# FOURTH INDUSTRIAL REVOLUTION

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**In Partial Fulfillment of the**
**Requirements for**
**APPLICATIONS DEVELOPMENT**
**AND EMERGING TECHNOLOGIES**

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## I. HISTORY OF IR4

The Industrial Revolution 4.0, which represents the current phase of technological advancement in industrial processes and systems. Industrial Revolution 4.0 builds upon the previous three industrial revolutions and is characterized by the integration of digital technologies, automation, and data exchange in manufacturing and other industrial sectors. Here is a brief overview of the history of Industrial Revolution 4.0:

1. **First Industrial Revolution**: The first industrial revolution took place in the late 18th century and was driven by the introduction of mechanized systems, such as the steam engine and textile machinery. This revolution transformed manual labor and introduced machine-based manufacturing.
2. **Second Industrial Revolution**: The second industrial revolution occurred in the late 19th and early 20th centuries. It was marked by significant technological advancements, including the development of electricity, mass production techniques, and the assembly line. These innovations revolutionized manufacturing and led to increased productivity and economic growth.
3. **Third Industrial Revolution**: The third industrial revolution, often referred to as the digital revolution, began in the late 20th century with the rise of electronics, computers, and automation. Key developments included the widespread use of computers, the internet, and telecommunications. This revolution led to the automation of various industrial processes and the digitization of information.
4. **Industrial Revolution 4.0:** The fourth industrial revolution emerged in the early 21st century and is characterized by the fusion of physical, digital, and biological technologies. It encompasses several transformative technologies, including the Internet of Things (IoT), artificial intelligence (AI), big data analytics, cloud computing, robotics, additive manufacturing (3D printing), and advanced materials.

Industrial Revolution 4.0 aims to create smart factories and interconnected systems that enable real-time data exchange and autonomous decision-making. It has the potential to significantly enhance efficiency, productivity, and flexibility in industrial processes. By leveraging data-driven insights and

automation, businesses can optimize their operations, streamline supply chains, and customize products to meet individual customer demands.

## II. BACKGROUND OF IR4

Industry 4.0 or Fourth Industrial Revolution is a term that is used to describe the trend of automation and data exchange in manufacturing industries. Industry 4.0 arose in 2011 from a project under the German government's high-tech strategy, which endorses the computerization of manufacturing. The term "Industry 4.0" was first used publicly in the same year at the Hannover Fair.

The fourth industrial revolution (IR 4.0) includes technology such as the internet of things (IoT), Cloud computing, Artificial intelligence (AI) and many more. IR 4.0 also shows the improvement in the types of technology:

a. **Connectivity, data and computational power** - this includes storage and services which are the internet, blockchain, and cloud technology.
b. **Analytics and intelligence** - this technology is all about automation and making computers perform advance functions that is similar to what a human can do which includes AI and Machine Learning
c. **Human and machine interaction** - is about how people and automated systems or machines interact with each other. This includes virtual reality(VR) and augmented reality(AR).

## III. CAUSE AND OPPORTUNITIES OF IR4

The Industrial Revolution 4.0,is driven by the convergence of digital technologies, automation, and data exchange. It brings about numerous causes and opportunities that have a significant impact on various aspects of society and the economy. Here are some of the key causes and opportunities associated with Industrial Revolution 4.0:

**Causes of Industrial Revolution 4.0:**

a. **Advancements in Digital Technologies**: The rapid progress in digital technologies, such as artificial intelligence (AI), the Internet of Things (IoT), cloud computing, and big data analytics, has paved the way for Industry 4.0. These technologies enable the collection, analysis, and utilization of

vast amounts of data, leading to more intelligent decision-making and automation.

b. **Connectivity and Data Exchange**: The increasing interconnectivity of devices, machines, and systems through IoT allows for seamless data exchange and communication. This connectivity creates a digital ecosystem where information can flow in real-time, enabling more efficient and coordinated processes.

c. **Automation and Robotics**: The advancements in robotics and automation technologies have made it possible to perform repetitive and labor-intensive tasks with greater precision and efficiency. Automation can enhance productivity, reduce costs, and free up human workers for more complex and creative tasks.

d. **Customization and Personalization**: Industry 4.0 enables mass customization and personalized production. Digital technologies facilitate the customization of products and services to meet individual customer preferences and requirements. This customization can lead to increased customer satisfaction and loyalty.

**Opportunities of Industrial Revolution 4.0:**

a. **Increased Productivity and Efficiency**: Industry 4.0 technologies enable enhanced efficiency and productivity through automation, real-time data analysis, and optimization of processes. This can result in cost savings, improved resource utilization, and streamlined operations.

b. **Smart Manufacturing and Supply Chains**: Industry 4.0 allows for the development of smart factories and interconnected supply chains. Smart manufacturing systems leverage IoT, AI, and data analytics to create agile and responsive production systems. Supply chains can become more transparent, efficient, and resilient through real-time tracking, inventory optimization, and predictive maintenance.

c. **Innovation and New Business Models**: Industry 4.0 opens up opportunities for innovation and the development of new business models. Companies can leverage digital technologies to create novel products, services, and customer experiences. It enables the emergence of disruptive startups and promotes entrepreneurship.

d. **Job Creation and Skill Development**: While Industry 4.0 leads to automation and shifts in job requirements, it also creates new job opportunities. The deployment of advanced technologies requires skilled professionals in areas like data analysis, AI, cybersecurity, and robotics. Moreover, Industry 4.0 can empower workers with new skills, enabling them to perform higher-value tasks.

e. **Sustainable and Environmentally Friendly Practices**: Industry 4.0 technologies can contribute to sustainability efforts. Optimized processes and data-driven decision-making can reduce waste, energy consumption, and environmental impact. For example, smart grids and energy management systems can enable more efficient energy use.

f. **Improved Quality of Life**: Industry 4.0 has the potential to enhance the quality of life for individuals and society as a whole. It can lead to the development of personalized healthcare, smart cities, and improved safety and security systems. Access to advanced technologies and digital services can improve education, healthcare, and overall well-being.

## IV. GLOBAL EFFECTS OF IR4

a. **In the Africa**

Unsprung opportunities for Africa to adopt technologies and seeks to bridge the gap between physical and digital worlds, through collaboration of standardization experts, technology communities, stakeholders and regulatory agencies in assessing industry standards and policy harmonization that enhances trade.

b. **In the Asian Countries**

Among Asian Countries, China today leads the US in key technology sectors and is increasingly competitive in advance Microchip, Artificial Intelligence, and other next-generations technologies. Investing for wide technological advancements and trading competition to the US, leads to significant progress in all industries. Particularly in China, India, Hong Kong, Japan, South Korea, Singapore and Taiwan, such as Robotics, Autonomous

Vehicles, 3D Printing Technology, Telecommunications and Mobile Phones, lastly Biotechnology.

c. **In the Western Countries (Europe and America)**

Leads the Industrial Revolutions in terms of globalization and technological advancement. This is in terms of digital economy, market leader and automation and entrepreneurships, and more likely ready for IR 5.0.

d. **In the Phillippines**

Investment in technology became a major role towards the ongoing shift to Industrial Revolution 4.0. to improve automate processes, efficiency and gain competitiveness in terms of IT-BPO Industry. More diffusion of the Internet of Things (IOT), usage of Artificial Intelligence (AI), Innovative Industries.

## V. TECHNOLOGIES THAT ARE DRIVEN THE IR4

Industry 4.0 (IR 4.0) is being driven by many major technologies, which are defined by the integration of advanced technology into the manufacturing process to create "smart factories" which are more efficient and are capable of flexible production. Among the primary technologies underpinning IR 4.0 are:

a. Internet of Things (IOT)
b. Cloud Computing
c. Artificial Intelligence (AI)
d. Embedded System
e. Augmented Reality

## VI. CONCLUSIONS

In conclusion, emerging technologies are transforming the world in profound ways, ushering in a new era of possibilities and challenges. From artificial intelligence and machine learning to the Internet of Things, blockchain, and quantum computing, these technologies are revolutionizing industries, shaping economies, and impacting our daily lives. They offer immense opportunities for innovation, efficiency, and improved quality of life.

Emerging technologies are driving unprecedented levels of automation, connectivity, and data analysis, leading to increased productivity, smarter decision-making, and enhanced customer experiences. They enable personalized products and services, customization at scale, and the creation of new business models. These technologies also have the potential to address global challenges, such as sustainability, healthcare, and energy efficiency.

However, with the promises of emerging technologies come challenges and considerations. Ethical considerations, privacy concerns, cybersecurity risks, and the impact on employment and society must be carefully addressed. Access and inclusivity also play crucial roles in ensuring that the benefits of these technologies are shared equitably across communities and nations.

As we navigate this era of rapid technological advancement, it is essential for individuals, businesses, governments, and policymakers to actively engage with emerging technologies. Collaboration, education, and proactive regulation will be key to harnessing the full potential of these innovations while mitigating risks.

In embracing emerging technologies, we have the opportunity to shape a future that is more connected, intelligent, and sustainable. By leveraging these technologies responsibly and with a human-centered approach, we can pave the way for a world that benefits everyone and drives positive transformation in the years to come.

## VII. NEXT FOR IR4

"New technologies that combine physical, digital and biological worlds. Impacting all disciplines, economies and industries" - Prof. K. Schwab.

It is a stepping stone in the evolution of mankind that we're barely grasping the concept that means for our human race. We come to know what will be for purpose and what should be their roles for us to look at possible applications. Constantly we will benefit from advancement and easy accessible technologies will be used for the future.

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