OECD Social, Employment and Migration Working Papers, No. 189*, OECD Publishing, Paris.
- Aum, S., S. Lee, and Y. Shin. 2020. Inequality of Fear and Self-Quarantine: Is There a Trade-Off between GDP and Public Health? *NBER Working Paper*. No. 27100. National Bureau of Economic Research.
- Autor, D.H. 2014. Polanyi's paradox and the shape of employment growth. *Vol. 20485*. Cambridge, MA: National Bureau of Economic Research.
- Autor, D., and L. Katz. 1999. Changes in the Wage Structure and Earnings Inequality. In O. Ashenfelter and D. Card, eds. *Handbook of Labor Economics*. 3A. pp. 1463–1555.
- Autor, D.H, Levy, F., Murnane, R.J. (2003). "The Skill Content of Recent Technological Change: An Empirical Exploration", *Quarterly Journal of Economics*, Vol.118, No.4, November 2003, pp. 1279-1334.
- Chiou, L. and C. Tucker. 2020. Social Distancing, Internet Access and Inequality. *NBER Working Paper*. No. 26982. National Bureau of Economic Research.
- Dao, M., M. Das, Z. Koczan, and W. Lian. 2017. Why is Labor Receiving a Smaller Share of Global Income? Theory and Empirical Evidence. *IMF Working Paper*. No. 17/169. Washington, DC: International Monetary Fund.
- Dingel, J. and B. Neiman. 2020. How Many Jobs Can be Done at Home? *NBER Working Paper*. No. 26948. National Bureau of Economic Research.
- Egana del Sol, P. 2020. The Future of Work in Developing Economies: What Can We Learn from the South? *GLO Discussion Paper*. No. 483. Global Labor Organization.
- Fleisher, B., W. McGuire, Y. Su, and M. Zhao. 2018. Innovation, Wages, and Polarization in China. *IZA Discussion Paper*. No. 11569. IZA Institute of Labor Economics.
- Frey, C. and M. Osborne. 2017. The Future of Employment: How Susceptible Are Jobs to Computerisation? *Technological Forecasting and Social Change*. 114. pp. 254–280.
- ILO. 2020. ILO Monitor: COVID-19 and the World of Work. 29 April. Third edition. Geneva: International Labour Organization.

- ILO. 2018. *Women and Men in the Informal Economy: A Statistical Picture (third edition)*. Geneva: International Labour Office.
- Khatiwada, S. and M. Maceda Veloso. 2019. New Technology and Emerging Occupations: Evidence from Asia. *ADB Economics Working Paper Series*. No. 576. Manila: ADB.
- Loayza, N. and S. Pennings. 2020. Macroeconomic Policy in the Time of COVID-19: A Primer for Developing Countries. *Research & Policy Briefs*. No. 28. Washington, DC: World Bank Group.
- Maloney, W. and C. Molina. 2016. Are Automation and Trade Polarizing Developing Country Labor Markets, Too? *Policy Research Working Paper*. No. 7922. Washington, DC: World Bank Group.
- Muro, M., R. Maxim, and J. Whiton. 2020. The Robots Are Ready as the COVID-19 Recession Spreads. *Brookings: The Avenue*, Washington, DC: The Brookings Institution.
- Schlogl, L. and A. Sumner. 2020. Automation and Structural Transformation in Developing Countries. In *Disrupted Development and the Future of Inequality in the Age of Automation*. Rethinking International Development series. Palgrave Pivot.
- Yang, G., B. Nelson, R. Murphy, H. Choset, H. Christensen, S. Collins, P. Dario, et al. 2020. Combating COVID-19: The Role of Robotics in Managing Public Health and Infectious Diseases. *Science Robotics*. 5 (40).
- FICCI & NASSCOM (2022). *Future of Jobs in India- A 2022 Perspective*. Retrieved http://ficci.in/spdocument/22951/FICCI-NASSCOM-EY-Report_Future-of-Jobs.pdf Government of India (2017). *Employment Prospects in India's IT Sector: Robust Outlook*. New Delhi: Press information Bureau, Government of India. Retrieved <http://pib.nic.in/newsite/PrintRelease.aspx?relid=162046>
- Mari Bhat, P.N. (2022). Demographic Scenario. Retrieved <http://www.planningcommission.nic.in/reports/sereport/ser/vision2025/demogra.pdf>
- NASSCOM (2017a). *Jobs and Skills: The Imperative to Reinvent and Disrupt*. Retrieved https://www.nasscom.in/sites/default/files/Jobs_and_Skills.pdf
- Government of India (2021). *IT and BPM, Make in India*. Retrieved <http://www.makeinindia.com/sector/it-and-bpm>
- NASSCOM (2017b). *IT-BPM Industry in India: Sustaining Growth and Investing for the Future*. Retrieved http://www.nasscom.in/sites/default/files/NASSCOM_Annual_Guidance_Final_22062017.pdf
- IBEF (2017a). *Research and Development in India*. New Delhi: India Brand Equity Foundation. Retrieved <https://www.ibef.org/industry/research-development-india.aspx>
- IBEF (2019). *IT and ITeS Industry in India*. New Delhi: India Brand Equity Foundation. Retrieved <https://www.ibef.org/industry/information-technology-india.aspx>
- IBEF (2017b). *IT & ITeS*. New Delhi: India Brand Equity Foundation: IT & ITeS. Retrieved <https://www.ibef.org/download/IT-and-ITeS-January-2017.pdf>
- Government of India (2018). Lok Sabha unstarred question no. 3805 to be answered on 19th March, 2018. New Delhi: Government of India, Ministry of Labour and Employment.

To cite this article:

Tapas Sudan (2021). Impact of the COVID-19 Pandemic on Employment in Information Technology Sector in India. *Asian Journal of Economics and Business*, Vol. 2, No. 2, pp. 209-229.