# Transition from Industry 4.0 to Industry 5.0: Opportunities, Challenges and Technology Requirement

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**Abstract:**

Industry 5.0 is still a developing concept, but it is expected to leverage a range of advanced technologies to facilitate human-machine collaboration and enable more customized and sustainable manufacturing.This research paper tried to discuss the opportunities and challenges in the implementation of Industry 5.0. It primarily explored the need to transform from Industry 4.0 to Industry 5.0. The research paper further studied the technologies needed for the implementation on Industry 5.0 and also the principles of Industry 5.0.

**Keywords**: Industry 5.0, AI, Internet of Things, Sustainability, Resilience etc.

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**Introduction:**

This is the age of technology and therefore each and every country is in search of new technologies, invention of technologies, innovations and adoption of new technologies. In 2018, the Japanese government first proposed the concept of Industry 5.0. The challenges of lack of human touch in manufacturing processes and job displacement in Industry 4.0 are addressed in Industry 5.0. Industry 5.0 envisions a manufacturing system that combines the precision and efficiency of advanced technologies with the problem-solving skills and creativity of human workers. In this model, humans and machines work together to produce goods that are not only high-quality and cost-effective but also customized to meet individual preferences and needs. Industry 5.0 also emphasizes the importance of social responsibility and sustainability, with a focus on reducing carbon emissions and waste and promoting fair and ethicallabor practices.[1]Thus, Industry 5.0 focuses not only on customization and development but also on sustainability.

**What is Industry 5.0?**

The term Industry 5.0 refers to people working alongside robots and smart machines. It's about robots helping humans work better and faster by leveraging advanced technologies like the Internet of Things (IoT) and big data. It adds a personal human touch to the Industry 4.0 pillars of automation and efficiency.[2]

**Objectives of the Study:**

Following are the objectives of this research paper:

1) To explore the need to transform from Industry 4.0 to Industry 5.0.
2) To discuss the opportunities and challenges in the implementation of Industry 5.0.
3) To study the technologies needed for the implementation on Industry 5.0.

**Materials and Methods:**

To study the opportunities, challenges and technologies needed for the implementation of 5.0, researcher studied and analyzed theoretical and literature reviews. This study is based on secondary data and trying to add to the existing literature on Industry 5.0.

**Transition from Industry 4.0 to Industry 5.0:**

Industry 4.0 focuses on adoption of digital technologies such as artificial intelligence, internet of things, cloud computing, blockchain and big data. While companies are struggling in handling the emerging technologies and agility in Industry 4.0, they need to start to think about the transition into Industry 5.0. Industry 5.0 focus on human-centered technology. It provides collaboration between people and smart technology to take over the manual and repetitive tasks. While implementing and getting used to industry 4.0, the term 5.0 came about. Does this mean that it is to start from scratch all over again? The answer is no. There is no need to forget or discard Industry 4.0. Industry 4.0 and Industry 5.0 are not mutually exclusive but are mutually complementary to each other.[3]

During the COVID-19 pandemic,the entire production chains all over the world came to a pause. This moment helped us to think about the role and importance of humans in the job market. Even though machines and equipment can operationalize

tasks, we realized thatevery job still needs people. This is what brought Industry 5.0.[4]Industry 4.0 focuses on connecting machines and systems to achieve optimum performance and thereby improving productivity and efficiencies. Industry 5.0 is thought to go one step further and improve the interaction between humans and machines.[5]

| Industry 4.0 | Industry 5.0 |
|---|---|
| Focus on Equipment Connectivity | Focus on Customer Experience |
| Mass Personalization | Hyper Customization |
| Smart Supply Chain | Responsive and Distributed Supply Chain |
| Smart Products | Interactive Products |
| Remote Workforce | Onsite Workforce |

**Source:**https://blog.bimtech.ac.in/transiting-from-industry-4-0-to-industry-5-0/

**Principles of Industrial Revolution 5.0:**

Industry 5.0 is based on three principles - sustainability, resilience and human centric, which are explained as follows:[6]
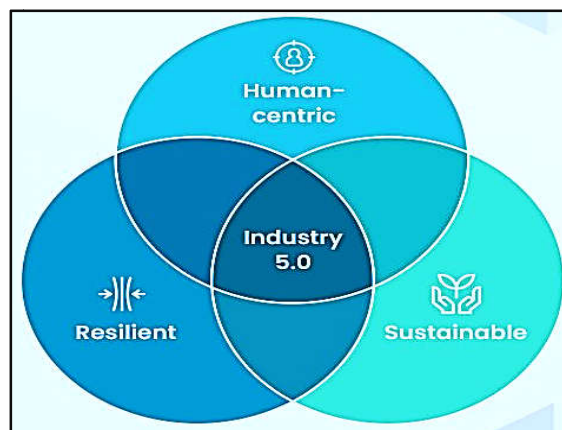


1) **Sustainability:** In previous industrial revolutions, one aspect had always been neglected and it was the adverse effects of industrial processes on the environment. Although business leaders show their environmental concerns through Corporate Social Responsibility (CSR) programs, it hasn't had much impact. Industry 5.0 emphasizes sustainable business strategy more strongly than CSR. It calls for incorporation of sustainability in firms' strategies.

2) **Resilience:** Businesses must anticipate and quickly adapt to changes in consumer trends and regulations. Companies need to be more flexible and agile to ensure stable and sustainable performance during crisis. Covid-19 crisis badly affected the

global supply chain causing shortages of supplies. Industrial revolution 5.0 aims to achieve a robust and resilient supply chain to ensure the continuity of essential supplies in times of crisis.

3) **Human-Centric:** This is another pillar of industrial revolution 5.0. The approach of organizations should be human-centric that means organizations should serve the people and not people to organizations. In the manufacturing industry, companies need to find the right technology that suits their workforce. They need to consider how to adapt technology to meet employees' needs. In a nutshell, a humanistic approach puts human at the center of the production process and focuses on choosing the technology that best suits their needs.

**Technology Requirement for Industry 5.0:**

The technologies that lead industrial transformation 5.0 are as follows:[7]

1) **Cloud Computing:** Cloud computing will allow manufacturers to store and analyze large amounts of data in real-time.

2) **Edge Computing:** Using edge computing also means that data stays near its source, reducing security risks.

3) **Artificial Intelligence (AI):** AI technologies, such as machine learning and natural language processing, will play a crucial role in enabling machines to understand and respond to human input and collaborate with humans in real time.

4) **Robotics and Automation:** Advanced robotics and automation systems will enable machines to perform complex tasks with high accuracy and speed. It will free up human workers to focus on more strategic and creative aspects of manufacturing.

5) **Internet of Things (IoT):** The Internet of Things will empower machines to collect and analyze data from various sources, providing real-time insights into manufacturing processes and increasing efficiency with customized production.

6) **Augmented and Virtual Reality (AR/VR):** AR and VR technologies will facilitate better collaboration and communication between humans and machines enabling workers to interact with machines and data in more immersive and intuitive ways.

7) **Cyber security:** When undergoing a digital transformation from Industry 4.0 to Industry 5.0, it is essential to consider a cyber-security approach that encompasses IT and OT equipment.

8) **Digital Twin:** Manufacturers can use digital twins to help increase productivity, improve workflows and design new products.

9) **Data Analytics and Big Data:** Big data will be crucial for Industry 5.0 manufacturing because the large volume of data can help manufacturers get better insights about their business, customers, and processes.

## Opportunities of Industry 5.0:

Industry 5.0 offers following opportunities for industries, employees as well as customers:

1) Industry 5.0 provides greater opportunities for creative people to come and work, which enables the optimization of human efficiency.

2) Industry 5.0 creates higher-value employment.

3) It enables the automation of manufacturing methods better with Industry 5.0 by feeding the real-time information from the sector.

4) In Industry 5.0, there is increased safety of the employees at the work floor because COBOTs can take up hazardous and dangerous works.

5) Industry 5.0 increases customer satisfaction and attracts new customers due to more personalized products and services, which results in increased profit and market share for the companies.

6) It provides great opportunities to start-ups and entrepreneurs in creative and innovative spheres to come up with new products and services.

7) Quality services can be provided at the remote locations with the help of industry 5.0.

8) Optimized use of resources and increased efficiency will reduce manufacturer costs.

9) Industry 5.0 will offer greater production quality with the collaboration of machines and humans.

**Challenges of Industry 5.0:**

There are various challenges in the implementation of Industry 5.0 as follows:[8]

1) There is an increased cyber security threat in industry 5.0 due to its increased.

2) Since Industry 5.0 requires significant investment, infrastructure and cutting-edge technology, this is a challenging process for startups and entrepreneurs.

3) It will be challenging to decide regulatory mechanisms in industry 5.0 due to the presence of high amount of automation. In case of failures, who will be held accountable and to what extent.

4) The existing business models and business strategiesneed to be modified and customizedto meet the requirements of industry 5.0.

5) In order to sustain in competition due to differential customer preferences, higher level of dynamism in business strategies will be needed in industry 5.0.

6) Due to the increased data streams, sensors and monitoring associated with Industry 5.0, one of the largest challenges involves energy management.

**Concluding Remark:**

Although Industry 5.0 has yet to get momentum as most companies are still engaged in Industry 4.0 or earlier frameworks, it is slowly getting traction. Also, companies have started to realize the importance of sustainable business strategies. As companies buckle up for the new industrial revolution, they need technologies and software solutions that help them to achieve their sustainability goals.

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