

A Trend on Smart Village and Implementation of Smart Village Platform

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Abstract

We intend to improve the sustainability of rural villages by investigating the element technologies and platforms necessary for building smart villages. There are so many investment smart city platforms and solutions in many cities. but there are relatively few investments in rural or small cities. This situation can not only increase the urban problem due to the increase of population to the city, but also deepen the digital gap of citizens. So far, studies on smart village have been investigated in fragments. We will examine the cases applied to smart village as a whole and study the open smart village platform that analyzes the overall data storage and management of the village after the smart village was finally established. First, we will look at the overseas trends of smart village and second, we will study the smart village platform that efficiently manages smart village through the technology necessary for smart village.

Key Words: *Smart Village, Smart Village Platform, Smart City, IoT*

1. INTRODUCTION

The progress of urbanization is rapidly progressing all over the world and there are various urban problems due to the increase of urban population. In the city, traffic delay and safety environment problems are becoming serious due to population growth. In order to solve these urban problems, many countries are investing and doing business to build smart city through ICT technology. As such, there are many urban problems due to the increase of urban population. In the city, traffic delay and safety environment problems are becoming serious due to population growth. In order to solve these urban problems, many countries are investing and doing business to build smart city through ICT technology. Smart City is emerging as the search for new industries that will dominate the era of the fourth industrial revolution is fierce through DNA (Data, Network, AI), a

super-connected intelligent infrastructure [1]. In contrast to the construction of smart city, rural villages face difficult rural problems as opposed to many cities such as the increase of the elderly population, the departure of young population, the decrease of rural population and digital information gap. Especially, it is urgent to improve the satisfaction of settlement in rural areas due to the expansion of the gap between urban and rural areas such as traffic, environment, safety and health Resident Satisfaction ('17 Rural Economic Research Institute ,10 out of 10) City 6.7 points VS Rural Community 5.8 points [2]. In order to build such a smart village, it is necessary to support the vision and government and to participate in the residents.

The vision of smart village is that modern energy access can act as catalyst for development in education, health, productive enterprise, clean water, sanitation, environmental sustainability and participatory democracy which helps to support further improvement in access to energy [3].

Also, Smart Village is a long-term society, economy, community environmental welfare activities to strengthen participation in the community and promotes governance processes, promotes entrepreneurship and build a more flexible community [4].

And in rural areas, farmland area is reduced by urbanization development. Therefore, as a research field of pollution-free agricultural products and stable supply for environmental pollution, efforts are being made to spread smart village [5].

In this study, we investigated the mutual problem solving between urban and rural areas. After investigating the precedent cases of smart village, we will study the efficient smart village solution and finally study the smart village platform that operates the village efficiently. Through the study of smart village, it is intended to create jobs and provide basic infrastructure and services to prevent overseas migrants and young people from going to the city again, thereby minimizing the digital gap between the city and the countryside, thereby promoting balanced regional development and improving the quality of life in the rural area.

2. CASE OF SMART VILLAGE

In Europe, it is defined as a rural village community that seeks to create new business opportunities based on assets and potentials already in the smart village. It is defined as a village where new network base is established to revitalize the local economy and service of the region is improved by utilizing ICT and knowledge.

In order to achieve balanced national development in the era of the 4th Industrial Revolution, we are promoting smart city business and smart village business in various countries to solve the gap between city and village

2.1 Europe

Europe is building smart village in various ways according to the characteristics of each country. Germany's digital village business, France's neighboring regional cooperation, Finland's innovative research, Italy's smart village strategy, and so on [6].

Digital Village in Germany

In order to solve the problems of lack of digital services in rural areas, lack of networking between citizens, communities and local governments, the Fraunhof Institute in Germany has invested a total of 4.5 million euros by 2019 in cooperation with the Ministry of Interior to select the digital village project as three areas (Eisenberg Heim Betzdorf Gebbard Sign).

The service of digital village

- It is a refurbished bar service that connects service marketplace Bestelba with volunteer. It is a delivery

app of local-based product online marketplace and delivery volunteer.

- Second is the Access Mobile DorfFunk service of Digital Village, which delivers local news, and it is an app that can see local news and news of interested areas.
- Finally, Hannah's digital village platform is leading the two-way communication with local residents and communication with local governments for all these communications.

Smart Village in France

France will promote cooperation between urban and rural villages in 2015 and will invest 2 million euros in public funds by 2020 for basic services such as economic development, social inclusion, health culture and environmental energy resources in Bress and Bretton rural areas. Through this, Bretton was selected as a local hub of documentary films to build a 0-small film cluster. Carhe Hospital, a local hospital, used a city's remote service and mobile MRI remote service to prevent the abolition of obstetrics and gynecology, and established a business model to help sustainable smart village district axis by supplying bio-wood to the city [6].

Smart Village in Finland

In 2016, Finland conducted a smart village research to solve social issues in rural villages and digitalize services, and as a result, proposed 7 basic services and 19 projects. In 2017, the digitized government project and broadband communication network were established and used for research. Major research results were to build a public platform, allow access to DB, and study digitalization to reduce the digital information gap, and to construct a digital promotion plan.

2.2 Asia

Smart Village in India

India has developed a smart city and has defined various rural areas as smart villages rather than living a city better, and is carrying out projects that all India can live well through ICT technology.

India is a concept of PURA (Providing Urban Amenities in Rural Areas) and promoted a project to reduce the need for villagers to move to the city such as communication, internet, and employment opportunities. In 17 years, Mori Village, a Kashner production area, was designated as the first smart village and Internet and telephone banking were built in all household [7].

Smart Village in Japan

Japan is planning to carry out autonomous public transportation service in some local cities up to 2021 women in order to solve the problem of increasing traffic accidents of elderly drivers by ICT technology, which leads to the extinction of the city when the elderly population dies.

In addition, the Japanese Ministry of General Affairs provides 18 years of 'StartupXAct' project, such as the elderly guardian solution in Deshiocho, Hokkaido, the local virtual currency of Kyotobu, Elbuzukoin, and shopping services using VR in Takamatsu City. Japan is trying to reduce the medical expenses and nursing problems for the elderly in the future in the direction of transforming the region of extinction crisis into a smart village rather than a big city [8].

Smart City Smart Village in Malaysia

Smart City Smart Village (SCSV) is one of the projects within Digital Malaysia initiative. Digital Malaysia initiative is an extension of the Multimedia Super Corridor initiative that has been introduced in the year 1990. The idea of SCSV was presented and approved by the Malaysia's Global Science and Innovation Advisory Council (GSIAC) in the year 2010. The aim of SCSV is to improve everything from energy use to healthcare, education, traffic and shopping by doing it 'smart' with the help of ICT and green technology [9].

2.3 Domestic

In Korea, as the gap between urban and rural environment services such as aging of rural population, youth phenomenon and traffic safety environment health has been expanded, smart village construction is being promoted to improve the lives of residents and to promote national development as a sustainable service to solve village issues and improve living convenience by using intelligent information technology.

Kookdeok-myeon Smart Village

It was selected as a target for the spread and spread of smart village in the Ministry of Information and Communication, and decided to apply the service that the villagers can experience as living lab base.

- We implement smart energy bank service to confirm real-time solar power generation and energy consumption status by household and suggest optimal power utilization plan
- ICT convergence-based cattle management service, Bio capsule is injected into the body of the cow, and the collected body temperature and activity data are analyzed in real time to predict disease, estrus, childbirth, etc.
- The village guard drone service analyzes the results of high-definition imaging in real time to promote autonomous flight video control for forest fire monitoring, crime, coastal safety accidents, etc.
- Smart streetlights equipped with intelligent CCTV are installed on major roads and village entrances through intelligent video security service, and safety monitoring is carried out to automatically recognize vehicle license plate recognition and sudden action [10].

Muan-eup Smart Village

Presenting Participatory Community Care Service based on Experience Site

- Drone-based precise agricultural information service analyzes the image information obtained while autonomously flying farming and fishing villages, and provides the growth status of crops to local farmers
- Bidirectional communication Through the elderly care service, we collect and analyze life-prog information such as temperature, humidity and movement data at home as well as information communication between the elderly and the welfare workers living alone, and support simple errands such as health care, ordering daily necessities,
- Identifying the current status of agricultural and fishing village garbage (pesticide bottles, waste plastics, etc.) widely distributed by smart garbage can service through IoT sensor and drones, and suggesting optimal collection route and waste bin arrangement plan through prediction of load [10].

2.4 Smart Village Solution

Smart Home & Building

Sensors and camera technology used in smart home and smart building will provide many convenience to smart village. The smoke detection sensor can turn off the fire in an emergency situation, can be confirmed in real time through video data, and can be identified through data storage through crowds when theft or accident occurs. In addition, we will check the storage level of the village water tank and oxygen saturation to realize a better smart village construction [11].

Smart Energy

Analysis and management of production power through real-time watt-hour data acquisition by installing wireless watt-hour meter with energy self-reliance service through solar energy and renewable energy

- Construction of sustainable smart village through energy independence
- Introduction of ICT Technology to Reduce Energy in Rural Villages

- Construction of Cooling and Heating System using Extra-Special Solar Heat

In addition to solar energy, renewable energy such as geothermal, hydroelectric, and wind power is added, and a small local area power network (LAPW) is constructed in a local unit through energy-saving home appliances and device development, thereby realizing a smart village that can self-support energy by storing power through a battery or ESS device and sharing it with each other [12].

Smart Traffic

The lack of efficient public transportation system in rural villages suggests solutions to urban access and lack of mobility.

- Development of transportation means of local villages according to demand rather than regular town buses through development of demand-type public transportation system
- Providing mobile services for the elderly population by autonomous driving village bus development, providing convenience for short-distance movement through unmanned operation and reducing operating costs [13].

3. A STUDY ON THE IMPLEMENTATION OF SMART VILLAGE PLATFORM

So far, we have investigated the definition of smart village, the case of construction of each country, and related solutions. Smart Villages should be applied differently depending on each country and farming and fishing village, but the part that collects and stores data of smart village and expresses the analyzed results should be applied as the standard as the integrated platform of smart city.

In particular, the construction of a platform in municipalities without technology and organization for IT can be a duplicate investment in each region, and it is highly likely to become a pilot project that will disappear in the future. To solve these problems, it is expected that establishing the definition and standard technology of smart village platform to some extent will contribute to the balanced development of the country as well as the success of smart village in the future. Smart Village Platform is a system that collects, stores, analyzes, and displays data on basic services of rural villages through high-tech IoT, cloud, big data, and AI. Smart Village platform is an open data platform that should share data with neighboring villages in real time and play a role as a connection platform to receive excellent city solution of local governments.

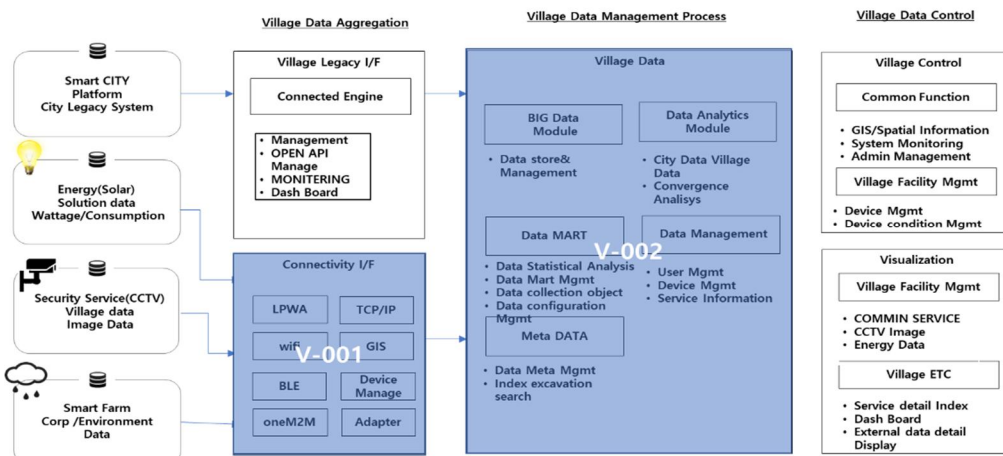


Figure 1. Overview of Village Platform

Figure 1 describes the overall architecture of the smart village platform. The Smart Village platform can integrate relevant data in the smart city platform of the surrounding city considering the characteristics of rural villages, and can collect CCTV image data, crop environment day of smart farm, energy storage and usage of

each resident on the collecting side of important services among the Use cases in smart village, for example, weather disaster safety. At this time, IoT sensing data should be constructed to be easily reused in the future when collecting other smart village data using oneM2M standard, which is an international standard. In data storage and analysis, the standardized atypical data and real-time data generated in rural villages are classified and stored, and the urban data and the linkage analysis fusion data are analyzed separately, and the data is stored in the mart and searched and used when necessary.

Finally, the control part should be composed of GIS functions for each village to form status information and emergency event data for each service facility, and the manager module should be able to extract user authentication and report data.

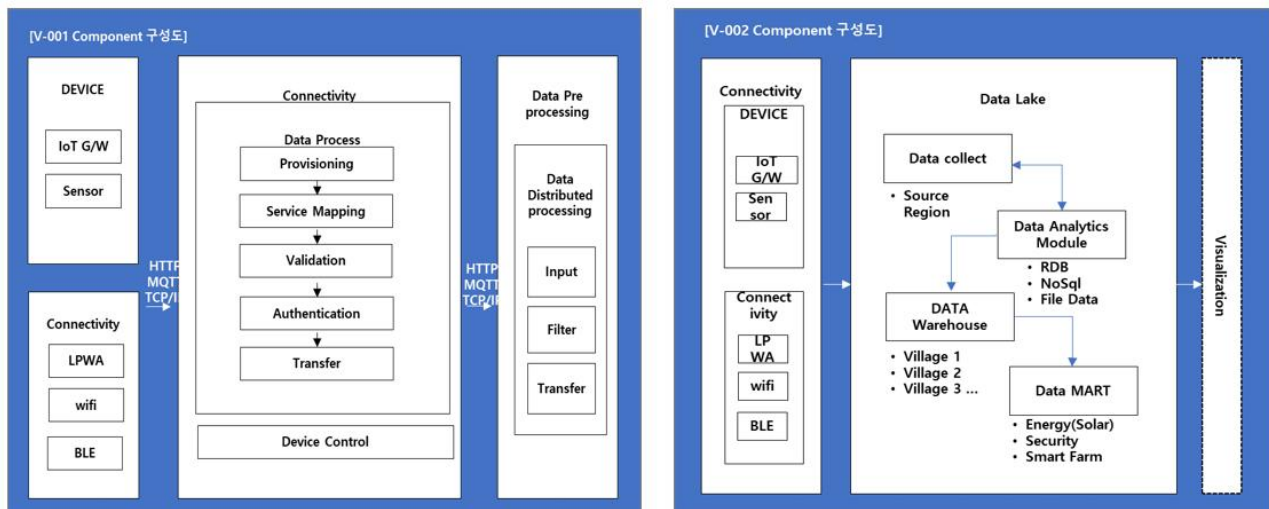


Figure 2. Connectivity/Data Module of Smart Village Platform

Figure 2 describes the components of smart village, connectivity, and detailed components and processing of data. The connectivity module delivers real-time sensor data generated by each device through the IoT gateway, and the data is transmitted to the next step data preprocessing module through the pre-provisioning process and the standardization authentication process. The data from the connectivity module is divided into the source area, but the DataWareHouse is divided into themes and the data mart is divided into business areas so that it can be easily used in each example. In the last analysis, data analysts refine data so that they can analyze data well.

4. CONCLUSION

So far, the case of smart village and necessary technology have been investigated and the parts that can be applied to smart village have been drawn. As ICT technology and the number of devices of things communication increase, smart city platform generates various data and volume is increasing, so ICT infrastructure and platform to accommodate it are necessary. However, smart village is still in its infancy and it does not require many systems and solutions. However, if the experience and technology obtained from the Smart City platform are applied to the Smart Village, it is considered that it will build the Smart Village in a small budget and a short period of time, and reduce the balanced development and digital gap across the country to solve problems such as environment, energy, transportation, and safety.

In this study, the specific smart village Use case and communication technology were not dealt with, but further research is needed to build a smart village continuously.

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