

# The Future of Work in India - Literature Review

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# INTRODUCTION

India needs 8% growth over the next 20 to 30 years to grow the Indian economy from a lower-middle income country to an upper-middle income country. Implicit in this aspiration is also the need to create 12-15 million jobs each year.<sup>1</sup> There is a shift from agriculture to manufacturing and services sector and there is a rising middle class which is pushing domestic demand.<sup>2</sup> Three ongoing mega-trends have the potential of significantly altering the nature of work in all G20 countries, albeit with a different intensity: globalisation, technological progress and demographic change - as well as the changes in values and preferences that will go paired with them.<sup>3</sup> Together, these trends are likely to affect the quantity and quality of jobs that are available, as well as how and by whom they will be carried out.

In both the first Industrial Revolution and today's Fourth Industrial Revolution, the first effects were in manufacturing in the developed world. The manufacturing productivity of U.S., roughly doubled between 1995 and 2015. Today, its output is at an all-time high. As a result, employment peaked in 1980 and declining precipitously since 1995.<sup>4</sup> As automation finds its way to developing countries as well, more than two-thirds of Southeast Asia's textile and footwear jobs are threatened by automation. In addition to spreading across the world, the effects of automation are also being felt by accountants, lawyers, truckers and even construction workers.<sup>5</sup>

In the low and medium qualification sectors, primarily, several million jobs worldwide are under threat, and it is not at all certain that they can be regrouped to other areas. There may not be employment opportunities in other sectors for these employees because they lack sufficient training. Owing to the introduction of ever more new machines and intelligent IT

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<sup>1</sup> Citi GPS: Global Perspectives and Solutions, "Securing India's growth over next decade: Twin Pillars of Investment and Productivity", February 2018.

<sup>2</sup> UNCTAD, "The Least Developed Countries Report 2015: Transforming Rural Economies", UNCTAD/LDC/2015, New York and Geneva, 2015.

<sup>3</sup> OECD, "Future of Work and Skills", 2nd Meeting of the G20 Employment Working Group, 15-17th Feb., 2017, Hamburg, Germany.

<sup>4</sup> Liao Yongxin, Loures Eduardo et. al., "The impact of the fourth industrial revolution: a cross-country region comparison", *Production*, 28, e20180061. DOI: 10.1590/0103-6513.20180061.

<sup>5</sup> Mayanika James, Chui Michael et. al., McKinsey Global Institute, "A Future that Works: Automation, Employment, and Productivity" January 2017.

systems, humans will become increasingly irrelevant in work processes. This may – like the feared shift into unemployment and the gap between rich and poor – lead to social conflicts.<sup>6</sup>

## Regional Perspective

Developing and emerging economies engage in singular, less diverse economic activities and have a majority of low skilled, less educated workforce. Hence it is imperative that ‘preventive’ and ‘proactive’ steps be taken to ensure that the demographic doesn’t lose its jobs.<sup>7</sup> ASEAN is seen as a follower and not as a developer of technology despite being a very tech savvy region.<sup>8</sup> Approximately 56 percent of all employment in the ASEAN-5 is at high risk of displacement due to technology over the next decade or two. Across the ASEAN-5 countries, prominent industries with a high capacity for automation are hotels and restaurants; wholesale and retail trade; and construction and manufacturing.<sup>9</sup> According to Boston Consulting Group (BCG), four industry groups will account for 75 percent of global robot installations in 2025: (1) computers and electronic products; (2) electrical equipment, appliances, and components; (3) transport equipment; and (4) machinery.<sup>10</sup> BCG indicates that at least 85 percent of the production tasks in these industries are automatable. Automation happens in a ‘human-centric’ manner and is known as semi-automation. These are collaborative robots (cobots) which aid the worker as opposed to replacing them. This collaboration may also change when robots become more sophisticated, but as of now, real workers bring adaptability and perception to the process while the robots replace repetitive tasks and challenging to reach operations.<sup>11</sup>

Automation and Robotics will have the most substantial impact on jobs in the industry throughout the region. If we talk about the automotive sector, Robots are becoming better at assembly, cheaper and increasingly able to collaborate with people. One key driver for

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<sup>6</sup> Wisskirchen Gerlind, Biacabe Blandine et. al., IBA Global Employment Institute, “Artificial Intelligence and Robotics and their Impact on the workplace”, April 2017.

<sup>7</sup> ILO: Asean in Transformation: The Future of Jobs at Risk of Automation

<sup>8</sup> Tobing Agustha, Fadhillah Askabea et. al., “Thinking ASEAN: ASEAN in an era of the Fourth Industrial Revolution - Prospects and Implications for Workers and Employment”, Issue 26 - August 2017.

<sup>9</sup> Cisco & Oxford Economics, Technology and the future of ASEAN jobs: The impact of AI on workers in ASEAN’s six largest economies, September 2018

<sup>10</sup> Sirkin Hal, Zinser Michael et. al., “Industries and Economies Leading the Robotics Revolution”, Boston Consulting Group, September 23, 2015.

<sup>11</sup> Universal Robots, White Paper on “Robots, Cobots and Human Labour” available at <https://cdn2.hubspot.net/hubfs/2631781/HQ%20Content%20and%20Enablers/HQ%20Enablers/White%20papers/Robots%20Cobots%20and%20Human%20Labor.pdf>.

robotic and automation deployment is the common practice of including “cost down” agreements, in which suppliers enter a contractual agreement to either reduce the overall price of an auto part or increase productivity without increasing the resources expended.<sup>12</sup> These trends have a double effect on the labour force. Firstly, Low-skill workers will find themselves displaced in favour of automation, and indeed, over 60 percent of salaried workers in Indonesia and over 70 percent of workers in Thailand face high automation risk. Secondly, manufacturers will increasingly seek higher skilled talent with R&D competencies, ranging from analytical experts to autonomous driving engineers and sustainability integration experts. Use of automation also disrupts the status quo, and there is an opportunity to look at new ways of structuring old industry processes and patterns. Government and education and training providers need to anticipate for automation impacts actively.<sup>13</sup> Governments may need to revamp their economic policies deal with the situation posed by automation.

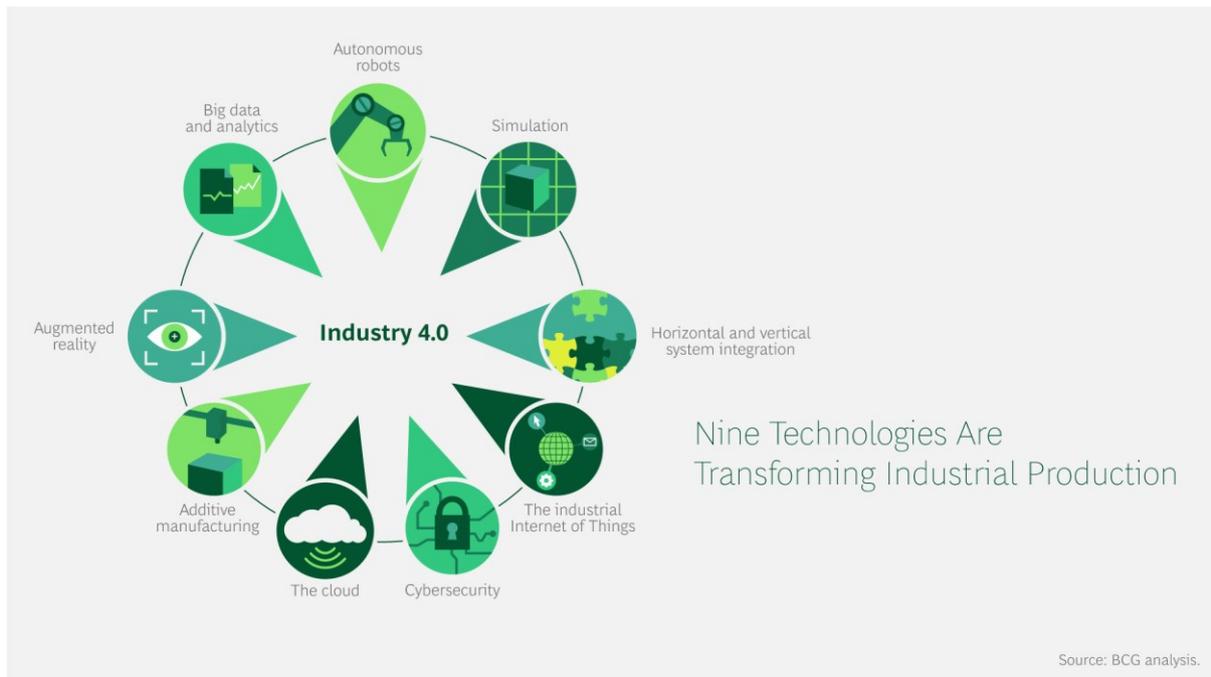
## **What Is Industry 4.0?**

What are the critical technologies within Industry 4.0 driving transformation?

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<sup>12</sup> ILO: ASEAN in Transformation, *op. cit.*

<sup>13</sup> Cawood Richard, “Can the universities of today lead learning for tomorrow: The University of the Future”, Ernst & Young.



The emerging technologies have their own set of challenges and opportunities which depend on various contextual factors like a) To which sector they are being applied to, b) What is the reliability of that technology per unit cost production, c) Knowledge about technology deployment within the industry etc. Some of the challenges are listed below:

1. AI has been regarded as the most impactful technology, followed by wearables, drones, 3D printing, and blockchain. The key is to latch on to technologies in the early phase of their disruption so that when (if) they become mainstream, businesses are equipped with the infrastructure and experience to ride the wave.<sup>14</sup>
2. Internet of Things (IoT) too is expected to produce a tectonic shift in the way we live, work and run businesses. 67% of market in the Asia Pacific region mentioned that this technology would have a significant impact on their businesses by 2020.<sup>15</sup>
3. Another technology that is disrupting the industry is 3D printing or additive manufacturing. It involves the process of making objects through successive layers of materials under a computer's control. Mass additive printing will be the next stage of this technology.

<sup>14</sup> Bahl Manish, "The work Ahead: The Future of Businesses and Jobs in Asia Pacific's Digital Economy", Cognizant - The Centre for the Future of Work.

<sup>15</sup> Bahl Manish, "Humans + Intelligent Machines: Mastering the Future of Work Economy in Asia Pacific", Cognizant - Centre for the Future of Work, 2018.

4. On the automotive manufacturing side of the sector, disruptions such as advanced robotics, autonomous transport, 3D printing, and new energy technologies will have some of the most direct impacts on jobs of any industry.<sup>16</sup>
5. Automation is not new to the industry and standardised robots have been incrementally upgraded and have the most significant impact on the industry. Previously, robots were large and did most of the dangerous, indelicate work (such as painting and body shop) which was repeatable in nature. They were kept separately from humans.<sup>17</sup>

### Key factors that influence Industry 4.0 implementation

India is on a driver seat when it comes to digital growth. However, with the advent of the computer and thereby Internet during the Third Industrial Revolution, it already paved the way for the recent boom in technologies. Further, India holds the maximum number of the youth population in the world and, millennials are pushing demand for fast, cheaper and customized products in mostly every sector. The Indian Market is pushed towards technology upgradation to meet the demand and the supply. Some of the key factors pushing the Indian Market towards Industry 4.0 are:

1. In India, new digital consumers seem to be born, literally every minute. Every second, five people join the online world for the first time in the region. It translates to 2.2 billion internet users – slightly fewer than the combined population of the U.S. and Europe – and over 53% of the global internet populations by 2020.<sup>18</sup> Thus, Exponential increase in the power of computers coupled with a drop in costs is leading to the current flourishing of emerging technologies.
2. Demand for better quality products is pushing the automotive industry to automate their manufacturing processes. The growing middle class will translate into increased demand for cars. Increased consumer demand increases the pressure on suppliers to produce faster and hence automation has been seen as a viable solution. Suppliers face constant pressure to comply with ‘cost-down’ clauses on their contracts with

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<sup>16</sup> World Economic Forum, “The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution”, Global Challenge Insight Report, January 2016.

<sup>17</sup> CBINSIGHTS, “Future Factory: How Technology is Transforming Manufacturing”, April 8, 2018.

<sup>18</sup> KPMG, “The truth about online consumers”, 2017 Global Online Consumer Report.

automotive companies. Cost down is when there is the condition to produce the same parts more cheaply or to increase the production of the parts. The cost reduction is achieved through process improvements and automation hence, increasingly, being adopted.<sup>19</sup>

3. Accidents on the industry floor have also reduced dramatically, thus creating safer work environments by cutting fatal accidents as robots are now doing the dangerous work.
4. Increasing minimum wage for labour is also pushing the demand for automation.<sup>20</sup> It was seen in western countries but now India also sees both silent and violent protests in labour industry for a hike in minimum wage. In a new paper, Grace Loren of the London School of Economics and David Neumark at the University of California show that between 1980 and 2015, minimum-wage increases led to a significant increase in the automation of low-skilled work in the US.<sup>21</sup> This encouragement to invest is good for the economy because it helps to boost productivity and living standards. It's certainly good for the workers able to maintain their jobs with a higher minimum wage. However, this method has its own set of challenges too.
5. Government regulations that mandate better environment standards (lowering carbon emission, raising consciousness amongst consumers) that require more technologically sophisticated parts are pushing changes in the sector too. (eg. Electric Vehicles).<sup>22</sup>
6. India accounts for 42% of the population employed in agriculture and informal sector combined, and both of them are seeing advanced technologies seeping in. In the informal sector too, the ability of technologies to reduce the drudgery of informal workers was essential. For example, waste pickers and street vendors expressed the

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<sup>19</sup> Maurer Andreas, Dietz Frank et. al., "Beyond Cost Reduction: Reinventing the Automotive OEM-Supplier Interface", Boston Consulting Group, March 2014.

<sup>20</sup> Karsten Jack, Darell M. West, "Rising minimum wages make automation more cost-effective", Brookings Institution, September 30, 2015. See also, Bourne Ryan, "A higher Minimum Wage Acts as a Subsidy to Automation" CATO Institute - August 18, 2017.

<sup>21</sup> Lordan Grace & David Neumark, "People versus Machines: The Impact of Minimum Wages on Automatable Jobs", NBER Working Paper No. 23667 - August 2017.

<sup>22</sup> Govt. of India, Ministry of Heavy Industries and Public Enterprises, "Government push for Electric Vehicles", <http://pib.nic.in/newsite/PrintRelease.aspx?relid=174902>

need for technology that can aid in easy transport across bad roads.<sup>23</sup> However, the gender disparity is still evident – due to lack of know-how of the technology, women were waste pickers whereas men were waste collectors, which exposed women to more health hazards. Technology can help these women in these sectors.

Industry 4.0 is expected to increase productivity significantly and alter the job creation potential of the manufacturing sector over the medium term. However, the impact is different across the light and heavy manufacturing sectors. While heavy manufacturing sectors are likely to start shedding jobs as facilities become increasingly automated, in the short term the light manufacturing sector in India has the potential to grow and create more jobs by taking advantage of the industry shifts away from China, where labour costs are rising rapidly.

### Key barriers to adoption of technology

Industry 4.0 plays an important role in helping business players to boost their productivity and customers in getting the product faster and cheaper. However, this does not come hassle-free but has its own set of challenges. Some of the key barriers to adoption of technology which various studies have pointed out are:

1. Lack of technical and digital capability to work, upgrade and maintain automated technology poses a roadblock to the adoption of such technology.<sup>24</sup> Integration of IoT will need stronger technical, engineering, science and manufacturing skills.<sup>25</sup>
2. The benefits of automation on operator mental workload and situation awareness are unlikely to hold if the automation is unreliable. Hence ensuring high reliability is a critical evaluative criterion in applying automation. Automation reliability is an important determinant of human use of automated systems because of its influence on human trust.<sup>26</sup>

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<sup>23</sup> Casey Jonathan, Hughes Kendra, "Technology and the Future of Work Project", WEIGO.

<sup>24</sup> PwC, "Moving at the speed of Innovation: The foundational tools and talents of technology", 2018.

<sup>25</sup> Miranda S. Suarez, Marcos M. et. al., "The challenge of integrating Industry 4.0 in the degree of Mechanical Engineering" Science Direct, Elsevier Publications, June 2017.

<sup>26</sup> Parasuraman Raja, Sheridan Thomas et. al., A Model for Types and Levels of Human Interaction with Automation, IEEE Publications, Vol. 30, No. 3, May 2000.

3. High levels of automation is associated with potential costs of reduced situation awareness, complacency, and skill degradation. It is not to say that high levels of automation should not be considered for decision and action automation. However, assessing the appropriate level of automation for decision automation requires additional consideration of the costs associated with decision and action outcomes.<sup>27</sup>
4. If one's organization is waiting for digital technologies to prove themselves or has adopted a wait-and-see approach to automation, it is probably a "laggard."<sup>28</sup> Companies behind the digital curve pay a big price. If one doubts the power of leaders over laggards, consider the "laggard penalty" – the difference in both cost and revenue performance achievable through proper use of digital technologies. In economic terms, a digital laggard today is on average, 8.3 percentage points worse off than a digital leader.

## **Impact of Industry 4.0 on Labour**

### Key Sectors Likely to be Impacted

Industries with low automation risk across the ASEAN-5 include education and training, as well as human health and social work. Prominent occupations in certain countries face extreme risks of automation. For example, in Cambodia, where garment production dominates the manufacturing sector, close to half a million sewing machine operators face a high automation risk. In Thailand, automation risk is particularly acute for approximately 1 million shop sales assistants. In Indonesia, about 1.7 million office clerks are highly vulnerable to automation. In each of the ASEAN-5, women are more likely than men to be employed in an occupation at high risk of automation. Moreover, less educated workers and employees earning lower wages face higher automation risk.<sup>29</sup>

International Labour Organization has picked out five key areas where Industry 4.0 has seeped in and how its bringing changes in the nature of work.

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<sup>27</sup> Endsley Mica, Kaber David, "Level of Automation effects on performance, situation awareness and workload in a dynamic control task", *Ergonomics*, 1999, Vol- 42, No. 3, 462-492.

<sup>28</sup> Davis Euan, Sambasivan Bhaskar et. al., "The Work Ahead: How Data and Digital Mystery will Usher in an Era of Innovation and Collaboration", Cognizant.

<sup>29</sup> International Labour Organization, "The Impact of technology on the quality and quantity of jobs", Global Commission on the Future of Work, available at [https://www.ilo.org/wcmsp5/groups/public/---dgreports/---cabinet/documents/publication/wcms\\_618168.pdf](https://www.ilo.org/wcmsp5/groups/public/---dgreports/---cabinet/documents/publication/wcms_618168.pdf)

### Automotive and auto parts<sup>30</sup>

Four major technologies are shaping the automotive sector: the electrification of vehicles and vehicular components, advancements in lightweight materials, autonomous driving, and robotic automation. They expect enterprises to accelerate research and development (R&D), with a focus on electric vehicles (EVs), hybrid electric vehicles (HEVs), lightweight materials and autonomous vehicles. As consumer demand for technologically capable cars with less environmentally harmful effects rises, governments across ASEAN will be compelled to implement policies incentivizing R&D activities and the purchasing of EV/HEVs.

### Electrical and electronics<sup>31</sup>

Three disruptive technologies are likely to shape the E&E sector: robotic automation, 3D printing (also known as additive manufacturing) and the Internet of Things (IoT). China advances up the E&E value chain and enters higher skilled tiers of production, ASEAN countries are well positioned to absorb much of the lower skilled E&E jobs from which China is moving away, but mostly in the short term. Even though wages are rising in ASEAN, the region's lower labour costs are still more attractive.

### Textiles, clothing and footwear (TCF)<sup>32</sup>

TCF sector seems to be the most vulnerable to the extensive technological displacement of workers. Many technologies stand to disrupt this sector: 3D printing, body scanning technology, computer-aided design (CAD), wearable technology, nanotechnology, environmentally friendly manufacturing techniques, and lastly, robotic automation. Body scanning sensors and CAD can not only provide the perfect fit for the consumer but also permit extremely fast delivery, which further accelerates through 3D printing. Because 3D printing does not require as much human input, it enables production to move closer to the markets in which products are sold. Automated cutting machines are now becoming a widely available technology, and robots capable of sewing – called “sewbots” – will soon change the calculus of TCF production.

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<sup>30</sup> Supra 13, op. cit.

<sup>31</sup> Ibid

<sup>32</sup> Ibid

### Business process outsourcing (BPO)<sup>33</sup>

Cloud computing, software automation, and knowledge process outsourcing are three technologies that are impacting this sector. Strong cloud computing products offer an opportunity to expand enterprises' client pool and continue the sector's growth. Cloud computing, specifically Business Process as a Service (BPaaS), allows BPO enterprises to store software and data over the Internet. Cloud computing also enables enterprises to select services personalized to their needs, as opposed to purchasing an entire outsourcing package. These advantages make BPO services accessible to small- and medium-sized enterprises (SMEs) – a previously untapped market segment.

### Retail<sup>34</sup>

Disruptive technologies in retail – such as mobile and e-Commerce platforms, the IoT, cloud technology, and big data analytics – are still yet to achieve mainstream usage in the region. Theoretically, mobile and e-Commerce platforms could massively displace ASEAN's more conventional “brick-and-mortar” retail establishments. Products can increasingly be sold online more cheaply, especially because rent and overhead expenses are rising, consumers are becoming more tech-savvy, and Internet infrastructure is improving. Cloud technologies, big data analytics and the IoT promise to improve enterprise operations by optimizing inventory management, product tracking and shopping intelligence. Classic retail challenges, such as producing too much or too little of a product, can be solved through an effective, Internet-connected system.

### Is Industry 4.0 changing the nature of work?

AI opens new opportunities for companies and individuals. Humans are adaptable and will create new jobs. The use of intelligent IT systems helps decrease the time required for the

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<sup>33</sup> Ibid

<sup>34</sup> Ibid

product or the service, and the associated costs as well.<sup>35</sup> The time saved, especially for dangerous work, can be used by human beings for other work or leisure. AI should thus result in a growth of prosperity.<sup>36</sup> This applies especially to high-wage countries where it is possible to produce at lower cost owing to production robots. The global workforce is expected to experience significant churn between job families and functions, with administrative and routine white-collar office functions at risk of being decimated and strong growth in Computer and Mathematical and Architecture and Engineering related fields.<sup>37</sup> Manufacturing and Production roles are also expected to see a further bottoming out but might have the worst behind them and still retain the relatively good potential for upskilling, redeployment and productivity enhancement through technology rather than pure substitution.

As one of the studies pointed out that the workforce mix in India by 2022 will roughly paint the picture in which 9% would be deployed in new jobs that do not exist today, 37% would be deployed in jobs that have radically changed skill sets and 54% of the workforce will fall under unchanged job category.<sup>38</sup>

Automation will shift the industry's labour needs from low-skilled, assembly line workers to technically equipped workers with a variety and depth of skills. There is also a lack of interest amongst the youth today to take up manual labour which is perceived to be low paying and physically intense, henceforth, in the past humans participated actively in production, they will now supervise it. The humans who become superfluous will make greater use of their time to develop and perform innovative services. While it is acknowledged that technology is less likely to change work opportunities dramatically in developing economies in the coming years – as labour costs remain lower than technology capital, running and maintenance costs – there are nonetheless many predictions of the transformational potential of emerging technologies to eradicate poverty<sup>39</sup>. Yet the role and importance of technology in informal work opportunities and livelihoods are little understood or explored. Technology can be a

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<sup>35</sup> Deb Sagarmay, "Information Technology: Its impact on Society and its Future" Scientific and Academic Publishing, Queensland University, 2014.

<sup>36</sup> Acemoglu Daron and Restrepo Pascual, "Artificial Intelligence, Automation and Work" MIT, January 4, 2018.

<sup>37</sup> Nilsson Nils, "Artificial Intelligence, Employment and Income", Artificial Intelligence Centre - Stanford University, The AI Magazine - Summer 1984.

<sup>38</sup> FICCI, NASSCOM & EY, "Future of Jobs in India: A 2022 perspective".

<sup>39</sup> Chandy Laurence, "The Future of Work in the Developing World", Brookings Blum Roundtable 2016 Post-Conference Report - January 2017

great enabler, helping people to do more, better. However, it will also be a mirror of social inequality.

### How is Automation shifting traditional processes and patterns in the sector?

To remain competitive, ASEAN enterprises will need to seek collaborative opportunities with OEMs to accelerate the integration of advanced automotive technologies. Equally important would be investing in the capacity development of local automakers.<sup>40</sup> Moving forward, ASEAN automakers should prioritize forging partnerships with technology and electronics firms, as electronics and gadgets have become indispensable to making smart vehicles. Tier-one companies are constituting internal task-forces to monitor new automation technologies and assess how they fit into their processes. Currently, tasks which are simple, low skilled and repetitive are being automated.

The biggest patterns which will see a blow will be those of Education, Skilling and Industrial Relations. Automation across the region is replacing low skilled manual labour. Skills such as critical thinking and problem-solving skills are in demand. New forms of employment, such as those borne with the gig economy, will eliminate the contributions towards social protection schemes. Likewise, a fall in labour supply will have an adverse effect on the number of social contributions and the sustainability of pay-as-you-go insurance systems.<sup>41</sup> Meanwhile, aging populations will require more funds to afford pensions and care services. The inward migratory pressure that many developed countries are expected to incur in the future may squeeze social protection systems further. For some emerging economies, high wages might stifle social security sustainability.<sup>42</sup> A last adverse effect arises from a low-interest environment which is predicted to continue. Studies also highlight the importance of including workers under non-standard forms of employment into social security benefits.

Flexible and temporary work, among other forms of non-standard employment, is expected to become more prevalent soon. Many anticipate lower wages, reduced social protection and

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<sup>40</sup> Nag Biswajit, Banerjee Saikat et. al., "Changing features of the Automobile Industry in Aia: Comparison of Production, Trade and Market Structure in Selected Countries", Asia-Pacific Research and Training Networks on Trade Working Paper Series, No. 37, July 2007.

<sup>41</sup> International Labour Organisation, "Strengthening social protection for the future of work", 2nd Meeting of the G20 Employment Working Group, 15-17 February 2017.

<sup>42</sup> Bloom David, "The world will struggle with population growth, aging, migration and urbanization", Finance & Development A Quarterly Publication of International Monetary Fund, March 2016, Volume 53, Number 1.

more work insecurity to follow.<sup>43</sup> Some studies point out, however, that flexible and remote work will allow marginalised workers to join the workforce, as well as workers with family responsibilities. The impact of the gig economy, entailing increased precarisation, decreased bargaining power and reduced legal protection.<sup>44</sup>

Another big problem is the gender divide as per data. The idea of freelancing is closely aligned with the constraints within which women in India seek employment. The ability to work from home, at a time convenient is a huge advantage for women, especially those who are primary caretakers of children and the aged at home.<sup>45</sup> In fact, some platforms claimed that freelancing was often thought of as a domain for women, but those trends were quickly changing as men have expressed the need for more control over work hours.

## Is adoption resulting in job creation/job loss?

When we are looking at job creation or job loss it has to be seen from Task-Based Approach (TBC). One of the most interesting aspects of Frey and Osborne's Research<sup>46</sup> is that they focused on the content of each occupation i.e. the tasks performed by each worker and classified them according to susceptibility to computerization. Such an analysis was made possible because of the existence of the Occupational Network Information Service (O\*NET) sponsored by United States Department of Labour.<sup>47</sup> In order to formulaically classify occupations, Frey and Osborne used nine variables to characterize the three non-automatable activities: Perception and manipulation tasks: (1) Finger dexterity; (2) Manual dexterity; and (3) Cramped workspace, awkward positions, creative intelligence tasks: (4) Originality; and (5) Fine arts Social intelligence tasks: (6) Social perceptiveness; (7) Negotiation; (8) Persuasion; and (9) Assisting and caring for others.

Industry 4.0 is still in its nascent stages in India. However, due to technology adoption many of the jobs in manufacturing sector and IT sector are already seeing a hit. However, the gap in

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<sup>43</sup> International Labour Organization, "Non-Standard Employment Around the world: Understanding challenges, sharing prospects", 2016.

<sup>44</sup> International Labour Organization, "A reflection on the Future of Work and Society", September 2017, Geneva.

<sup>45</sup> Asia Productivity Organization, "Why Asia must up female Workforce Participation" August 2018.

<sup>46</sup> C. Frey and M. Osborne, The Future of Employment: How Susceptible are Jobs to Computerisation?, in Technological Forecasting and Social Change, 2017, vol. 114, issue C, 254-280.

<sup>47</sup> <http://www.onetonline.org>

employment created due to the fall in manufacturing employment will need and has the potential to be met by the services sector. The services sectors can broadly be categorized into three buckets, with growth and job creation potential varying across them.<sup>48</sup> ‘Evolved’ services like construction and financial services are currently contributing over five percent of GDP and a large number of jobs. They will continue to grow and drive a sizeable share of job creation; however incremental job creation (over current levels) is likely to be low.<sup>49</sup> ‘Under-penetrated’ services, such as education, tourism, transport and storage and healthcare will see rapid growth and job creation, fuelled by the growth in technology. Finally, a new set of ‘emerging’ services sectors, such as natural infrastructure management and digital services, will need to be developed to bridge the jobs gap.

If we take an example of emerging technology, say, 3D printing, the traditional approach of manufacturing different components separately and then assembling the product will be replaced by one-time printing, which is a single action. Some believe that drawing from the experience of other industries that have adopted the 3D printing, the technology will be used only for low volume prototyping or to perform unsophisticated tasks. 3D printing will require supply of highly skilled workers, therefore its disruptive impact is still being debated.

Overall, social skills—such as persuasion, emotional intelligence and teaching others—will be in higher demand across industries than narrow technical skills, such as programming or equipment operation and control.

## **How should Policymaking respond to Future of work?**

### Education and Skill Training

Targeted policy focus on education and skills is essential to climb the value chain as more factories move to automation and robotics, the availability of higher skilled labour is becoming more important, and this will drive investment decisions.<sup>50</sup> It’s imperative for the sector to have stronger strategic alliances with education and vocational training institutions

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<sup>48</sup> Bhattacharya Arindam, Bijapurkar Aparna, BCG & CII, “India: Growth and Jobs in the new Globalization”

<sup>49</sup> Ibid

<sup>50</sup> World Bank. The East Asian Miracle: Economic Growth and Public Policy. World Bank: Oxford University Press, 1993.

so that relevant skills are provided by the incoming workforce.<sup>51</sup> The sector should also collaborate with educational partners to encourage female students to enter degree and certification tracks for recruitment in the auto industry. Create regional innovation clusters, districts, and corridors by building strong linkages around manufacturing automation and robotics between universities and start-ups in India. Use AI-based training and teaching software in various skilling and educational applications. Introduce tailored courses with flexible completion timings to enhance students' inclination towards learning.<sup>52</sup>

## LABOUR REFORMS

Creative solutions from employee representatives, national lawmakers and companies are required in order to manage the problems that will arise. For instance, the Italian Sharing Economy Act is a potential way to solve the new labour market's problems. Such new legal frameworks will create new jurisprudential questions, for example, concerning the distinction between a platform and real business or the definition of specific criteria to distinguish between 'on-demand workers' and 'traditional workers'<sup>53</sup> for each sector. Design labour market institutions (e.g. minimum wages; employment protection; health and safety regulations) which encourage employers to seize the opportunities offered by technological change and globalisation, while making sure that the risks are not borne disproportionately by workers in the form of low pay, precariousness and poor working conditions.

## SOCIAL SECURITY MECHANISM

Re-think social security systems to minimise the chances of people slipping through the holes by (i) tailoring or adapting them to the new forms of employment; or (ii) decoupling them entirely from people's work status and history. Permanent and casual workers, including trainees and apprentices, perform largely the same kinds of tasks in the assembly line. However, permanent workers have a greater level of involvement in roles involving both manual labour and supervision, while casual workers perform core production (manual repetitive) tasks only. Contract workers thus end up performing more physically strenuous

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<sup>51</sup> OECD, "Bridging the Gap: The Private Sector Role in Skills Development and Employment" October 2016.

<sup>52</sup> Potode Ankita and Manjare Poonam, "E-Learning using Artificial Intelligence", International Journal of Computer Science and Information Technology Research, Vol. 3, Issue 1, March 2015.

<sup>53</sup> Groen Willem, Lenaerts Karolien, et. al., European Economic and Social Committee, "Impact of Digitalisation and the on-demand economy on labour markets and the consequences for employment and industrial relations", Feb. 2017.

and even dangerous tasks with lesser training. As the organization of work becomes more precarious and flexible, it has become increasingly necessary to disassociate social security and traditional forms of employment, in order to extend minimum wages, security, pensions, and benefits equal to a range of atypical workers. Industry and state bodies will equally have to respond to this casualization of the workforce in a traditionally formal sector with imaginative ways of ensuring conditions of decent work<sup>54</sup> non-standard employed workers across the formal and informal sector.

## RECOMMENDATIONS

Some of the recommendations which have not been explored in India to a larger extent are:

1. In its current form in India, online freelancing is neither very glamorous nor viable. It might take years of perseverance from both clients and freelancers to established trust. Unless both sides of the market work together to address concerns, the growth of online freelancing will never achieve full potential.<sup>55</sup> Digital infrastructure will be as critical as physical infrastructure. This should cover all layers of the ‘technology stack’ —high quality and ubiquitous broadband and low cost smartphones, the India stack, societal platforms, and standards and norms for interoperability of digital systems that enterprises can leverage.
2. The kind of information given by United States Department of Labour is needed by researchers for the mapping of skill requirements and the relevant tasks to come up with a suitable job role. Like, United States, Japan also has similar examples where relevant data was gathered by Japan Institute for Labour Policy and Training (JILPT) through online surveys. In India, we too need this kind of information collection survey.<sup>56</sup>
3. The learning and skilling ecosystem has to move towards a ‘life-long learning system’ as new kinds of jobs emerge with very different skill profiles. This will ensure that the appropriate skills are provided to enable employees in the new development paradigm

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<sup>54</sup>Bhandari, A. K., & Heshmati, A. (2006). Wage inequality and job insecurity among permanent and contract workers in India: evidence from organized manufacturing industries.

<sup>55</sup> Hussenot Anthony, World Economic Forum, “The future of work could lie in freelancing”, August 2017.

<sup>56</sup> See the JILPT Research Report No. 146 (<http://www.jil.go.jp/english/reports/documents/jilpt-research/no.146.pdf>) and No 176 ([http://www.jil.go.jp/english/reports/jilpt\\_research/2015/no.176.html](http://www.jil.go.jp/english/reports/jilpt_research/2015/no.176.html))

and there is a continuous mechanism in place to update these skills as required. As bots take over a wide range of low skill repetitive tasks, the government must focus on computer literacy for individuals to sustain the growth of online freelancing and micro-work. In addition to the technical training, surviving online freelancing jobs also requires soft skills training which includes people skills, communication skills, social intelligence, etc. The government could allocate resources to create a database along the lines of the Online Labour Index (OLI) that help better understand the composition of this market. It will also help direct policies on formalization and re-skilling of the labour force in India.<sup>57</sup>

4. Labour norms need to be revisited to ensure that they also cater to and support the new types of workers and their employers who will drive growth in this new paradigm.
5. Invest in automation research in India by building research labs and design studios in India. Risk and growth capital for micro-entrepreneurs has to be scaled up rapidly, along with the rules and mechanisms for easy access to them.

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<sup>57</sup> University of Oxford is carrying out The iLabour Project to investigate the Construction of Labour Markets, Institutions and Movements on the Internet. Available at <https://ilabour.oii.ox.ac.uk/online-labour-index/>