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# The Fourth Industrial Revolution and Human Identity

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## Abstract

A linked and smart manufacturing system, enabled by the Fourth Industrial Revolution (Industry 4.0), is promised in which the internet, machines (physical systems), and people are all grouped. Unlike previous economic booms, current industrialization is mostly focused on Information Technology (IT). Private information is frequently created and transferred through interactions between devices as well as between machines. It is currently being said that personal information is a "new oil" or a "new domain of war," even if it is not a new commodity. The greater the amount of information produced and gathered, the more comprehensive and riskier the personal information becomes. Even though privacy and security are often grouped, they are distinct concepts. It is the purpose of this research to explore various Industry 4.0 element privacy threat vectors. An examination of data breaching events, privacy issues, regulatory requirements as well as the requirement for contextual privacy awareness are all addressed in this research. This study concludes by elaborating on the risks associated with the disclosure of Personally Identifiable Information (PII) throughout the era of Industry 4.0. Future technological advancements will result in an inventory miracle with long-term benefits in improved productivity. The cost of transportation and telecommunication will go down, global logistics and transportation channels will advance, and pricing levels will fall, boosting the economy and fostering economic expansion.

**Keywords:** Big Data, Cloud Computing, Fourth Industrial Revolution, Internet of Things, Industry 4.0, Industrial Revolution, Manufacturing.

## Introduction

In 2011, the phrase "Fourth Industrial Revolution" was used to characterize this situation. The German manufacturing industry formally announced Industry 4.0, sometimes referred to as the "fourth industrial revolution" or just "Industry 4.0." In 2016, Schwab put out

the Fourth Industrial Revolution (sometimes referred to as the Fourth Industrial Revolution) theory. The Fourth Industrial Revolution was formally announced during the World Economic Forum's annual summit in Geneva (Industry 4.0). 4.0 Industry, also known as Smart Industry Industrial Internet and Integrated Industry is a term used to describe the fourth industrial revolution. This revolution is still in progress, and it is confronted with a wide range of difficulties. The security aspect has already been brought up by several researchers. As a result of the historical security problems, this sector will also inherit data privacy concerns. As a result, in the age of Industry 4.0, there is a greater need to investigate the privacy of personal data. Three essential characteristics are required to construct the framework of the Fourth Industrial Revolution i.e. self-sufficient discovery via decentralization required to develop insolent products, compatibility is mandatory to maintain a balance Interoperability integrating tools and methods is necessary to increase efficiency. A deeper look into Industry 4.0 reveals a significant amount of personal data is being collected and used. As a result, data privacy is a major source of worry for future industrial revolutions, particularly in the context of big data (Schiølin, 2020; Xu, David, & Kim, 2018).

The Fourth Industrial Revolution will make the most private data ever known to mankind available. We decided to undertake personal data privacy research because, even though the majority view them as advantageous, several recent malicious insider incidents have raised serious concerns about data privacy worldwide. Only a person's zip code's final five digits, gender, and birthday may be used to determine their identification in the United States. In a survey conducted, the people expressed strong worries regarding the privacy of data, with the most common being an unwanted and stupid assembly of Personally Identifiable Information (PII) i.e. 33.3 percent and illegal use of PII i.e. 27.6 percent. Ten million pieces of PII are revealed every day, with 74 percent of those being used for identity theft. Several organizations have introduced legislation and rules to address data privacy and security concerns to help the reduction of sensitive data to a minimum. Every year, about 200 billion USD is traded in the exchange of personal data. In certain cases, people yield to their data which are personalized with the necessary permission as well as other instances (Bettiol et al., 2021; Teck, Subramaniam, & Sorooshian, 2019).

The future progress of better education is also threatened more by Fourth Industrial Revolution (Industry 4.0), which also poses a danger to management education's ability to continue existing. Managers must be aware of the Fourth Industrial Revolution's presence and the necessity to educate trainees who are properly prepared to create knowledge-based and character-based jobs in its setting. They must acquire new skills, adapt to new environments, manage change, and take advantage by developing as critical developers, change-makers, broadcasters, and practitioners of significant governance. All of these requirements are intertwined with character education and cannot be separated. The research on the character education method is expanding at an alarming rate. Another method involves categorizing pupils into three groups: those who relatively clearly reasoning, pre-conventional reasoning, and post-conventional reasoning. The starting degree, the structured stage, the transformation stage, and the podium of meaning are the four phases of an available technique. In Indonesia, character education is centered on a class-based approach, as well as classroom atmosphere and the community as resources. The growth of students' entire personalities is strongly emphasized in the approaches used in schools for character education. The entire personality exhibits harmony whether it pops up or education, honesty or responsibilities, athletics or health and cleanliness, initiative or competence, and inventiveness.

It has been shown in much research that the method of classroom instruction has not been widely adopted in the nation. As days went on, its application won't be able to rely on the hold sequence, which sees teachers as the only source of knowledge and as having the last say in how pupils are taught, while students are only treated as bystanders. Because of the ease of access to information, schooling students and teachers whom is industrious and have high conduct are expected to be available to individuals' knowledge and information. Teachers need to be close to their students, act as moral police, and even as live examples for them. When compared to other methods, the application of a holistic and practical approach is the distinguishing feature of this research. Thus, character education must not only be conceptualized, but it must also be implemented comprehensively, including all stakeholders, being supported by facilities and infrastructure, and being planned with quantifiable outcomes in mind (Li, Hou, & Wu, 2017).

### *1.1 Fourth Industrial Revolution:*

The transition to a more intensive manufacturing method began in England in the late 18th century and quickly extended throughout Europe. This period, which was characterized by substantial scientific advancements and a string of discoveries, is referred to as "industrialization." Automation enhanced output and economic benefits while also improving the quality of life for English citizens. Technical advancements also expanded the populace's capacity for creative thought. Following the success of the first industrialization, the process resulted in a series of industrial revolutions that spread to other regions of the world, causing the phenomenon to be acknowledged on a worldwide basis. The second industrial revolution in the latter decades of the 20th century, and was characterized by the invention of electricity, which made it possible to produce items in large quantities. The third industrial revolution, which began in the late 20th century and brought with it technological devices and electrical gadgets, enabled factory mechanization (Rotatori, Lee, & Sleeva, 2021).

The Internet of Things (IoT), optical sensor, radio frequency identification (RFID), cloud computing, artificial intelligence (AI), big data, and 3D printing are all now being used as part of the Fourth Industrial, or Industry 4.0. Such technologies allow real-time data to be sent and create cyber-physical systems (CPS). CPS' main tasks include meeting production capacities and dynamic requirements and increasing the efficiency as well as the effectiveness of the entire industry, according to the organization. Furthermore, Sector 4.0 makes it easier to integrate connectivity and computerization into the conventional manufacturing industry. Manufacturers may now provide bulk personalization of produced goods through Information and Communications Technology (ICT), utilization of Human-Machine Interaction (HMI) paradigms, Cloud computing of Factors process monitoring in manufacturing technologies, documenting of materials and accessories, ease of communication between parts, products, and machines, immediate and expandable alteration of the value chain, the clause of new types of services. Industry 4.0 has several objectives. Additionally, supply networks, organizational structures, and internal procedures would undergo disruptive adjustments (Humphreys, 2020).

### *1.2 Fourth Industrial Revolution and Technologies:*

According to a study, Japan and Germany are the nations with the highest levels of digitalization in the world, and Digitalization is projected to reach 72 percent worldwide by 2020. Moreover, expenses are projected to drop by 3.6% as well as productivity would rise by 15% over the next five years. It is reasonable to utilize technologies and digitalization in industrial applications since they have the potential to reduce costs while also providing high dependability. To achieve the objective of a connected, data-driven 5G network supply network, some technologies are being

deployed in smart manufacturing, including cloud computing, robotics or mechanization, IoT, automation, and big data analytics. A manufacturing facility that uses few or no individuals in its operations is known as an autonomous plant (Yusuf, Walters, & Sailin, 2020).

Now with the development of technology and the integration of several technologies, such as wireless connections, microcontrollers, and pattern recognition, the IoT has emerged. The sensors collect information in real-time for enhancing manufacturing operational efficiencies. The Internet of Things (IoT) is defined as a worldwide network that enables communication among people, among things, and between people and things by giving each thing a distinct identity. Everything and everything may be connected. Tremendous volumes of data are generated from the distributed system and connected to the network for interpretation. In many cases, material for the IoT has been generated using RFID tags and IP addresses that have been connected to an Electronic Product Code (EPC) network. The IoT is critical to the advancement of Industry 4.0 because IoT produces a large amount of data (Ćwiklicki, Klich, & Chen, 2020).

Big Data is broadly described as information assets that have "large volumes, rapid rates of change, and a wide range of characteristics, and which requires cost-effective, new ways of processing data that enhance understanding, decision strategic thinking process as well as simplification of processes The use of big data, especially in commercial business, may benefit a variety of businesses. But there is one, and that is the finance sector. Employing efficient Big Data analytics in the workplace might help businesses in increasing productivity, improving marketing tactics, and making better forecasts and decisions in real-time. In addition, Industry 4.0 is supported by a Fifth Generation (5G) connectivity which will enable latent, long-range, reliable, and safe communications, as well as meet the complicated requirements of new business models, among other things. Though still in its infancy, 5G technology is an essential developmental step for the Internet of Things (IoT) and Industry 4.0-related machine-to-machine (M2M) communication (IoT). Industry 4.0 generates enormous volumes of data that become more valuable over time as enterprises become far more sophisticated and information (Liao et al., 2018).

The goal of cloud manufacturing, a sophisticated production, and logistics technique that uses cloud computing, is to meet the growing need for more individualized and customized products as well as increase global cooperation. The development of sophisticated smart factories that provide anytime, everywhere access to data is also made possible by cloud production. The "Innovation Anything, Create Anywhere" philosophy of development and construction has the potential to be realized with the help of cloud computing and cloud manufacturing technology. Other cognitive technology including unmanned gadgets, apps, and deep learning, are transforming industrial processes. Advances in robotics and artificial intelligence are already causing disruption in sectors that were previously thought to be immune from automation. As robots grow in autonomy and flexibility while also becoming more cooperative. It is possible to utilize an autonomous robot to execute autonomous manufacturing techniques more accurately, as well as to operate in areas where human employees are not permitted to work. In addition to completing tasks accurately and intelligently within the time constraints set, automated systems must also take into account cooperation with several other vehicles, safety, flexibility, and mobility.

### *1.3 Applications of Fourth Industrial Revolution:*

The Fourth Industrial Revolution might well be described as an integrated, adaptive, optimized, service-oriented as well as extensible manufacturing process, linked with analytics, big data, and sophisticated technology. Additional examples involve autonomous cars, delivery drones

as well as 3D printers relying on a personal template and are capable of producing extremely complicated things without the need for any modifications to the manufacturing process or for any human intervention in any way whatsoever. Production processes will become completely automated as a result of these advancements, with humans serving solely as a production component in certain instances (Park, 2018).

The Fourth Industrial Revolution might improve social work and led to more career possibilities. Local Malawians, for instance, are assisting with the relief effort by deploying a drone. To encourage the use of drones to solve logistical issues in distant regions, such as the delivery of medications and food supplies. For people, the major actors must try to engage with the communities to fully accept the drones which may result in a change in their preconceptions about humanitarian drones. Among the key players are UNICEF, its local staff, and those participating in the entire humanitarian drone activity? For instance, it's a good idea to let the locals inspect the drone and watch it being completely hovered by the operators. Organizations acting in the capacity of humanitarian aid providers shouldn't just focus on providing better operations by supplying medical assistance, but they must also assume social responsibilities to decrease local anxiety and ensure that drones aren't used as a tool to hurt people (Jung, 2020).

### *1.4 The creativity of the Fourth Industrial Revolution:*

An important connection exists between Robots, pattern recognition, and the capacity to resolve challenging problems will all have a significant impact on the effectiveness of developing a decision-making strategy. According to reports, there is a growing need for specialists or highly trained workers (e.g., software specialists, mechatronics, and data analysts) it has shown compatibility With AI technology. The fourth industrial revolution has given tremendous opportunities to transcend time and geographic barriers and produce new values, especially via the internet or apps, which encourage companies to use technology as well as electronic commerce to integrate the digital world. The talents of there is a great need for big data analytics, data engineers, visual analytics, and cognitive computing. This is because every sector recognizes how important Big Data is to its operations, whether they are public or private. People with the necessary credentials are increasingly difficult to find because there is such a high demand for these talents. Additionally, some human attributes such as creativity, invention, compassion, curiosity, emotion, and others cannot be replicated by techniques and equipment. These skills cannot be imitated by machines and their technology. Furthermore, the detrimental consequences of integrating new technologies may have to be mentioned in the priority list. Considering that extensive Internet usage may influence the establishment of a condition called Internet obsession in people's daily lives. Online dependence is a type of behavioral dependence that is created as a result of excessive Internet usage and could well be recognized as a major of mental stability. Because people may now communicate physically with one another, the growing usage of the internet has indirectly impacted people's ability to connect. These issues occurred because of the advancement of technology, which necessitates interpersonal interaction and highly developed social or interpersonal capacities to protect human identity. As a result, the Industrial Revolution 4.0 doesn't somehow eliminate all jobs and work; rather, it requires the creation of new jobs and their application to fields of human research to preserve human identity (Krafft, Sajtos, & Haenlein, 2020).

### *1.5 Privacy Attack in the Fourth Industrial Revolution:*

### *1.6 Robotics and Artificial Intelligence (AI):*

Robotics and AI have been at the peak of the privacy violations list on this list. AI poses a threat to personal privacy, according to several experts. Real-time image processing reveals a person's identity while also leaking millions of pieces of personal information. According to the findings of this research, the most significant problems surrounding robotics and AI regarding the privacy of data are as follows:

- AI-based technology provides no privacy standards.
- The process of obtaining consent from the user is inefficient.
- The use of artificial intelligence in decision-making (profiling) should be closely controlled.

### *1.7 Virtual Reality (VR) and Augmented Reality (AR):*

One must disclose some personal information to fully experience the world of augmented reality and virtual reality. Studies conducted on augmented reality (AR) and virtual reality (VR) devices manufactured by the mixed reality, Sony, Oculus, PlayStation, and Daydream, discovered that they were comparable to one another. Almost everyone collects information via the use of cookies or beacons these days (Chung, 2021).

### *1.8 Internet of Things (IoT):*

Data privacy on the Internet of Things (IoT) was highlighted in many studies across a variety of domains of use. The development of a future global network of "things" will provide difficulties in terms of privacy. As a result, we describe the primary cause of IoT data privacy leakage as follows:

- Default Storage of unprocessed data
- Make certain that the gadget is in working order.
- There is an energy limit.
- Encryption is restricted in certain ways.
- Standardization organizations are not well-organized enough.
- In terms of device-level data gathering and sharing, there is less information available from IoT device manufacturers.

### *1.9 Cyber-Physical System (CPS):*

It was found that Cyber-Physical Systems (CPS) are the basic enabler of Industry 4.0, with critical quality control being a necessity to achieve success. In the CPS, most of the time, the disclosure of personal information is passive. According to the research, there are two methods in which personal information is leaked in the CPS:

- A physical attack on a system is one that in some way interferes with the system's mechanical properties. For illustration, it would be able to change the functionality of an embedded health chip.
- A cyber assault against CPS includes the use of computer viruses and malware, as well as network-based attacks. For example, faking sensor data is a crime. Threat surfaces, such as those shown in Figure 1.

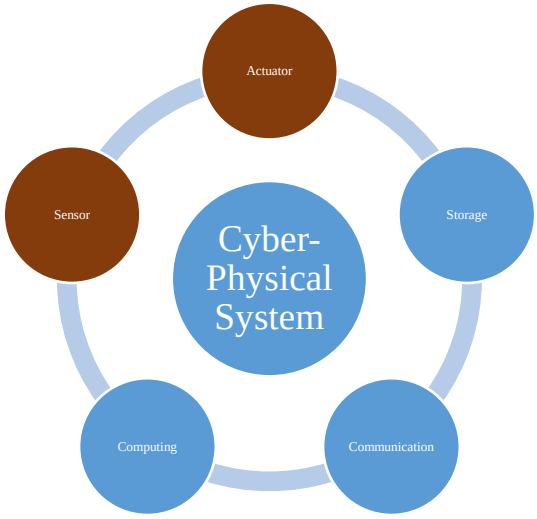


**Figure 1:** Illustrates Cyber-Physical System (CPS) Attack Surface. In the CPS, most of the time, the disclosure of personal information is passive.

### *1.10 Cloud and Big Data:*

In today's business environment, compromise of important and private information and data whether intentionally or unintentionally is the most significant danger cloud computing may provide. Following the incorporation of artificial intelligence, surveys of Big data have become faster, more effective, and much more reliable. The following are the primary difficulties associated with cloud computing and big data:

- The use of a professional data encryption technique.
- Vulnerability on the physical level.
- The policy on data sharing and exchanging is vague.
- Data aggregation on a massive scale.

### *1.11 Blockchain Technology:*

The conflict between General Data Protection Regulation and blockchain technology is a major privacy disadvantage of blockchain technology. On the one hand, blockchain saves data in an immutable manner, on the other hand, personal data must be erasable in an ethical manner after usage. Storing personal information on a blockchain is a severe violation of one's right to data protection. Identity concealment may be abused, and privacy violations may have been committed unanimously. In the case of blockchain technology, the moral concern is superseded. The use of blockchain technology in human resource management was suggested, however, little consideration was given to moral considerations (such as privacy).

## Discussion

The majority of recent material on the Fourth Industrial Revolution focuses on its technological innovation nature. There is a significant concern about whether the quickening pace of technological advancement and digitalization is benefiting individuals and groups as a whole. Therefore, while considering how technological advancements must be used to alleviate social challenges, one must do it from both a social and a technical standpoint. The fourth industrial revolution has shattered established industrial frameworks with the quick growth of technology-enabled platforms and generated new methods to consume commodities in novel and inventive ways by fusing production and distribution. In addition, it controls how people

work and spend their money, alters the architecture of available resources, and affects how data is gathered and used, among other things. Additionally, it lessens the barriers that stop people and businesses from making investments and generating income, which has a knock-on impact on the nearby social and professional contexts. The fourth industrial revolution, a new phrase that has been connected to rapid technological advancements that are changing many aspects of our socioeconomic existence, has just been listed as a global issue on its agenda. This point of view claims that one of the most important questions is always how countries can create the conditions for their 4.0 once more, which would include related emerging technologies that offer people and society new opportunities and benefits, help heal the community harm caused by the previous three rebellions, and encourage a financially viable 4th industrial revolution.

Because of the present economic climate, the World Wide Web may be used to provide value for individuals and populations rather than merely serving as a medium of expression. Digital, networked, versatile, and responsive are all characteristics of the Fourth Industrial Revolution. Even popular personal networks are undergoing drastic change as we shift away from business-to-consumer contacts toward community connections. Engineer and economist Klaus Schwab, who founded the World Economic Forum and currently serves as its Executive Chairman, said during the 2016 World Economic Forum that "the world has to have a broad and clear example of just how technology has profoundly updated our community, institutional, ecological, and other cultural life." a case of fusing social and technological innovation to influence the future of our communities and advance society.

Compared to previous technological revolutions, the present one has contributed to a better knowledge of the social impact of technological advancements on various economic sectors, the broader economy, business, and innovation. Policymakers and regulators must immediately adapt to the smart manufacturing landscape's rapid transformation to guide future good governance and to make use of all the capabilities of Industry 4.0-derived solutions to protect society in general. To do this, they must build a sustainable economy and social development framework, protections, and regulations that can lead the future, while making use of the potential of Industry 4.0 technology for people and society. It is important to understand how the Fourth Industrial Revolution will affect every aspect of society to take advantage of its potential. As a result, we also need to consider how the technological revolution has affected social innovation. To put it another way, we must focus on the compatibility between technological advancement and the creative approaches needed to address the social issues that people and organizations are facing on the other hand, and even the convergence between the two. There will still be a reciprocal relationship between society and electronic progress since ideas have a significant systemic influence. The growth and dissemination of innovation systems may be facilitated by technology innovation and rapid technological advancement, and in certain cases, the maximum potential of technological advancement may be realized when combined with social innovation. If managed within the aegis of sustainable growth, it is likely that the digitized character of Industry 4.0 product innovations would result in benefits for both the economy and society.

The impact of the Fourth Industrial Revolution on our economy and society has a great deal of potential to be positive. The exponential growth in the quantity of data that can be accessed by content gadgets combined with more potent artificial intelligence will fundamentally alter society and provide brand-new answers to pressing problems, including catastrophic system failures. Industry 4.0 promises fresh possibilities or chances for medical technology, the capacity to turn more consumers into entrepreneurs globally, and improved

access to higher education. A thorough approach or technique for the fourth revolution must be utilized to solve the environmental and social issues that face civilizations, mitigate or prevent unexpected consequences of fast technological advancement, maximize positive societal benefits, and defend public interests.

Early discussion on collective innovation within the context of Industry 4.0 is necessary to concentrate on the growing concern over potential negative repercussions on communities and the general populace. This is a critical issue since new technological developments like virtual reality, robots, drones, AI, and IoT can improve human function in a wide range of contexts. Therefore, as a result of intelligent automation of the production process, some vocations may become outmoded or obsolete, and the qualification requirements for new roles will become more severe, requiring the acquisition of new knowledge as well as new skills. A never-before-seen flurry of rapid technology, industrial, and made prior could usher in the fourth industrial revolution, raising concerns about how well people and institutions will be able to adapt to threats to human belonging, social stability, and financial prosperity, as well as about how well governments will be able to defend their citizens.

## Conclusion

The only justification for keeping personal data private is to distinguish between security and privacy. The Fourth Industrial Revolution has been made possible by technologies that, up until recently, have been sufficiently resilient to long-term risk. Identifying data cannot be secured as well as it should be since present legislation, policies, and public understanding are still in their infancy. It is not surprising that the coming industrialization would have established a standards organization for that purpose to protect personal information. But the Fourth Industrial Revolution's production of personal data will spark an ethical conflict between the concepts of data collection and data privacy, one that will be decided in the courtroom of public opinion. On the one hand, the Industrial Revolution requires more data gathering and possibly a better user experience, while on the other hand, the Industrial Revolution demands more data collection and maybe even a better user experience. On the other token, the protection of personal data won't be compromised. We looked at existing technologies and discovered that context-aware information de-identification and confidentiality by architecture are essential for effectively enhancing personal data privacy for police agencies.

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