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A Study on the Fourth Industrial Revolution

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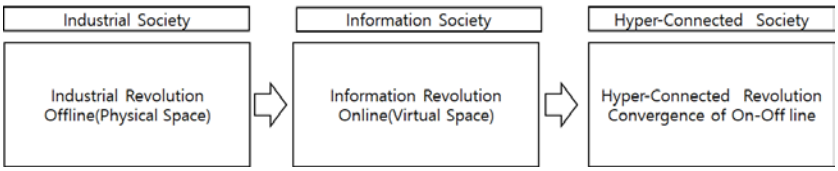
Abstract

The Fourth Industrial Revolution is an era of convergence between on and ofvfline. The analysis of big data enables the creation of value in the Fourth Industrial Revolution era by overcoming the burden of low-growth, unbalanced growth, global entry barriers, and aging. In the Fourth Industrial Revolution era, where artificial intelligence and the Internet of Things are becoming universal, the Internet of Things is possible as a hyper-connected society where people and things are connected. The development of self-driving vehicles will also advance with remote adjustable autonomous vehicle technology. Robots will help increase productivity in place of human labor, while quantum cryptography will provide speed, security, and stability. We should think about how we will achieve destructive innovation and pursue a new technological revolution.

Keywords: *Fourth Industrial Revolution; Big Data Statistical Analysis; Artificial Intelligence; Internet of Things, Online to Offline(O2O); Self-Driving Vehicles*

1. INTRODUCTION

The first industrial revolution, in which the humankind began to use energy and machinery in earnest, the second industrial revolution that established the basis of modern civilization through the mass of electricity, the advent of the personal computer and the Internet. There is a world coming in which the boundaries of learning and learning disappear, and barriers between industries are collapsing, and everything is connected. In particular, what sets the Fourth Industrial Revolution apart from the existing industrial revolution is connectivity. As shown in Figure 1, from an industrial society to an information society, it developed into a hyper-conception society [1].



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Figure 1. Development of Fourth Industrial Revolution

2. THEORETICAL BACKGROUND OF FOURTH INDUSTRIAL REVOLUTION

2.1. Big Data Statistical Analysis

The Fourth Industrial Revolution refers to computer-based innovation in production, software centered on artificial intelligence, big data technology dealing with vast amounts of data, and modern robot technology that represents innovative labor. Therefore, a lot of data is needed for big data statistical analysis. Big data is characterized by its volume, variety and velocity. Volume refers to the size of tens of tera-bytes or tens of petabytes, variety is the type of data, and velocity refers to the nature of processing and analyzing data. As shown in Table 1, Big Data is characterized by its volume, variety, and velocity [2].

Table 1. Characteristic of Big Data

Characteristic	Contents
Volume	Big Data are created each day, and that number is doubling every 30~40 months or so. More Big Data cross the internet every second than were stored in the entire internet just 20~30 years ago. This gives companies an opportunity to work with many petabytes of data in a single data set and not just on the internet.
Variety	Big Data takes the form of messages, updates, and images posted to social networks; readings from sensors; GPS signals from cell phones, and more. Many of the most important sources of big data are relatively new. The huge amounts of information from social networks, Thus the structured databases that stored most corporate information until recently can be ill-suited to storing and processing Big Data.
Velocity	For many applications, the speed of data creation can be even more important than the volume. Real-time or nearly real-time information makes it possible for a company to be much agiler than its competitors.

2.2. Artificial Intelligence

Human learning, reasoning, perceptual, and natural language comprehension can be said to be a technology that translates into computer programs. In general, intelligence is an adaptive ability, a function that is highly associated with learning skills and thinks independently of emotions. It is also a concept that uses prior knowledge for effective analysis in new situations and includes other mental activities, interactions, and coordination.

Artificial intelligence should be interested in two reasons from a business perspective. One is the decision support system. The amount of information that needs to be processed each year is increasing, and decisions need to be made faster. Important decisions need to be made by the people themselves, but the data collection

and processing is fast in artificial intelligence. Another is customer response system. Customer needs are growing every year. In addition to simple responses, analysis, prediction, and suggestion based on customer information accumulated so far are tasks that can be utilized by artificial intelligence.

As shown in Figure 2, the functions of artificial intelligence are decision support systems and customer response systems [3].

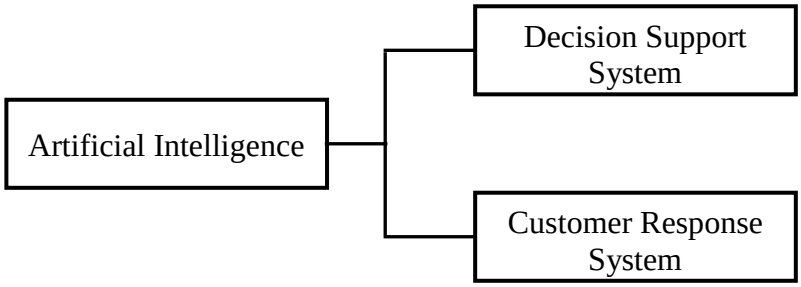


Figure 2. The function of Artificial Intelligence

2.3 Internet of Things (IoT)

The Internet of Things means hyper-connected Internet in which all people, things, space, and data are connected through the Internet and information is created, collected, shared, and utilized.

Table 2. Definition and Range of Internet of Things

IoT Application Service	Health Care	Smart Home	Smart Factory	Smart Agriculture	Smart Grid
IoT Platform	Health	Construction	Manufacture	Agriculture	Energy
	IoT Service		IoT Common platform		
IoT Network	Bluetooth, 4G/5G Zigbee, Internet, Wifi etc.				
IoT Device	Physical Things (Sensor / Actuator)		Virtual Things (Data Process)		

An independent device, usually called a thing, has its own sensor based on communication and, as humans communicate, information collects, and acts as if it were a human being. It is a tool to maximize productivity by suggesting and implementing optimal solutions using the Internet through an on-line and off-line, which transfers all information that is in real life online.

The ability to deal with continuous streaming of data is gaining relevance for IoT applications. The goals for the IEEE P2413 working group that is developing this standard are to define an IoT architecture framework that covers the architectural needs of the various IoT application domains. The IoT Platform is a topic of particular relevance, in fact, it is the platform that will induce the value of IoT solutions. Small IoT solutions have limited needs on software platforms, but the more we move towards larger systems the more we need an IoT platform that is capable of supporting many functionalities and offering a high level of programmability. Small IoT solutions have limited needs on software platforms, but the more we move

towards larger systems the more we need an IoT platform that is capable of supporting many functionalities and offering a high level of programmability.

Fixed, broadband and mobility communication technologies will yield the connectivity required for the IoT. Networking of interrogators and gateway devices may also be seen as an important infra-structural feature in this layer and an important contributory feature within the IoT. IoT devices consume very little power and frequently have poor network connectivity. As shown in Table 2, Definition and scope of Internet of Things are IoT application service, IoT platform, IoT network, IoT device [4].

2.4 Self-driving Transport

As the current vehicle is a vehicle, it is speeding up the development of a free-wheel vehicle that combines artificial intelligence with IT technology. If self-driving cars are commercialized and dominate the land, then autonomous airplanes that will dominate the sky are likely to emerge, but what is interesting is that autonomous vehicles existed before self-driving cars.

The rapid development of self-driving car technology in the 2000s has drawn attention, and as self-driving technology has developed, it has been preparing for autonomous flight era in the sky. Recently in Dubai, unmanned aerial taxi drivers were successfully tested, and NASA has started developing autonomous flying taxis.

In particular, the U.S. Boeing and France Airbus, which divide global aircraft production, are working on introducing an autonomous flight system that enables them to operate in the cockpit without pilots. Table 3 shows the operating parameters of autonomous vehicles which are based on sensors, networks and artificial intelligence [5].

Table 3. Principles of Operation of Self-driving transport

Characteristic	Contents
Sensors	Parking Aid System(PAS)
	Air-bag Impact Sensor
	Electronic Stability Control(ESC)
	Tire Pressure Monitoring System(TPMS)
	Anti-lock Braking System(ABS)
	Traction Control System(TCS)
	Electronic Brake-force Distribution(EBD)
	Active Safety System
	Passive Safety System
	Lane Departure Warning System(LDWS)
	Light Detection And Ranging(LIDAR)
Networks	
	Intelligence Transportation System(ITS)
	Bluetooth
	WiGig

	ZigBee
	Dedicated Short-Range Communication(DSRC)
	Wireless Access for the Vehicular Environment(WAVE)
Artificial Intelligence	
	Recognition Technology
	Automatic Control Technology
	Reaction Technology
	Learning Technology

3. OTHER FOURTH INDUSTRIAL REVOLUTION

Robot engineering is a robot that helps people, and cleaning robots, assisted robots, etc., will contribute to the overall productivity of society [6], whereas quantum cryptography is based on most existing mathematical complexities and quantum cryptography has a natural, one-pronged feature and is ideally used to create a one-term pad.

In the event of an interception, the existence of a bug is revealed, and even a city official cannot obtain accurate information due to distorted signals. In other words, it is also called quantum key distribution. The security industry also expects to implement a non-communicable encryption system if quantum numbers can be applied to all IT devices [7]. Most of the time, 3D printing has bought and produced products that are not suitable for them. Now that it's a personalized age, you can use a 3D printer to create your own devices that are cheap and fast.

Examples include your own food, your own home, your own tissue, and your medicine. These things can improve productivity. Nanotechnology (NT) can create new substances and machines with a wide range of applications such as medical, electronics, biomaterials, and consumer products, contributing significantly to improved productivity. Connection and display technologies include 5G and LTE (4G). And as for visual display technology, there is UHD TV with high shape, VR with a mobile view, and AR with this technology, which enables faster, more convenient and more connection to production [9].

4. THE FUTURE OF THE FOURTH INDUSTRIAL REVOLUTION

4.1 The Future of FinTech (Financial Technology)

FinTech is a combination of finance and technology. While finance has so far been centered on finance and technology behind it, FinTech is dominated by technology. For FinTech, banking is the largest and most variable, including remittance, payment, and investment [10]. The future of remittance and payment can be seen as a competition between simple remittance and simple payment. In addition, IT technology plays an important role in three stages: input of amounts, the input of recipients, and password or fingerprint authentication without a public certificate.

Competition between banks and credit card companies can be a good opportunity and a crisis. Therefore, when providing services, it is necessary to take advantage of technological developments such as customization and improvement of consumption habits to go more personal.

4.2 The Future of Smart Mobility

Smart mobility is all about smart moving things. It includes everything from personal vehicles to intercontinental vehicles but can be seen in two ways: personal mobility, which is a personal vehicle, and a slightly larger form of smart cars. Representative products of personal mobility are electric kickboards and electric bicycles. Especially, electric kickboards are used more for commuting than leisure activities enjoyed in weekend parks. Smart cars can be divided into electric cars and connected cars. Electric cars are electric vehicles that are important factors such as mileage, charging speed, and cost. Whether or not the connected car will be able to connect smart-car-operating system with current Smartphone by combining information and communication technology with other AI businesses or whether or not it will be working with other Smart-phone manufacturers.

As technology advances, one of the areas to be noted is the infotainment zone. It is a combination of entertainment and information, which means everything you can enjoy in a car. The future of smart mobility is linked to the beginning and end of a car, the business of making cars, the business of selling cars, the fuel business that drives a car, everything that you do when you drive a car,

As cars are changing from manufacturing to service, it is necessary to convert them into services that connect them to customer interfaces, not individual components. In the case of electric vehicles, it is necessary to build up a range of experiences on common markets and in the case of connected cars, such as manufacturing, communication, and artificial intelligence [11].

4.3 The Future of Online to Offline (O2O) Services

O2O refers to Online to Offline or Offline to Online, which is the Fourth Industrial Revolution era in which online services are moved to offline services or the convergence between the offline services is important. In the Fourth Industrial Revolution era, digital equipment is developing continuously. As a result, the lines of on-offline business have been old and could be a threat of survival if only one side is considered important [12].

So far, the O2O service has had to use various app buttons on top of each smart-phone but is now moving toward mounting all of its services in one app. With the number of single-person households on the rise, services that focus on home-related areas should be developed to inform and suggest delivery and home.

5. CONCLUSION

Online and offline are not two kinds. One answer is how to make them two more closely related. Because the concept of mobile, not online, cannot be done except mobile, the dependence on the service is likely to be higher. We need to predict the future of online and off-line from a point of view of reliable prices, reliable performance, and convenient shopping experience design.

The core technology of the Fourth Industrial Revolution is artificial intelligence. Regardless of the level of artificial intelligence, artificial intelligence is expected to be introduced to more places faster than ever. Another key technology is the Internet of Things. The Internet of Things is all about communication, and artificial intelligence, which can be managed as a whole, not separately, inevitably develops. We should think about how we will achieve destructive innovation and pursue a new technological revolution.

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