

INDUSTRY 4.0 AND ITS POTENTIAL IMPACT ON EMPLOYMENT DEMOGRAPHICS IN INDIA

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Abstract

In the 21st century, we are at the brink of entering the fourth Industrial Revolution, and this is going to hit us with an advent of radical transformation in the fields of Robotics and Automation. The combined effect of these technologies is going to dramatically increase industrial productivity and efficiency. This could eventually lead to an era of mass disruption in the labor market - sharp decline in jobs coupled with complete overhaul of certain professions is likely as advances in automation & robotics will be capital intensive, labour saving and skills biased. As per a report published by The World Economic Forum - by 2022, 75 million jobs would be displaced all over the world - this is in line to what we are trying to explore in our research.

Our study investigates the impact of Industry Revolution 4.0 on future employment in India and the need for responsive education system to tackle this issue. Presently, the education system does not appear to be adapting as fast as the changes occurring in the technological world - which would lead to a disbalance in labor supply and demand and in turn lead to a rise in unemployment.

Keywords: *Industry 4.0, Employment, Workforce, Global Competitiveness*



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Introduction

India is currently on the brink of shifting towards the global phenomena - Industrial Revolution 4.0 (IR4.0). It is characterised as the marriage of physical and digital technologies such as analytics, artificial intelligence, cognitive technologies and the internet of things (IoT) (1). Companies are seeking to harness these technologies to attain higher levels of efficiency of production and increasingly seeking high skilled workers to retain their competitive edge (2).

From the advent of the first industrial revolution that substituted water/coal/steam/power for animal and human labour in the 18th century (3) to mass production and assembly lines using electricity in the second (4), the fourth revolution takes what started in the third with the adoption of computers and enhances it with smart and autonomous systems fueled by data and machine learning. Many jobs will now become redundant while many others will be created anew (5).

This paper is motivated by the *Global Competitiveness Report* by *Klaus Schwab* which assesses and ranks countries on various indicators critical for productivity in IR4.0 by country level analysis (6). In this report we study the preparedness of SAARC countries - India, Pakistan, Sri Lanka, Nepal & Bangladesh. We have scoped out Afghanistan, Maldives & Bhutan for study.

Literature Review

India’s readiness for IR4.0 in comparison to other economies is still unclear. India has started adopting Information & Communication Technology (ICT) through government funded regional digital literacy projects (7). Continued efforts have helped India reach over 500 million internet users via rapid growth in rural areas (8). But in Asia, India still lags behind Singapore, South Korea and China towards its preparedness for adopting ICT technologies (9).

Relationship between technological unemployment and education

As per PWC paper, using an extensive analysis of OECD countries, automations is expected to impact in three waves depicted in Figure 1.

| | | |
|--|---|--|
| Automation of simple computational tasks and analysis of structured data, affecting data-driven sectors such as financial services | Dynamic interaction with technology for clerical support and decision making. Also includes robotic tasks in semi controlled environments such as moving objects in warehouses. | Automation of physical labour and manual dexterity, and problem solving in dynamic real world situations that require responsive actions, such as in transport and construction. |
| Algorithmic Wave Early 2020s | Augmentation Wave Late 2020s | Autonomous Wave Mid 2030s |

Figure 1

Source:<https://www.pwc.co.uk/economic-services/assets/international-impact-of-automation-feb-2018.pdf>

There is an ongoing discussion whether the advancements in IR4.0 will result in net increase in unemployment. Earlier, after every industrial revolution there was a change in job sector, where unexpected and unexplored new jobs were created after a brief period of adjustment (11). Frey and Osborne estimated the probability of computerisation of 702 detailed occupations. Its methodology estimated around 47% of all jobs in the United States could be performed by computers in the next 10 to 20 years (12). Using similar methodology, World Bank reported an even more dire static estimating 60 - 70% probability of automation in

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developing countries (19). Interestingly, recent studies are less pessimistic, stating deployment of newer technology takes time and only a certain task of activities in a job are at a high risk of automation. It estimates only 5 - 10% of jobs can be fully automated with the current technologies (13). This suggests IR4.0 will not completely replace all labor or wages (14).

Education Systems and IR4.0

Studies strongly suggest that non-routine manual labour and non-routine tasks involving cognitive skills will broadly remain unaffected, but middle-skilled routine tasks have a threat to be substituted by computers (15). Employment and wages in jobs requiring high cognitive skills and/or intensive ICT use have shown an increase (13). In India, majority of the labour force is employed in low to medium skilled jobs which constitutes a significant part of the unorganised sector. Wherein, the organized sector, the quantum of the labor force employed in low to medium skilled jobs is much lower. Hence, the impact of this automation in India will not be as drastic as it would be in other developed economies.

However, these low - medium skilled jobs in organised sector is what the youth aspires for, with organized sector realignment to new technological possibilities, a critical pathway for upward income mobility is likely to go down(5).

Indicators for Competitive Index

This study uses the latest methodology introduced in the Global Competitiveness Report analysing 140 countries published by World Economic Forum (WEF) in 2018. It is a study of 98 pillars organised into 12 indicators using data from international organisations and World Economic Forum's Executive Opinion Survey. These 12 indicators are - Institutions; Infrastructure; ICT adoption; Macroeconomic stability; Health; Skills; Product market; Labour market; Financial system; Market size; Business dynamism; and Innovation capability. Our methodology of this research exploits these factors with a focussed approach on SAARC countries. We have scoped out Afghanistan, Maldives and Bhutan from this study due to lack of data on these parameters.

WEF in its latest 2018 Competitiveness Report has enhanced the parameters used in its methodology from the previous years to include new critical concepts such as business dynamism, labour market flexibility, property rights, health and life expectancy, education of current and future workforce, depth and stability of financial systems, and research and development in innovation capabilities. For the purpose of comparing improvements in

Competitive Index, data from 2016 WEF Report cannot serve as a base. Using the new methodology, figures for 2017 have been back calculated and used in the analysis.

Countries are marked on a score of 1 - 100 on each pillar, where 100 signifies the policy target. At each aggregate level an average of the score of its components are taken. The overall Competitiveness Index score is an average of the 12 pillars. Countries are then ranked on the basis of this score. Rank 1 is the highest ranking and then it descends.

Performance Measurement

SAARC countries are experiencing a period of continued growth with a forecast of 7.1% in 2019-2020 period. At its current rate it has maintained the position of the fastest growing region in the world. However, with the changing demographics and an expected 1.5 million people entering the workforce every month it has to create jobs at a faster rate. During the 20th century, the pathway for development of developing economies was relatively clear - industrialization through leveraging of labour force. However with IR4.0 the sequence to the pathway will have to be reimagined.

India at 58th position is the only SAARC nation in the top 60 countries out of 140 analysed by the index, followed by Sri Lanka at 84th place. Bangladesh at 103rd, Pakistan at 107th and Nepal at 109th are lagging behind in the global index. In South Asia, India is the best performing country with a GCI score of 62. It is a regional leader in all pillars except for Health, Skills and ICT adoption. The other SAARC countries GCI scores are more closely clustered around 50, led by Sri Lanka at 56. Nepal is the highest gainers from 2017 closely followed by India. This has been a result of Nepal’s economic policy which has helped the country bounce back from 2015 earthquake aftermath and the establishment of a stable elected government in 2018.

Source: Global Competitiveness Report, 2018 | GCI : Global Competitiveness Index

| Countries | GCI 2018 | GCI 2017 | Difference from 2017 | Current Ranking |
|------------------|-----------------|-----------------|-----------------------------|------------------------|
| India | 62.0 | 60.8 | +1.2 | 1 |
| Pakistan | 51.1 | 50.4 | +0.7 | 4 |
| Sri Lanka | 56 | 56.4 | -0.4 | 2 |
| Nepal | 50.8 | 49.5 | +1.3 | 5 |
| Bangladesh | 52.1 | 51.4 | +0.7 | 3 |

Key Sector Highlights

In the light of IR4.0 one key factor that will accelerate the growth of a country will be innovation. Innovation includes ease of doing business, growth of innovative and disruptive companies, research and developmental capacities of a nation. These are essential requirements for developing first mover advantage and getting ahead in the race with developed economies. India, sailing on new reforms introduced in the last 5 years with the Make In India Campaign, Ease of Doing Business reforms has helped it improve its position in innovation vis a vis its neighbours. India scores 53.8 in innovation much higher than the median score 33.7.

Another key aspect for embracing IR4.0 is ICT Adoption which includes sub aspects like mobile phone users and internet users. Interestingly, India has about 500 million internet users. From 2016 to 2018, the internet users have increased from 29% to about 40% of the population. This is taking place at a faster pace due to overhaul of network providers after the entry of heavily subsidised internet offers by Reliance Jio. Even after these efforts more than half of India does not have access to internet whereas advanced countries like USA have 90% penetration. India will have to take major steps to connect rural area with internet and improve its ICT adoption score. Nepal performs the best in this parameter with almost 65% of its population connected with internet.

Skill development is an important pillar for harnessing the current workforce to suit the changing demands of the future. Investments in this pillar is going to be a game changer for developing economies if they take control of it during the early years of IR4.0. Globally Finland is the best performing country in this index and Sri Lanka is the highest performing in SAARC. Sri Lanka annually spends a huge chunk of its budget on education programmes and boasts of 92% literacy rate in the country, highest in South Asia. India is second to Sri Lanka in this parameter, and with the largest young workforce in the world it has a huge challenge waiting in front of it to capitalise. To combat the issue of skill development, Vice Chairman of NITI Ayog recently suggested giving industries labour subsidies instead of capital subsidies. Under this scheme subsidies will be given to companies employing more labourers and training them to be more skilled and cost effective.

From the economic point of view, three parameters are essential for a country these are - **Macroeconomic Stability, Financial System and Market Size**. India has come out as the strongest country in the South Asian region. India vis a vis other SAARC nations has a top score of 89.8 in Macroeconomic Stability riding on a high GDP growth rate of 6.6%. This is
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taking place even as countries globally are shifting businesses from outsourced nations back to home country. Increase in income of middle class and a large population has made India's consuming population among the highest in the world. In terms of Market Size parameter, India has a near perfect score of 92.7 which is considerably higher than the second best country Pakistan in this region with a score of 70.7. Ease of FDI policies and a strong financial market has helped India maintain confidence of the world over its market growth. At the same time, Financial System parameter which includes sub systems like performance of banks, transparency and non performing assets remains a problem for South Asian countries including India. Although India performs better than the other countries in this region, there is a lot of scope for further improvement especially in dealing with Non Performing Assets of public sector banks.

Source: Global Competitiveness Report, 2018 / Ranking done on a scale of 1 to 5. 1 denoting the highest

| Pillars | India | Pakistan | Sri Lanka | Nepal | Bangladesh | Median |
|-------------------------|--------------|-----------------|------------------|--------------|-------------------|---------------|
| Institutions | 57.9 (1) | 46.3 (5) | 51.5 (2) | 48.5 (3) | 46.5 (4) | 48.5 |
| Infrastructure | 68.7 (1) | 59 (3) | 68.6 (2) | 48.5 (5) | 53.4 (4) | 59 |
| ICT Adoption | 28.0 (4) | 23.6 (5) | 32.9 (3) | 40.5 (1) | 39.8 (2) | 32.9 |
| Macroeconomic Stability | 89.8 (1) | 69.6 (4) | 68.2 (5) | 70.3 (3) | 72.6 (2) | 70.3 |
| Health | 59.0 (4) | 58.2 (5) | 86.7 (1) | 66.8 (3) | 71.2 (2) | 66.8 |
| Skills | 54.5 (2) | 39.9 (5) | 61.7 (1) | 48.4 (3) | 44 (4) | 48.4 |
| Product Market | 50.9 (1) | 47.9 (2) | 44.9 (4) | 44.8 (5) | 47.8 (3) | 47.8 |
| Labour Market | 58.3 (1) | 49.7 (4) | 50.6 (3) | 49.1 (5) | 50.9 (2) | 50.6 |
| Financial System | 69.5 (1) | 54.1 (4) | 56.8 (3) | 62.9 (2) | 51.8 (5) | 56.8 |
| Market Size | 92.7 (1) | 70.7 (2) | 57.9 (3) | 46.7 (4) | 36 (5) | 57.9 |
| Business Dynamism | 61.2 (1) | 59.1 (2) | 58.3 (3) | 54.0 (4) | 50 (5) | 58.3 |
| Innovation Capabilities | 53.8 (1) | 34.9 (2) | 33.7 (3) | 29.0 (5) | 30.6 (4) | 33.7 |

Conclusion

The study clearly indicates India is in a good position in comparison with SAARC countries. However, it is also clear that advent of IR4.0 will bring in a set of new challenges for India for which it will have to realign itself to make it competitive at the global level. India is already on the right track with the introduction of Make In India campaign, Ease of doing business relaxations, incentives for start ups, increased digital literacy programmes in rural areas and introduction of Goods and Service Tax (GST) which has helped to integrate the economy and make India a common national market through uniform taxes. However there is a long way to go. There is still a lot of research going on the potential impacts of IR4.0 and solutions to cope up with the changes. These can be broadly classified into three categories - Labour Protection Strategy, Labour Upskilling Strategy and Technology Advancement Strategy.

Labour Protection Strategy

As the number of labour workforce in India increases it is a key job of the government to provide social security for the millions entering the labour workforce. Start ups have given a push to the “gig economy” wherein more people are taking part time, contractual jobs (16). To protect their social rights government will have to strengthen labour laws catering to contractual employment, minimum wages and working conditions. In comparison to developed economies India still hosts medium skilled labourforce at low wage rates more competitive than deployment of AI in manufacturing areas. This will delay the effects of IR4.0 in India. The government can also use schemes to offer labour subsidies instead of capital subsidies to businesses employing more labourforce and upskilling them. However, this is only a short term solution, in the long run, the government will have to retrain its labour to suit the changing needs of the market.

Up Skilling Strategy

The government will have to invest to support educational systems that provide learnings for a lifetime (13). ICT and digital literacy have been identified as the key basic requirements for labour force in the coming years. Along with this soft skills is an area where big companies like IBM are finding it difficult to recruit people from India (17). It is imperative for India to make continued changes in its education system to bring more practical learning opportunities for its students. For this more universities and schools should participate in offering vocational computer training, coding and applications making courses for its students. Humanistic skills, interpersonal skills, leadership skills, creative and problem

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solving skills will prove helpful for employees to update themselves with changes in the work environment.

Technology Advancement Strategy

Research and Development wings of Indian institutes can use technology to solve a lot of problems faced by the economy. AI brings with itself a lot of opportunities and benefits for example - AI in the field of agriculture can bring the next green revolution for India. Microsoft in its pilot project is helping farmers to increase crop yield in villages (18). The government should incentivise the research institutes and universities in the country to conduct more Research and Development as this will be the defining edge of the future.

Appendix

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Diagram

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