



The 4th Industrial Revolution Era and Emergency Preparedness Policy: Artificial Intelligence, Big Data Analysis, Cloud Computing, Drone Use

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ABSTRACT

The purpose of this paper is to suggest the development of emergency preparedness policy to implement intelligent government in the 4th Industrial Revolution. For accomplishing the research goal, I examined the significance of emergency preparedness policy in the 4th Industrial Revolution and the emergency preparedness policy of intelligent government in connection with the use of artificial intelligence(AI), big data analysis, cloud computing, and drone. And the development suggestions of emergency preparedness policy in the intelligent government are presented as follows. First, it is necessary to construct a crisis management decision support system using artificial intelligence, big data analysis, and IoT, etc. Second, we have to establish a system and technology for linking and utilizing private and public data. Third, it is desirable to improve the system to utilize big data in the situation of not deleting personal information or invading privacy. Fourth, big data analysis and artificial intelligence should be used to support military operations in the emergency preparedness plan, maintain government functions, and stabilize people's lives. Fifth, we need to combine AI and big data analysis to integrate civil defense resources and emergency preparedness resources, which have been classified as a national crisis and emergency management resource. Sixth, a comprehensive and trans-disciplinary crisonomy study should be carried out based on the convergence academic system of the government's emergency preparedness policy. Seventh, it is desirable to activate educational opportunities and personnel exchanges with universities for emergency preparedness in intelligent governments to enhance the professionalism and creativity of public officials in charge. Eighth, it is necessary to utilize the expertise of military retirement officials in emergency preparedness in intelligent governments.

Key words: the 4th industrial revolution, emergency preparedness policy, artificial intelligence(AI), big data analysis, IoT

Introduction

Recently, from the concept of comprehensive security developed after the 9.11 terror, national security can be seen as an effort

to ensure the safety of people, territories, sovereignty and critical infrastructure from all military crises that threaten national sustainable development, as well as from non-military crises. National security in the concept of comprehensive security is very different from the traditional concept of military security from the past.

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From the point of view of military security, military threats, war, armed conflict, military attack, nuclear and WMD development, regional conflict, armed provocation, and invasion of territories were seen as national crises threatening national security. But in terms of comprehensive security concepts, non-military threats such as typhoons, floods, torrential rains, earthquakes and tsunamis, as well as large fires, collapse of buildings, ship sinking, plane crashes, chemical explosions, etc. Other threats such as human disasters, homicides, sexual assaults, kidnappings, inducements, falls, suicides, and major illnesses are also considered a national crisis that threatens national security. In a comprehensive security concept, a national crisis can be defined as: "Military or non-military threats and threatening situations that threaten the security of the critical infrastructure that play a key role in ensuring the security of the people, territories and sovereigns that make up the state and ensuring the survival and operation of the state (Lee, 2018: 162-163).

In fact, during the Cold War, the concept of security in terms of military force was that state-firstism, that is, wars, was not necessary to gain an advantage in the system competition with the opposing or hostile states for the purpose of maintaining the regime. However, after the post-cold war, as all countries pursued national development through globalization and advancement, the concept of security that the state is responsible for changed.

All countries apply a comprehensive concept of security that protects their citizens from emerging non-military threats such as terrorism, disasters, environmental pollution, and infectious diseases, as well as security from the past, external security and traditional security limited to the military sector. Therefore, the government's emergency preparedness plan should also be a plan that can effectively respond to various threats and security situations by approaching a comprehensive security concept (Na & Shin, 2019: 67).

The security sphere in modern countries extends not only to the traditional military sector, but also to a comprehensive security concept that includes non-military terrorism, massive illness, natural disasters and social disasters. This means that crisis & emergency management in modern countries covers not only the military but also the non-military sectors (Kim, 2014: 274). Nevertheless, considering the situation in Korea where the two Koreas are facing each other, there is also a need for a thorough preparation of the military security crisis.¹⁾ (Ministry of the Interior and Safety, 2019: 489).

1) To this end, the Ministry of the Interior and Safety is in charge of emergency preparedness at the government level by establishing a wartime plan, a wartime readiness plan, and conducting annual training to identify and evaluate emergency preparedness and improve effectiveness. In addition, the Ministry of the Interior and Safety is promoting various policies such as publicizing the guidelines for public behavior in case of emergency, expanding the evacuation facilities,

With economic growth and the development of new technologies, we look forward to a safer and more comfortable life. However, with the development of highly innovative technologies and complex social structures, modern society faces unpredictable risks.

The post-cold war deconstructed the structure of conflict and confrontation between East and West, shifting the critical values of the state from politics and military to economic and social fields. At the same time, the spread of democracy and market economy principles changed the concept of security to a concept of comprehensive security. And progress in globalization, informatization, and democratization, along with New Liberalism, have had a major impact on the global spread and acceleration of the wave of change. Globalization, symbolized by the expansion and condensation of time and space, further deepened interdependence among nations with the development of informatization, transportation, and communication. Thus, not only did the national boundaries that set the scope of national sovereignty become meaningless, but they also weakened the state's control over individuals and businesses within their territories. Advances in informatization have created an active vertical and horizontal information exchange environment, undermining the concentration of power through the monopoly and regulation of information (Jeong, 2007: 82).

In the era of the 4th Industrial Revolution, the use of advanced new technologies represented by intelligence such as artificial intelligence and big data, which are the core technologies, will be internalized and accelerated throughout the society, and the direction of the new intelligent government needs to be changed. The redesign of e-government services is required due to growing public awareness, diverse needs of individuals, and diversification of public services (Ministry of the Interior and Safety, 2017: 12-13).

Based on the rapid development of ICT technology, mutual organic communication is possible between humans and humans as well as non-living objects such as devices and objects. This is even more so in an innovative hyper-connected society. In hyper-connected societies, anticipatory or intelligent governments go beyond the traditional concept of e-government. It is to realize a system that can analyze and learn various policy-related data using artificial intelligence. In the government sector, it is not new to use big data to analyze policy demand and find solutions. In addition to artificial intelligence, anticipatory and intelligent governments, which make extensive use of information and communication technologies such as cloud computing and mobile-based communication technologies, are rapidly evolving (Moon, 2019: 6).

In this context, the purpose of this paper is to suggest the develop-

and strengthening the civil defense warning system so that people can be evacuated safely (Ministry of the Interior and Safety, 2019: 489).

ment of emergency preparedness policy in the 4th Industrial Revolution. First of all, this paper examines the significance of emergency preparedness policy in the 4th Industrial Revolution era. Second, it examines how to apply major information and communication technologies such as artificial intelligence, big data analysis, cloud computing, drone. to emergency preparedness policies. Third, it proposes plans to advance emergency preparedness policies in the future era of the 4th industrial revolution.

Significance of Emergency Preparedness Policy in the 4th Industrial Revolution

The 4th Industrial Revolution was brought to the attention of the world as it was issued at the “World Economic Forum” held in Davos, Switzerland, in January 2016. The 4th industrial revolution will be accelerated by new emerging technologies (AI, robots, IoT, autonomous vehicles, 3D printing, nanotechnology, biotechnology, materials science, energy storage, quantum computing, etc.) (Ministry of Trade & Industry and Energy, 2016: 7-9).

Due to technologies such as AI, 3D printing, robots, and IoT, the 4th Industrial Revolution is faster than ever. In this era, it is necessary to construct an ecosystem of regulations and legislation that can utilize new emerging technologies (Kim, 2018: 64).

A national emergency is a state in which war or incident or a serious threat to national security has arisen, resulting in a security disturbance or a corresponding degree of risk that affects the survival of the country. The government establishes and implements a plan to effectively utilize the state's human and physical resources in

preparation for emergencies in accordance with the Emergency Preparedness Resource Management Act. Emergency preparedness training is based on a plan designed to protect the lives and property of the nation and its people in the event of an emergency (Ministry of Defense, 2012; Ministry of the Interior and Safety, 2008; Kim, *et. al.*, 2019: 202).

Emergency preparedness plans are constructed by the government to support military operations, maintain government functions, and stabilize people's lives during national emergencies. It consists of a Basic Plan established by the Ministry of the Interior and Safety, an Implementation Plan established by the central government department, an Execution Plan established by the Metropolitan City & Province, and an Carry-out Plan established by the municipal and district management agencies. In addition, emergency preparedness plans include war martial arts plan (The Joint Chiefs of Staff), wartime civil defense plan (Ministry of the Interior and Safety), and anti-war liberalization plan (Ministry of Unification).

The main contents are as follows (Moon, 2006: 193). First, military operations support is divided into human resource mobilization, material mobilization, and other mobilization. Human resource mobilization includes troop mobilization, wartime labor convocation, and technical manpower mobilization. Material mobilization includes industrial mobilization, transportation mobilization, construction mobilization, and communication mobilization. Other mobilizations include financial and economic mobilization

Second, there is a transition to wartime administrative system in maintaining government function. This wartime administrative system dissipates government agencies and has control of residents and vehicles. This includes traffic control for securing military operation routes and administrative routes, dissipation and movement of residents for protecting residents and securing operational space.

<Table 1> Major technologies of the 4th industrial revolution

Technology	Contents
IoT (Internet of Things)	<ul style="list-style-type: none"> - Known as the Internet of Things, it refers to a technology or environment in which sensors are attached to objects to exchange data in real time over the Internet - IoT devices can communicate with each other directly without human intervention, interpreting the information according to the needs, and operating on their own
CPS (Cyber-Physical System)	<ul style="list-style-type: none"> - A system that integrates real-world physical systems such as robots and medical devices with software and surroundings in cyberspace in real time - As a future-oriented and developmental form of existing embedded system, it can be widely applied to complex infrastructure such as manufacturing system, management system, and transportation system
Big Data	<ul style="list-style-type: none"> - It refers to various types of data generated in the digital environment, and refers to a large amount of data having a large scale and a short generation cycle - Based on the increased amount of data, we can analyze and predict people's behavior patterns, etc., and when it is used in industrial sites, the system can be optimized and efficient
Artificial intelligence	<ul style="list-style-type: none"> - A branch of computer science and information technology that enables computers to imitate human-specific intelligent behaviors such as thinking, learning, and self-development - In addition to being used alone, it is possible to connect with various fields to replace tasks that can be done by human beings and to bring higher efficiency

* Source: Information & Communications Technology Development Center(2016).

Third, people's living safety includes the stable supply of war necessities, the provision of wartime and shortages, and the treatment of all cases as a medical aid and the measures for the relief of displaced persons

It has been pointed out that the government's emergency preparedness plan has so far settled on a military-oriented emergency preparedness system. Criticism has been raised that an emergency preparedness plan should be prepared to reflect the changes in inter-Korean relations and the development of science and technology (Na & Shin, 2019: 68). In the areas of defense, disaster and emergency preparedness, synergies are even greater when developed in conjunction with policy proposals and research activities using ICT (Choi, 2019: 34).

The government conducts annual Eulji exercises in parallel with military exercises to verify the effectiveness of the wartime preparedness program. However, based on the results of Eulji practice since 2013, the necessity and development of simulation-based emergency preparedness government practice system are as follows (Jo, 2015; Kim, *et al.*, 2019: 203).

First, since Eulji practice proceeds according to a pre-written event message, it lacks a sense of reality and has been formalized. Second, the demonstration exercise of the show type is in progress, which does not produce actual practice results. Therefore, key practice tasks appropriate to the functions of the central government departments should be identified, and large-scale practical exercises that reflect the regional characteristics of metropolitan and provinces should be carried out by region.

Third, in the case of actual practice such as resident movement training and lifesaving training against terrorism and disasters, it was difficult to implement real-time integration situation measures because there is no integration situation plan necessary for integrated action. In particular, since disaster is an irresistible force that cannot be avoided or prevented by humanity's current science and technology, we must anticipate possible disasters, minimize the damages through prompt response, and try not to expand into secondary disasters (Rheem, 2014: 26).

The emergency preparedness policy in foreign countries is as follows.

First, France enacted the 2004 Modernization of Civil Security Act by integrating 90 laws after the September 11 terrorist attacks in the United States (Ahn, 2014: 91). This Act defines the responsibility of individual citizens, the responsibility of owners of private sector facilities and buildings, the responsibility of basic local governments, and the responsibility of the state, and so on. The government is operating a decentralized national disaster management system through a cooperative system (using a union system) between the national and regional governments with the government.

Second, the United States developed a standardized crisis & emergency management system and Homeland Security Exercise and Evaluation Program (HSEEP) through the Department of Homeland Security, and the National Exercise Simulation Center (NESC) was established under the Federal Emergency Management Agency (FEMA). HSEEP is a program developed to train and assess emergency response personnel and civil servants in 2007 to effectively prepare for and respond to disasters such as terrorism. NESC is an organization that develops training models and simulations to effectively design, conduct and evaluate training (Mapar, *et al.*, 2012). In the defense sector, the state-of-the-art IT technology and M & S (Modeling & Simulations) techniques are used for military training. Since the 1970s, the proportion of simulation training has gradually increased, and now, the training using M & S has been actively carried out such that simulation training takes up more than actual training (Page & Smith, 1998; Tolk, 2003; Kim, *et al.*, 2019: 208).

Third, Japan conducts annual training sessions with all relevant agencies including the Self-Defense Forces, the police, and fire-fightings, organized by the Cabinet's Crisis & Emergency Management Center to practice wars such as armed situations. At the same time, it prepares for damages considering the anticipated damages for all types of disasters, trains local residents to understand the on-site situation, and manages crisis and emergency management operated by the Minister of Disaster Prevention. Public-private response training is continuously conducted through the center (Kim, 2014). It trained the operation of the disaster response headquarters, identified and disseminated the situation, emergency response activities, and monitoring the surrounding situation, and made assumptions about the damage situation in the anticipated damage area. By using a computerized decision support system, the central government is building and operating an information system for each disaster-designated administrative agency. Local governments are also building and training informatization systems for each local government. Each information system implements education and training using the disaster response training function based on the disaster response manual. Informatization system is actively developing a disaster response training method through games (Furuichi, 2014; Kim, *et al.*, 2019: 209).

Fourth, the UK operates emergency management into emergency preparedness stages and emergency response and recovery stages. Emergency preparedness plans are divided into generic plans and specific plans, which apply to specific emergencies and emergencies in specific areas. In addition, Business Continuity Management (BCM) is an internal plan that ensures that major organizations' activities are not interrupted in the event of an emergency (Ahn, 2014: 94-95). The United Kingdom established and operated an

Office of Emergency Preparedness in 2001. Its purpose is to assess disaster management and recover from disasters to respond to large-scale disasters occurring in the UK, as well as those that affect the UK from outside. The Minister of Home Affairs assists the Citizens' Emergency Preparedness Committee, whose chairman assists ministers on a case-by-case basis. The primary function of the emergency preparedness office is to firstly plan the country to learn and address lessons learned from emergencies and disasters.

Second, the Office of Emergency Preparedness looks for potential risks. It will take any necessary coordination measures, address risks or support the department. Third, the emergency preparedness office creates an environment where disaster recovery is always in everyone's interests. Fourth, the emergency preparedness office reviews the legislation of emergency preparedness plans that address emergency preparedness obligations related to the province. The Office of Emergency Preparedness promotes public safety from disasters by providing subsidies to local governments, playing a leading role in central government planning, improving national civil protection, and improving the quality of local civil protection. It also serves to promote the international interest of government in the field of civil protection (Lee, *et. al.*, 2006: 587).

Emergency Preparedness Policy in Intelligent Government

There are not many examples of artificial intelligence in the government sector today. But AI can be expected to bring a whole new change in how governments work. Some tasks will be fully automated by AI, some will turn into a role-sharing approach between humans and AI, and some will remain areas of human processing with the help of AI (Eggers, *et. al.*, 2017: 17-19).

The age of knowledge informatization emphasizes the importance of big data's overall processing technology that reflects simultaneous

and diversified aspects of data volume and quality, as well as data analysis that finds meaningful information by analyzing big data accumulated. Big data, like coal during the Industrial Revolution, can be seen as an important source of innovation, competitiveness, and productivity improvement during the ICT and Smart Revolution eras (Jeong, *et. al.*, 2016: 687; Manyika, 2011: 2-3). The government's emergency preparedness policy was established several decades ago and is being gradually supplemented to date. However, research is needed to establish a system that supports rational decision-making of heads of state based on rapid situation analysis, judgment and resource mobilization using ICT in emergencies. Policy proposals using information and communication technology (ICT) in the defense and disaster sectors, and emergency preparedness policy as a non-military security field, will also provide comprehensive crises & emergency management. In order to achieve synergies, policy linkages with related sectors must be maintained and developed (Choi, 2019: 34).

The intelligent government promoted by the government combines human sensitivity and creativity with the power of accurate machine analysis to provide a service that impresses the people, and defined it as a government that manages the state wisely with the people and suggested four strategies and eight key tasks (Ministry of the Interior and Safety, 2017a; Ministry of the Interior and Safety, 2017b; Doh, *et. al.*, 2018: 12-13).

First, the "evolutionary administration that innovates itself" strategy. It consists of two key tasks: redesigning administrative processes through self-learning and laying the foundation for data-driven administrative innovation.

Second, "warm service to the heart" strategy. It consists of two key tasks: realizing a digital secretary service that solves the problem and realizing a digital care service for everyone.

Third, the "transparent society with the people" strategy. This strategy consists of two key tasks: creating a justice social-ecosystem using data and implementing platform-based digital partnerships.

Fourth, "know smart infrastructure" strategy. This strategy consists of two key tasks: establishing an intelligent safety net based on

<Table 2> Comparison of e-government and intelligent government

Classification	e-Government	Intelligent Government
Administrative job	Raising issues by the people and public officials → Improvement	Automatic recognition of problems through the digital brain → Suggest alternatives itself → Improvement
Policy making	Government-led policy operation	People-led policy making
Field administration	Simple business process	Complex problem solving
Service goal	Provide quantitative and efficient services	Qualitative and sympathetic service co-production
Service content	Life cycle customized	Everyday Niche + Secretary by Lifecycle
Delivery Method	Online + mobile channel	Demand-based on/offline multichannel

* Source: Ministry of the Interior and Safety(2017a), Ministry of the Interior and Safety(2017b), Doh, *et. al.*(2018: 13).

situational awareness and establishing a self-friendly cyber use base.

Examples of the introduction of artificial intelligence into government affairs are as follows (Yun, *et. al.*, 2018: 35-36).

First, a case of restaurant hygiene testing to prevent food poisoning by the US Nevada Health Authority (SNHD). In the United States, 48 million people are affected each year, more than 128,000 are hospitalized, and 3,000 die from infection. Nevada's health authorities compared the existing random methods with artificial intelligence when selecting restaurants to be inspected for restaurant hygiene testing in Las Vegas. Artificial intelligence is 64% more effective at finding problem restaurants. This has led to Las Vegas alone being able to prevent more than 9,000 foodborne illnesses and prevent 557 hospitalizations each year (Sadilek, *et. al.*, 2017: 37).

Second, the US Department of Homeland Security (DHS), Office of Citizenship and Immigration Services, uses EMMA, a virtual assistant that accurately responds to human language, and responds to 500,000 questions a month. As answers to questions increase, they respond smarter (Eggers, *et. al.*, 2017: 6).

Third, the introduction of artificial intelligence in the US Army. The US Army spends hundreds of millions of dollars every year to recruit new recruits and visit colleges and booths. Military enlistment is an important decision that can change one's life from an individual volunteer's point of view, and recruiting new recruits also requires many considerations, including specialty illnesses, length of service, and benefits. To address this issue, the US Army has installed an interactive virtual support system called SGT STAR on artificial intelligence. SGT STAR handles the work of 55 people alone, with an accuracy of over 94%. In 2016, the system answered 16 million questions raised by applicants (NextIT, 2017).

Artificial Intelligence and Emergency Preparedness Policy

The development of science in the 4th Industrial Revolution era will reduce errors in terms of means and methods of crisis and emergency management. It will operate an automatic crisis & emergency management system, or AI risk prevention system, to prepare for a crisis ahead of humans. In particular, as science advances, the predictability of crises increases, and natural disaster crises are also managed in a broad sense when sporadic and sudden crises occur. Through advanced sensor and cumulative data analysis, more information and systems will provide a variety of knowledge to overcome the crisis (Park, 2017: 27-28).

AI is a technology that enables machines to learn from experience, adjust existing knowledge based on new inputs, and perform tasks in the same way as humans do. Most of the AI cases today, from

chess computers to cars driving directly, rely heavily on deep learning and natural language processing. This technique makes it possible to train computers to perform specific tasks by processing large amounts of data and recognizing patterns in the data (https://www.sas.com/ko_kr/insights/analytics/what-is-artificial-intelligence.html, 2019. 10. 10 visit).

Artificial intelligence (AI) technology is becoming more prevalent because it combines more data, faster processing power, and more powerful algorithms. Indeed, as AI technology begins to be introduced into virtually every industry, a wide range of use cases expands on potential applications as computers can speak, see, hear, and make decisions in an unprecedented way. Artificial intelligence is seen as a catalyst for next-generation technological change, which is equivalent to past changes such as the industrial revolution, the computer age, and the smartphone revolution.

According to a recent report by Tractica, a global market research firm, revenue from direct and indirect applications of AI grew from \$ 5.4 billion in 2017 to about \$105.8 billion in 2025, with a rapid growth rate of 45% annual CAGR (<http://www.aitimes.kr>, 2019. 10. 10 visit).

AI can be seen as an alternative to increase the rationality of decision-making to solve difficult problems that require political judgment within the medical, defense, education, financial and government sectors. It is possible to innovate administrative services in various areas by systematically analyzing accumulated data and combining meaningful information with AI, noting that AI's deep learning mechanism can follow human behavior under various conditions. AI can also do administrative innovation in more technical areas (Korea Institute of Public Administration, 2018: 130-131).

The combination of AI and big data analytics can revolutionize decision making in emergency preparedness.

Utilization of Big Data Analysis and Emergency Preparedness Policy

In modern times, the collection, storage, and analysis of data continues to increase based on improved processing power, lower computation and storage costs, and the development of sensing technologies in all types of devices. Based on this, the source of big data and the way of organizing big data continue to be complicated and diversified. These sources include public websites, social media, mobile applications, government records and databases, commercial and public records, data related to specific locations, and observations. Includes traditional off-line documents that have been converted into electronic documents via records, optical equipment.

The advent of more tools and sensors with Internet access has also expanded the ability to collect data from physical objects such as radio-frequency identification chips (RFID chips). The location data of a person can be collected through global positioning system chip (GPS chip), cell-tower triangulation, wireless network map using credit card, debit card, cash card, direct payment, etc. (Lee, 2016: 18).

Big data must create meaningful information that can grasp the current situation and predict the near future, and there is no meaning of big data unless a meaningful interpretation can be derived (Bok & Yoo, 2014: 47). Information has a variety of personalities that can vary in value depending on the person, time and organization that handles the information. There is no absolute standard for assessing the value of information. The value of information can be evaluated differently depending on the purpose of use and when and where it is used (Jeong, *et. al.*, 2016: 688). Internet big data (Google Trends, etc.) can be used to identify citizens' interests and help policy decisions (Lee, 2015: 506). It is necessary to find ways to make big data useful for human life useful for emergency preparedness policy. For example, there is a great need to develop development measures to support optimal crisis & emergency management and war guidance decision-making by the mobilization authorities by raising the mobilization to the mobilization demands at each stage of the war and raising future mobilization demands.

Cloud Computing and Emergency Preparedness Policy

It is time to use artificial intelligence, big data analysis, IoT, cloud computing, drones, sensing, and cameras due to rapid changes in politics, economy, and society, as well as global weather events. It is time to use artificial intelligence, big data analysis, IoT, cloud computing, drones, sensing, and cameras due to rapid changes in politics, economy, and society, as well as global weather events. In other words, administrative services that guarantee the safety of the people are difficult to cope with the traditional methods, and it is required to cope effectively through the solutions of information technology in the 4th industrial revolution era, which combines high technology and data (Korea Institute of Public Administration, 2018: 292).

In order for the government to respond quickly to emergency preparedness policies in line with unpredictable domestic and international security environments, it is necessary to have an information system integrated and efficiently operated by rapidly developing information and communication technology (ICT). For this purpose,

it is desirable to integrate and manage mobilization-related information systems such as defense mobilization information system and emergency preparedness resource management system.

By creating a Cloud Computing environment, the quality of emergency preparedness policies can be improved by integrating various emergency preparedness-related networks and servers operated by individual systems and sharing data to establish a platform for optimal decision making in emergency situations (Choi, 2019: 46-47).

In the future, information and communication technology is a key factor to secure the continuity of war and ensure the victory of war through quick and accurate mobilization by grasping real-time necessary conditions for mobilization resources, mobilization and resource storage, resource allocation and allocation. It will be a necessary condition for future warfare.

In this respect, mobilization resource management and mobilization are the production management, logistics, and distribution sectors compared to the companies. Therefore, the introduction of Smart Logics system that improves its efficiency in all logistics areas such as storage, unloading, transportation, facilities, equipment and distribution system using IoT, ICT, etc. is indispensable. By integrating sensors, information and communication, and control technologies in all areas of mobilization, transportation, loading and unloading, equipment, and logistics, efficiency of logistics operations and cost reduction are possible (Moon, 2018: 37-28)

Drone Use and Emergency Preparedness Policy

Disaster safety issues are increasing due to changes in socio-economic and scientific technologies, the extent of disaster accidents are getting bigger and more complex, and disaster patterns are further evolving. Therefore, it emphasizes the necessity of establishing a mid- to long-term future disaster management strategy and laying the foundation for scientific disaster management in connection with core technologies of the 4th Industrial Revolution.

The Ministry of the Interior and Safety combines existing disaster safety technologies with core technologies of the 4th Industrial Revolution, such as IoT and AI. It encompasses R & D to actively utilize the revolutionary core technology infrastructure. In recent years, the government has been promoting the development of science and technology in the field of disaster safety and collaborative R & D at the ministry level, in line with the progress of technology due to the 4th Industrial Revolution, etc. Efforts are being made to build new systems that incorporate new technologies into the field of disaster safety and analyze and prepare for disaster-related data (Ministry of the Interior and Safety, 2017c: 52).

Drones are used in various fields such as broadcasting, telecommunications, agriculture, logistics, and hobbies, and are expected to be used in various fields in the future. In particular, research on drones used in disaster sites such as fires and forest fires in high-rise buildings has been actively conducted in recent years and is expected to be actively utilized in actual sites. The demand for drones for rapid spatial data acquisition in an emergency is also increasing (Park & Kim, 2016: 74).

If a person enters a disaster site, there is a risk of personal injury or property damage, such as death caused by fire, explosion or poisonous gas poisoning. Therefore, if a disaster safety drone is put in place at the disaster site, it is possible to grasp the situation in a place where site access is difficult. And if used in extreme environmental and widespread area surveillance, human and property damage can be greatly reduced.

Overseas, drones are already actively used in the field of disaster safety. The US NASA uses drones to collect data from the center of the hurricane, while British master BP is using the drones to check Alaska's pipeline damage. China, which uses drones to monitor smog, has successfully tested smog by spraying chemicals into it.

In Korea, it is being used for forest protection activities as a drone in Haeundae-gu, Busan. The drone recorded images can be sent to the Haeundae-gu CCTV Control Center for real-time monitoring. In January 2015, a fire spot was found near Hawoljeong. In February 2016, the National Institute of Forest Science designated the Yeongwol, Gangwon area as a pilot project and is conducting projects such as forest fire monitoring, transportation of goods, and land survey using drones (Kim, *et. al.*, 2017: 51).

Development Plan of Emergency Preparedness Policy in the 4th Industrial Revolution

The basic mechanisms of the 4th industrial revolution are hyper-connectivity, superintelligence, and great convergence. Therefore, in the 4th Industrial Revolution, the industrial ecosystem is connected to all things horizontally through IoT & IoE, and utilizes the immense big data generated in this process. Based on this, it makes super intelligent products and services by making appropriate judgment and autonomous control. The Industrial Revolution pursued the two effects of improving productivity and raising the standard of living of human beings, and has built a means of enhancing the added value of the industry. The changes caused by the 4th Industrial Revolution were changed from the human-centered industrial environment in which the machine was operated and con-

trolled, to the industrial environment using big data and artificial intelligence, in which the machines made their own judgments and communicated with each other. This industrial change is expected to be completed through the process of combining ICT and manufacturing, and fusion of open systems such as cyber physics systems and standardization (Jeon & Byun, 2016; Oh, 2018: 65).

First, it is necessary to construct a crisis & emergency management decision support system using artificial intelligence, big data analysis, and IoT (Choi, 2019: 44-45). If a decision-maker decides by combining the locations, production capacities, stocks, means of transport, and distance of thousands of key management companies that produce mobilized goods in a crisis, it will be difficult for him to take timely action. However, artificial intelligence (AI), where this data has already been entered, will support decision makers by designating the best mobilizers by algorithms. In a crisis & emergency management situation, it is necessary to cover all existing data and information, and to quickly determine reasonable decisions while predicting future effects. In the crisis situation, important decisions make the need for artificial intelligence (AI) even more urgent. In the worst case, artificial intelligence (AI) makes decisions that transcend the limits of human reason. Artificial intelligence (AI) enables the screening of priorities and the pros and cons of a number of different measures.

Second, it is necessary to establish a system and technology for linking and utilizing private and public data. In order to facilitate the use of big data, it is necessary to prepare a national support plan for data utilization. At the same time, there is a need for continuous cooperation and support for infrastructure construction and data linkage for service development. It is difficult to utilize data held by government agencies or local governments (Bok & Yoo, 2014: 56).

Third, there is a need to improve the system to utilize big data in a situation where personal information is not deleted or privacy infringement is required, and related laws are required to be revised (Bok & Yoo, 2014: 56). Currently, there are legal and institutional limitations on the disclosure and use of personal information in the use and collection of data. In the case of cloud functions, the policy of widespread use in life is still incomplete (Baek, *et. al.*, 2013).

Fourth, the use of big data analysis and artificial intelligence is effective in ensuring military operations in the emergency preparedness plan, maintaining government functions, and ensuring stable functioning of people's lives. For example, using big data analysis and artificial intelligence, it is possible to mobilize troops, mobilize wartime workers, mobilize technical personnel or dissipate government agencies, control residents and vehicles, mobilize industrial workers, transport mobilizations, deal with all war victims, and

provide relief for victims, etc. are efficient and practically possible. In order to utilize big data, it is necessary to integrate various information. This means that departments with different roles must be integrated (Lee, 2016: 29).

Fifth, it is necessary to integrate and manage civil defense resources and emergency preparedness resources, which are the resources for crisis and emergency management. Civil defense resources and emergency preparedness resources are common in that they are secured and managed by the state in preparation for national crises, such as peacetime and wartime emergencies, and crises & emergency management resources to be used during emergencies. These civil defense resources and emergency preparedness resources are both national and materials (equipment, etc.) owned by the people. Therefore, in a large framework, it is related to the national crisis encompassing normal and war times, and it is desirable to manage and manage these resources collectively (Ahn, 2005: 9). In normal times, the use of crisis & emergency management resources to manage large-scale disasters and various types of national crises can be an opportunity to identify problems and solutions for emergencies.

Sixth, a comprehensive study based on the convergence academic system on the government's emergency preparedness policy should be conducted. Refrain from studying fragmentation of emergency preparedness policies in terms of specific disciplines or skills, and require research through an interdisciplinary or transdisciplinary approach. In particular, a transdisciplinary approach should be taken in which the citizens, staff, experts, and public officials in the policy field should work together to find and solve problems in the emergency preparedness policy (Lee, *et. al.*, 2018: 93).²⁾

Seventh, institutional support should be provided to support new roles and capacity changes of public officials in charge of emergency preparedness in intelligent government. Emergency preparedness, one of the areas of crisis & emergency management, is more complex and diverse than others, requiring a high degree of expertise. As a result, the government has introduced a professional experience officer system to operate the workforce, but hardly any promotions or rotational positions are made and no professional benefits are received. Therefore, it is necessary to activate military and private university entrusted education opportunities, improve the professional personnel officer system, and vertical and horizontal personnel exchanges to foster professionalism and creativity. For

employees in charge of emergency preparedness, it is desirable to have a plan that leverages the expertise of retired officials. For example, a military retiree who has a career in emergency preparedness or a military retiree in a public agency is responsible for the safety of local governments or major facilities through reemployment. U.S. government prepared for civil emergency retirement rather than part-time employees of civil defense officers. Because these retirees receive military pensions, local governments use their expertise with minimal salaries (Phillips, 2017: 10-11).

Conclusion

The 4th industrial revolution ultimately has the characteristics of hyper-connected and hyper-intelligent, and is expected to change into a society where everything is interconnected and intelligent. Therefore, the 4th industrial revolution is expected to bring about overall changes in human life through technologies such as artificial intelligence, 3D printing, robotics, IoT, big data, and biotechnology. The characteristic of the 4th industrial revolution is the part that can find the desired information in real time anywhere through the connection between people and things (Kim, *et. al.*, 2019: 72).

In the intelligent government of the 4th Industrial Revolution, the introduction and use of artificial intelligence and big data analysis for emergency preparedness can increase the efficiency, effectiveness and rationality of policies. It also has the advantage of helping to solve social problems by reducing social costs and policy failures and increasing policy success. However, there is a question of who is responsible for the failure of a policy due to errors or negligence in decision making. If a person makes an error in a policy decision or causes a policy failure, he or she is liable for legal or political responsibility in the event of obvious illegal or negligent care. However, there is a question of who is responsible for artificial intelligence or big data analysis when errors and failures occur due to algorithm or data problems (Yun, *et. al.*, 2018: 51-52; Moon, 2019: 9). Nevertheless, the government's emergency preparedness policy is urgently needed to make an intelligent government through the combination of high technology and big data and to secure the safety of the people.

In this context, this paper aims to suggest the development of emergency preparedness policy in the 4th industrial revolution era. In order to achieve the purpose of this study, the significance of emergency preparedness policy in the 4th industrial revolution was examined. And we examined the emergency preparedness policy in the intelligent government in connection with artificial intelligence

2) Example of Participatory Disaster Management System through SNS. In the face of growing disaster damage, the government's ability to respond and recover is limited. Voluntary participation of various private sectors through SNS is an important medium for collecting and transmitting disaster information in the event of a disaster, where active participation of the private sector and the community is important. (임상규, 2014: 39).

(AI), big data analysis, cloud computing, and drone. Based on this, the development of emergency preparedness policy in intelligent government is presented as follows.

First, it is necessary to construct a crisis and emergency management decision support system using artificial intelligence, big data analysis, and IoT.

Second, it is necessary to establish a system and technology for linking and utilizing private and public data.

Third, there is a need to improve the system to utilize big data in a situation where personal information is not deleted or privacy infringement is required, and related laws are required to be revised.

Fourth, it is desirable to perform military functions, maintain government functions, and stabilize people's lives in emergency preparedness plans using big data analysis and artificial intelligence.

Fifth, by combining artificial intelligence and big data analysis to implement intelligent government, it is necessary to integrate civil defense resources and emergency preparedness resources, which have been classified as crisis and emergency management resources.

Sixth, the government's emergency preparedness policy should be based on a convergence academic system, and a comprehensive and transdisciplinary crisis where citizens, business people, experts and government officials work together to find and solve problems. emergency management research should be undertaken.

Seventh, institutional support should be prepared to support new roles and capacity changes by activating educational opportunities and personnel exchanges with universities to foster the expertise and creativity of civil servants in charge of emergency preparedness.

Seventh, institutional support should be prepared to support new roles and capacity changes by activating educational opportunities and personnel exchanges with universities to foster the expertise and creativity of civil servants in charge of emergency preparedness. In particular, in the case of employees in charge of emergency preparedness in the era of the 4th industrial revolution, it is essential to prepare a plan to utilize the expertise of military retirement officials.

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