

Theme paper
“Industry 4.0, Leapfrog Opportunity for India”
(For Productivity Week)

Industry 4.0, to put it briefly, is a mélange of many futuristic and advanced concepts and technologies which have the potential of transforming the production scenario in the 21st century mainly comprising of a ‘connected shop floor’ where data is collected from various sensors and other input devices to be used for predictive maintenance, better control and long-term analysis.

Industry 4.0 or the fourth industrial revolution as it is called, is emerging globally as a powerful force and is being touted as the next industrial revolution. It is characterized by the increasing digitization and interconnection of products, value chains and business models Industry 4.0 is driven by an amalgamation of emerging technologies like data volumes, computational power, Internet of Things (IoT), business analytics, augmented reality, artificial intelligence, elemental design, simulation, advanced robotics, additive manufacturing, sensor based technologies and cyber-physical systems. Industry 4.0 would mean the convergence of real and virtual worlds - the next phase in bringing together conventional and modern technologies in manufacturing. This will result in the “Smart Factory”, which is characterized by versatility, resource efficiency, ergonomic design and direct integration with business partners.

Industry 4.0 is one of the major drivers of the Fourth Industrial Revolution. The first industrial revolution was triggered by water and steam power to move from human labor to mechanical manufacturing. The second industrial revolution built on electric power to create mass production. The third used electronics and information technology to automate manufacturing. The fourth is the current trend of automation and data exchange in manufacturing technologies.

Manufacturing today is cutting edge and requires a high level of skill. Today, the global manufacturing sector is undergoing a structural transformation. Though India banks heavily on its Service Sector for growth, the Manufacturing Sector needs to play a significant role in the Indian economy. Manufacturing now needs to fuel the high growth in India. Hon’ble Prime Minister of India, launched the ‘**Make in India**’ program to place India on the world map as a manufacturing hub. The Manufacturing Sector especially MSMEs play a pivotal role in the Indian economy and provide the largest share of employment after agriculture. In order to converge the aims of growth with employment it is important to increase the share of manufacturing in the country’s Gross Domestic Product from 16% to 25% by 2022 and to create 100 million additional jobs by 2022.

Digital connectivity forms the backbone for adoption of advanced technologies. With increasing penetration of the internet in India and emergence of e-Commerce, presence of enterprises on the internet has become inevitable. Ensuring comprehensive broadband connectivity in industrial clusters, Government of India has launched **Digital India Programme** with a vision to transform India into a digitally empowered society and knowledge economy.

Smart Factory may be characterised in terms of flexible systems and machines, distribution of functions throughout the network, communication/interaction among all participants across

hierarchy, self-optimization and autonomous decision-making. Digital technologies allow for new business models and value-producing opportunities, and are attainable for most developing countries.

Smart manufacturing brings in the following benefits:

- Lower Cost
- Additional Revenue
- Enabling Industrial Companies to optimize customer relationship.
- Transparency in the production process
- Clarity on the status of all aspects of production system in real time
- Industrial companies that successfully implement Industry 4.0 no longer need to choose between focusing on a better top or bottom line. They can improve both at the same time.
- Logistics processes becomes leaner
- Reduced inventories
- Maintenance processes standardization
- 100% traceability

India is uniquely advantaged in scalable digital technologies. In financial services, it is building a unique, first-of-its-kind digital stack (known as the “India Stack”) with Aadhaar, Jan Dhan accounts and various payment technologies such as UPI and the Aadhaar Payment Bridge System. This scalable platform offers an opportunity to develop innovative services not just for the Indian customer but can easily be modified to offer similar services to global customers. Developing and deploying these ‘technology stacks’ across well-penetrated service sectors like construction, under-penetrated sectors like health or nascent sectors like urban management services can deliver not just economic growth but millions of new jobs.

The organization need to upscale their competitiveness by selecting and adopting the technologies of I 4.0 from the following list based on the relevance, cost-effectiveness, and impact on productivity enhancement:

- Additive Manufacturing – 3D Printing
- Sensors
- Robots (auto + co-bots)
- Simulation
- Augmented reality
- Cloud Computing
- Big Data and Analytics
- Industrial Internet
- Cyber-security
- Horizontal and vertical integration

There are many challenges which have to be addressed in order to successful adoption of advanced technologies and realization of Industry 4.0 potential. Few key challenges are given below:

- Lack of a clear digital vision.

- A lack of data analytical capabilities.
- Fostering a strong digital culture.
- Level of digitization
- Data Security
- The major risk with recording, storage and analysis of large volumes of customer data is the inappropriate use of the said data
- Lack of standardization
- Though concepts like sharing of data and integration of technology are not new, however lack of standards or rather prevalence of proprietary standards is going to be a key roadblock

National Productivity Council, New Delhi has been designated by the Asian Productivity Organisation (APO) as a Centre of Excellence on IT for Industry 4.0 (CoE: IT for I4.0)". The scope of CoE is to function as a knowledge centre for the entrepreneurs, start-ups regarding concepts of information technology and its application in Industry, to disseminate this knowledge through workshops, lectures and training programmes, to facilitate display of latest technology / demonstration projects for helping the new start-ups, etc.

In this scenario, the Centre of Excellence (CoE) can be very effective in collection of information, development & dissemination of knowledge/information, facilitation in capacity building of industries in coordination with various stakeholders. This will result in the "smart factory", which is characterized by versatility, resource efficiency, ergonomic design and direct integration with business partners.

India must proceed on a different development journey, which accounts for different global circumstances and leverages India's strengths. Our hypothesis is that digital technologies will power mass services just like industrial technologies powered mass manufacturing.

If India is to benefit from Industry 4.0 and win against global competition, it has necessarily to integrate the principles of Industry 4.0 with the 'Make in India' initiative. "**Make in India**" initiative is more broad-based idea to encourage multi-national, as well as national companies to manufacture their products in India. Government is focusing more on enabling policies and improving infrastructure for certain key Sectors.

There are two schools of thoughts on this revolution. First, the experts believe that by fourth industrial revolution, the manufacturing base will become modernized by 4.0 solutions, allowing capital to be used more gainfully. In making better use of its base, industry will draw less on capital employed. Profitability and Return on Capital Employed will rise and create new investment opportunities – a key aspect in the funding of new projects and in creating new jobs.

Second school of experts says that the use of industry 4.0 technologies will result in an increase in labor productivity and in the quality of the products manufactured. As a result, the demand for quality products manufactured will increase, rendering companies with no option but to increase capacity to meet the demand. There is no doubt that certain low-skilled jobs will be eliminated. However, it is expected that an increase in capacity will have a positive effect on the creation of jobs,

requiring higher levels of skills. Employees who were rendered jobless due to elimination of low-skilled jobs need to be re-skilled or up-skilled to make them ready for the new requirements. All in all, the creation of new high skilled jobs will compensate, to a large extent, for the elimination of low skilled jobs.

Various initiatives are being undertaken by Government of India and other stakeholders in order to realize successful adoption of smart manufacturing concept which will expedite the process of achieving goals of “Make in India”. There is no doubt Industry 4.0 is a leapfrog opportunity for India to become hopefully the first large economy in the digital 21st century.