International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 08 | Aug 2020 www.irjet.net p-ISSN: 2395-0072

Acceptance of Industry 4.0 in Digital Industrial Technology and Rediscovering Growth

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Abstract - *The globalization and the competitiveness are encouraging companies to rethink and to redesign their production processes following the Industry 4.0 model. It represents the combination of tools already used in the past like big data, cloud, robot, 3D printing, simulation, etc., that are now associated into a global network by transmitting digital data. The accomplishment of this new paradigm represents a massive change for companies, which are faced with big investments. In order to gain from the opportunities offered by the smart revolution, companies must have the prerequisites needed to hold up changes generated by "smart" system. In addition, new workers who face the world of work 4.0 must have new skills in automation, digitization, and information technology, without forgetting soft skills. This paper aims to present the main good practices, challenges, and opportunities related to Industry 4.0 paradigm.*

Key Words*: *Industry 4.0, Artificial Intelligence, automation, industrial revolution, robotics, machine learning

1. INTRODUCTION

The growth of new digital industrial technology, also known as Industry Revolution 4.0, is a renovation that makes it possible to assemble and analyze data across machines, enabling more rapid and more efficient processes to produce higher-quality goods at cheap costs. This manufacturing revolution will boost productivity, shift economics, cultivate industrial growth, and amend the profile of the workers—eventually changing the competitiveness of companies and regions.

The term 'Industry 4.0' or 'Industrial Revolution 4.0' originated in the year 2011 from a project in the high-tech strategy of the German government, which works on promoting the computerization of the manufacturing. The term was announced during the Hannover Fair publicly.

The Fourth Industrial Revolution is shifting the way we live, work and think. It comes with the rapid change/advancement of technologies, which is more focused on the technologies like advanced robotics, artificial intelligence, and machine learning. As technology becomes invisible it changes the lives of young community and workers across the world and allowing people to work from wherever they are comfortable. Now a day Work can be managed from anywhere, and requires such type of persons that can be creative, think critically and solve problems as they arise. Humanity continues to go on board on a period of incomparable technological advancement. In the next coming decades will present both significant challenges and opportunities. Private sectors, governments, academics and entrepreneurs are all seeking the roadmap for navigating these profound changes in the world of work.

2. NINE TECHNOLOGIES TRANSFORMING INDUSTRIAL PRODUCTION

Advanced computerized technology is now utilized in assembling, but with Industry 4.0, it will change the way of production. It will prompt more prominent efficiencies and change conventional creation connections among providers, makers, and clients—just as among human and machine. Nine innovative trends from the Industry 4.0

2.1 Big data and analytics

Big data analytics is the use of complex analytic techniques aligned with very large, diverse data sets that include structured, semi-structured and unstructured data, from dissimilar sources, and in different sizes from terabytes to zettabytes. In an Industry 4.0 perspective, the assortment and comprehensive evaluation of data from many different sources—production equipment and systems in addition to enterprise- and customer-management systems—will become standard to support real-time decision making.

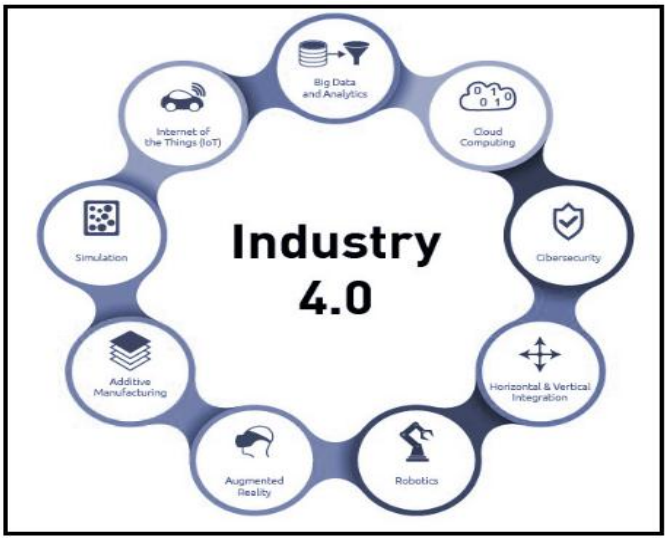

Fig 1: Nine innovative trends from the Industry 4.0

2.2 Autonomous robots

Manufacturers in many industries have used robots to deal with complex assignments, but robots are developing for even greater utility. They are becoming more independent, flexible, and supportive.

Self-governing Robots provides details regarding the hypothesis and uses of automated frameworks prepared to do some level of self-sufficiency. It highlights papers that remember execution information for real robots in real world. Inclusion incorporates: control of self-ruling robots • constant vision • self-governing haggled vehicles • legged vehicles • computational designs for self-sufficient frameworks • distributed structures for learning, control and adaptation • investigations of self-sufficient robot frameworks • sensor combination • hypothesis of independent frameworks • territory mapping and acknowledgment • self-alignment and self-fix for robots • self-imitating astute structures • hereditary calculations as models for robot improvement.

Robots will act together with one another and work safely side by side with humans and learn from them. These robots will charge less and have a greater range of capabilities than those used in manufacturing today.

2.3 Simulation

In the engineering phase, 3-D simulations of goods, resources, and manufacturing processes are already used, but in the future, simulations will be used more comprehensively in plant operations as well. These simulations will leverage real-time data to reflect the physical world in a virtual replica, which can include machines, goods, and humans. This allows operators to test and optimize the machine settings for the next product in line in the virtual world before the physical switch over, thereby lashing down machine setup times and increasing quality.

For example, Siemens and a German machine-tool vendor developed a virtual machine that can simulate the machining of parts by means of data from the physical machine. This minimizes the setup time for the real machining process by as much as 80 percent.

2.4 Horizontal and vertical system integration

Large areas of the present IT industry are not completely incorporated. Organizations, suppliers, and clients are infrequently firmly connected. Capacities from the endeavor to the shop floor level are not completely coordinated. Even engineering-from products to plants automation—lacks complete integration. But, with Industry 4.0, organizations, departments, functions, and capabilities will turn out to be considerably more powerful, as cross-organization, all inclusive information coordination systems develop and enable truly automated value chains.

For example, Dassault Systèmes and BoostAeroSpace propelled a joint effort stage for the European aviation and confrontation industry. The stage, AirDesign, fills in as a typical workspace for plan and assembling cooperation and is accessible as assistance on a private cloud. It deals with the unpredictable undertaking of trading item and creation information among numerous accomplices.

2.5 The industrial internet of things

IoT enables real-time machine to machine interaction by linking them over a network and help set up a connected value chain. IoT initially referred to an industrial framework whereby a large number of devices or machines are connected and coordinated through the use of software tools and third stage technologies in a machine-to-machine and Internet of Things background, later an Industry 4.0 or Industrial Internet context.

2.6 Cyber security

Cyber security helps set up secured communication protocols to ensure data security. With the increased connectivity and use of regular communications protocols that come with Industry 4.0, the requirement to protect critical industrial systems and manufacturing lines from cyber security threats increases considerably. As a result, secure, dependable communications as well as complicated identity and access management of machines and users are necessary.

2.7 The cloud

Cloud computing offers a podium ready with vast computational, storage and networking capabilities, which would make possible the interaction amongst various technologies. Cloud-based IT-platform serves as a technical spine for the connection and communication of various elements of the Application Centre Industry 4.0. With industry 4.0, organization wants increased data sharing across the sites and companies i.e. targeting the response times in milliseconds or even faster.

2.8 Additive manufacturing

With Industry 4.0, additive-manufacturing methods will be widely used to manufacture small batches of customized goods that offer construction advantages, such as complex, lightweight designs. High-performance, distributed additive manufacturing systems will decrease transport distances and stock on hand. The manufacturing should be faster and cheaper with the use of additive manufacturing technologies like fused deposition method (FDM), selective laser melting (SLM), and selective laser sintering (SLS).

Additive manufacturing helps manufacturing in small-batches in a cost-and-time effective way, by decreasing the lead time from product designing to product release and improves customization.

2.9 Augmented reality

Augmented-reality-based systems carry a variety of services, such as selecting parts in a warehouse and sending repair instructions over mobile devices. Industry can use of augmented reality to provide workers with real-time information to get better decision making and work procedures. Workers may get repair instructions on how to replace a particular part as they are looking at the actual system needing repair [12].

3. THE FOURTH INDUSTRIAL REVOLUTION

At its core, a modern transformation can be portrayed by progressions in innovation that mankind applies to improve the procedure of creation. Be that as it may, in actuality, it implies quite a lot more.

The initial three mechanical insurgencies brought to the world water and steam force, power and digitization. With each modern upset comes refining movements to social, financial, natural and political frameworks that genuinely adjust the human's life. A portion of these movements are predicted, and others are totally unexpected.

Today, a fourth mechanical insurgency unfurls. The Fourth Industrial Revolution is bringing innovations that obscure the lines between the physic al, advanced and organic circles across all the centers. Innovations like man-made reasoning (AI), nanotechnology, quantum registering, manufactured science and mechanical autonomy will all radically override any advanced advancement made in the previous 60 years and make real factors that we recently thought to be unimaginable. Such significant real factors will disturb and change the plan of action of every single industry.

4. THE JOURNEY OF INDUSTRIAL REVOLUTION

The Fourth Industrial Revolution also called the 4IR or Industry 4.0, is set to transform society like never before, it builds on foundations laid by the first three industrial revolutions. The advent of the steam engine in the 17th century led to the first industrial revolution, allowing production to be mechanized for the first time, and driving social change as people became increasingly urbanized.

Second industrial revolution mainly focused on electricity and other scientific advancements led to mass production. In the beginning of third industrial revolution in the 1950s, the emergence of computers and digital technology has been there in the picture. This encouraged automation of manufacturing and the disruption of industries including banking, energy, and communications.

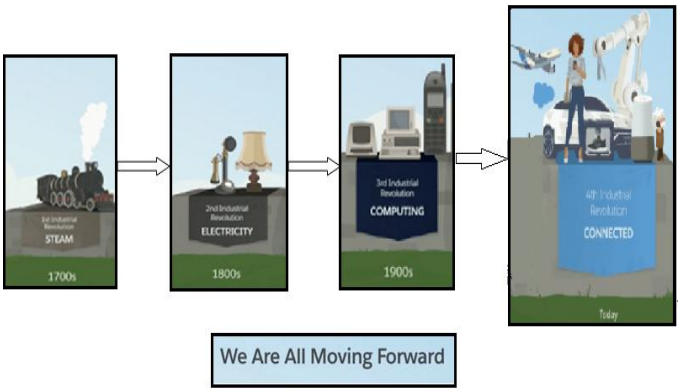

Fig -2: From where the Fourth Industrial Revolution Comes

The person who labeled today's advances as a new revolution was Klaus Schwab, Founder and Executive Chairman of the World Economic Forum and author of a book titled The Fourth Industrial Revolution. Klaus Schwab, written in his article in 2016, that "like the revolutions that preceded it, the Fourth Industrial Revolution has the potential to raise global income levels and improve the quality of life".

Schwab also recommended the revolution could lead to greater inequity, "particularly in its potential to upset labor markets." Furthermore, the job market may become increasingly segregated into "low-skill/low-pay" and "high-skill/high-pay" roles, which could raise social tension.

Schwab also added that, "the changes are so considerate that, from the perspective of human history, there has never been a time of greater assurances or potential threat."

5. THE FOUR PILLARS OF TUTORING MINDSET

As a result, the worlds of work and labor market demand are rapidly changing. According to McKinsey, up to 375 million workers may need to change their occupational category by 2030, and digital work could contribute $2.7 trillion to global GDP by 2025. Faced with the scale of the inevitable shifts in workforce demands, we must address the challenges related to the workforce transformation, starting by taking an in-depth look at its impact on the world of work. Four key contact areas should be considered:

5.1 Technological

For most global industries (e.g., logistics, financial, manufacturing, aerospace, etc.), advancements in AI, robotics, 3D printing and the internet of things will put a great deal of pressure on companies to mechanize in order to remain competitive in a global scenery. This will need companies to have a solid understanding of the way these technologies impact their industries and how they can make sure that organizational quickness to adapt to these changes. Increased global competitiveness will speed up cost

pressure, which will direct to substantial downsizing or relocation of a large contingent of workers. McKinsey estimates that up to 800 million individuals may be displaced by automation by 2030.

5.2 Economic

There are four main entity of production that fuel economic growth: land, labor, capital and enterprise. Today, the world is attaining only 52% of its entrepreneurial capacity, and this number is declining year over year. Large, established enterprises have a significant advantage in the future of work than smaller companies due to their ability to adapt to technological changes. However, this is not a principle for long-term, sustainable economic success. The world have to focus on underneath independent entrepreneurs, as small and midsize businesses are the oil of most economies of the world today.

5.3 Social

Technology will prolong to change communal values. Today, more than 36% of the U.S. workforce are freelancers for reasons including autonomy, flexibility and extra income? Co-working spaces are exploding in popularity and are often fully subscribed before opening their doors. Technology has enabled people to work anytime, anywhere. By 2027, more than half of American employees will be freelancing.

5.4 Education and training

An essential part of economic development is one's capability to access training for employment. Naturally, tectonic shifts are happening in the education space. Students are less interested in stale curriculums and keener to take shorter, skills-based training that is more relevant to today's workplace. Employers are focusing on the skills required to achieve their business objectives and remain competitive and agile, which requires them to ensure their employees the necessary training to fill these skills gaps. Workers, naturally, need to acquire skills "on demand" to adapt to their changing roles and responsibilities.

6. PREPARATION FOR THE FUTURE OF WORK THROUGH THE INVOLVEMENT OF INDUSTRY, ACADEMIA AND GOVERNMENT COLLABORATION

Despite the challenges we face, we also possess an unprecedented possibility to apply an abundance mindset to solving the challenges. The Fourth Industrial Revolution will provide us the opportunity to learn and teach new skills, build new jobs requiring unique skills today, to explore talent that we didn't know about and in doing so, grow our businesses and create a new generation of workers that are highly skilled in more diverse areas. The question is that, how do we achieve the target?

Collaborations among the private sector, academia and policymakers will be essential to navigate the future of work as we go through these profound moments. Schools need to work with businesses and the public sector to develop on-demand, relevant, adaptable curriculums and focus on teaching skills; governments need to utilize advanced technologies to generate real-time and predictive insights on the labor market in order to develop sound policies, programming and budgets; companies need to hire for competencies over credentials and, more importantly, take the lead in supporting existing workforces' up skilling and lifelong learning.

7. THE FUTURE OF WORK

Numerous advanced economies are implementing the concept of Industry 4.0, marking the fourth industrial revolution. Increasingly, companies are applying innovative solutions, including through the "Internet of Things" (IoT), cloud computing, miniaturization, and 3D printing, that will enable more interoperability, flexible industrial processes, and autonomous and intelligent manufacturing.

One of the most instantaneous and impactful outcomes of technological development is the huge advancement in automation. Every day, more manual process become automated, and as technology continues to pick up the pace, so will automation.

Let's prepare ourselves for this next transition with an abundance mindset and create a future of work that is prosperous for all.

The term Industry 5.0 has been introduced to the research areas which are considered as next industrial revolution, but it is more systematic transformation that includes impact on civil society, governance and structures, and human identity in addition to solely economic/ manufacturing ramifications.

8. CONCLUSIONS

The paper mainly focused on the concept of fourth industrial revolution, called Industry 4.0 which allows smart, efficient, effective, individualized and customized production at reasonable cost, and how Digital Industrial Technology accepting Industry 4.0 in rediscovering growth. Among the consequences of "Industry 4.0" and structural problems in the world, economy will be an escalation in competition at the geo-economic level. By the implementation of faster computers, smarter machines, smaller sensors, cheaper data storage and transmission could formulate machines and products smarter to communicate with each other and learn from each other. The nine pillars of industry 4.0 explained with the examples to comprehend the application of Industry 4.0 as well as used to recognize the challenges and issues with the accomplishment of Industry 4.0. The paper also evaluated the preparation for the future of work through the involvement of Industry, Academia and Government Collaboration.

As the accomplishment of the industry 4.0 increases new research streams should be discovered like translucent and organized supply chain and industrial management, Data collection from the production lines and maximization of that data for the use of efficient machines, Energy Saving and Optimized maintenance scheduling.

In conclusion it is commendable to note that to face the challenges of the future it is premeditated to digitize manufacturing processes and implement intelligent automated systems that can self-manage. The pledge must be extended not only to companies but also to governments, whose task is not only to develop investment strategy that are easy for companies wish to renew their processes but also to train young workers from high schools by making enforced modules of computer science, automation, and foreign languages, to create a new generation of work force who own the hard and soft skills needed to operate within the smart industrial unit. In this way, it will be probable to properly apply the new Industry 4.0 practices and to make technological advances to companies and the whole society.

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