THE FACTORS AFFECTING THE IOT USER SATISFACTION IN SINYEONG CITY FROM CHINA

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ABSTRACT

With the development of Internet and information technology as well as the birth of the concept of smart cities, paramount changes occur in people's life. People nowadays can use various high-end smart devices at home without going out. Therefore, the construction of Internet of Things (iOT) facilities is particularly suitable for modern smart cities, which is not only convenient and reliable, but also greatly facilitates people's lives.

The objectives of this quantitative research are to study 1) the satisfaction level of affecting factors. 2) The factors that affecting the IOT user satisfaction of citizen in Sinyeong City from China. The population is 550426, and sample was 245 people in 5 districts of city. Data were collected by Online-questionnaires. And bring the data to find frequency, percentage, mean, standard deviation and using multiple regression analysis by determining the statistical significance of 0.05.

The results of hypothesis testing show that there are 3 factors that affecting Sinyeong City IOT user satisfaction which are Information quality (IQ), System quality (SQ), Service quality (SEQ) and the Level of Satisfaction was at agree level equal to 4.233 (Strongly Agree). IQ was 4.359 (Strongly Agree), SEQ was 4.199 (Agree), SQ was 4.140 (Agree).

ACKNOWLEDGEMENT

This research study is to investigate the factors affecting the IoT user satisfaction in Sinyeong City.

As the world is suffering from the COVID-19 epidemic from 2020 to 2021, it is very tough time to do research and data collection. I would like to express my sincere thanks to the investigators Mr. Chen XC, Chen MH, Ms. Guo YQ, Chen JT, Zhouchen JH and others, who helped me. they took the risk of infection to complete the questionnaires collection. Some of the respondents are in high positions, thanks for their support and suggestions for this research.

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The researchers strongly hope that this quantitative study will be useful to the local Authority.

Mr. Peizhi Chen

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CHAPTER 1

INTRODUCTION

1.1 Background and Significance

Following China's reform and opening in 1978, China's urbanization construction has achieved world-renowned achievements, especially since the 21st century, the pace of urbanization construction has been accelerating, and tens of millions of rural people enter the cities every year. As the urban population continues to expand, "urban diseases" have become the primary problem that plagues the construction and management of cities, and problems such as resource shortages, environmental pollution, traffic congestion, and hidden safety hazards have become increasingly prominent. In order to solve the predicament of "urban disease", smart cities have emerged.

1.1.1 Building a mart city is the need to achieve sustainable urban development

As smart cities comprehensively adopt a new generation of information technology including radio frequency sensing technology, Internet of Things technology, cloud computing technology, and next-generation communication technology, it can effectively resolve the problem of "urban diseases". The application of these technologies can make cities more easily perceivable, and city resources can be fully integrated (Exploration on the action mechanism and path of China's smart city construction, 2021), On this basis, refined and intelligent management of the city can be realized, thereby reducing resource consumption, reducing environmental pollution, and solving traffic congestion. Eliminate hidden safety hazards, and finally realize the sustainable development of the city (Ministry of industry and information technology: promoting the construction of a new smart city is conducive to the realization of urban sustainable development, 2019).

1.1.2 Building a smart city is the need for the development of information technology

At present, global information technology is showing an accelerated development trend. Information technology has become increasingly prominent in the national economy, and information resources have increasingly become an important factor of production (Significance

of building a smart city - how to build a smart city: What is the significance of developing a smart city, 2018). Smart cities are based on the full integration, mining, and utilization of information technology and information resources, gathering human wisdom and endowing things with intelligence, so as to realize the precise management of various areas of the city and the intensive use of urban resources. Due to the important role of information resources in today's social development, developed countries have introduced smart city construction plans to promote the rapid development of information technology (Smart city, 2021), so as to achieve the purpose of seizing the commanding heights of the new round of information technology industry. In order to avoid becoming passive in the new round of information technology industry competition, the Chinese government has reviewed the situation and put forward a strategic layout for the development of smart cities in a timely manner, in order to better grasp the huge opportunities brought by the new round of information technology reforms and promote country's economy. The society develops well and quickly.

1.1.3. Strategic choices to improve China's comprehensive competitiveness

The development of strategic emerging industries is often accompanied by major technological breakthroughs. It has a major leading role in the overall economic and social and long-term development and is an important force to guide future economic and social development. At present, countries all over the world generally attach great importance to the development of strategic emerging industries. In the "Twelfth Five-Year Plan" (New smart city construction presents five new trends, 2021). China has also made it clear that strategic emerging industries are the focus of development. On the one hand, the construction of smart cities will greatly promote the development of strategic emerging industries including the Internet of Things, cloud computing, triple play, next-generation Internet, and new-generation information technology; The development of, transportation, logistics, finance, communications, education, energy, environmental protection and other fields also has obvious driving effects, and the promotion effect on expanding domestic demand, adjusting structure, and transforming economic development mode is also obvious. Therefore, the construction of smart cities is of great strategic significance to the overall improvement of China's comprehensive competitiveness (Significance of building a smart city - how to build a smart city: What is the significance of developing a smart city, 2018). The degree of urbanization in Western countries is relatively high, and the progress is relatively early. In order to deal with the problems brought about by the development of

urbanization, they first put forward the viewpoint of building a smart city. In Asia, the Chinese government, which is good at absorbing experience, also quickly realized the importance of smart city construction. Especially in recent years, the construction of smart city is conducive to the sustainable development of the city relying on national policy support and government financial assistance, China has become the country with the highest urban growth rate in the world. To seize the opportunity of smart city construction, the government issued in 2014 the "National New Urbanization Plan 2014-2020" an analysis on the development scale and industry development trend of China's Internet of things market in 2018 clearly proposes to "accelerate the construction of smart cities" and raise the construction of smart cities to the national strategic level. In April 2016, the development of new smart cities was formally written into the "13th Five-Year" national information plan, which proposed that by 2018, by 2020, 100 new models of smart cities will achieve significant results. According to the "Smart City Development Report 2019" statistics, as of February 2019, 100% of the sub-provincial cities and 93% of the prefecture-level cities nationwide, a total of more than 700 cities (including the proposed county-level cities or smart cities are shared There are 290 national smart city pilot projects, accounting for 70% of the global total during the same period. City Sin Yeong became one of the first pilot cities for national smart city construction in 2013 under this background.

In addition, if this study can be referred to in the future for government, many Chinese cities can derive experienced from it. That is reasons this research is monitored for IOT Satisfaction.

1.2 Research Questions

Since the concept of smart city was introduced to China in 2013, it has been quickly promoted nationwide. New words such as the Internet of Things, artificial intelligence and big data in the information age are constantly appearing. We have entered a new era of "industrial revolution", full of development opportunities. At the same time, we have also encountered unprecedented difficulties and challenges. The multi-level, multi-dimensional, multi-temporal data analysis results brought about by the construction of smart cities can help the government formulate policies that benefit the country and the people and help policymakers do decisions.

1. Are the citizens satisfied with the Internet of Things? It is one of the important factors and judgment methods that most directly reflect the success of the city's smart construction.

2. What factors will affect citizens' satisfaction with the Internet of Things?

Due to China's special socialist national conditions, most of the basic resources are allocated by the state, and the development of enterprises and local governments is affected by central policies and fluctuates greatly. After understanding these factors, it will help all kinds of enterprises to optimize the industrial structure, help the government improve policies and guidelines, and promote the sustainable development of urban resources.

1.3 Research Objectives

1.2.1 To study the satisfaction level of affecting factors.

1.2.2 To study the factors that affecting the IOT user satisfaction of citizen in Sinyeong City from China.

1.4 Definition of Terms

Information Quality (IQ): mean Information quality refers to the accuracy, completeness, and consistency of information quality. Means After the information is processed by the system, the generated data is transmitted to the IoT-device, which is a safe, timely and accurate state

System Quality (SQ): Mean a good-standard system quality can be easy to operate and access with IoT-device. This system must have a stable compatibility, which can deal with huge IoT-enabled devices generated data to help system-users make decisions quickly and accurately

Service Quality (SEQ): Mean service quality of IoT-enabled system is reliable, quick, timely in order to increase user's satisfaction level and motivate the intention of potential users in Sinyeong City.

User Satisfaction using the IoT (IOT US): Defined citizens who from S city has been used IoT-devices and system happy, enjoy with it or not. It also means difference in actual usage between user expectations and actual technology.

CHAPTER 2

LITERATURE REVIEW

The researcher has studied the Concepts, Theories and Related Research as follows:

2.1 General Information, Overview and Evolution Smart City, IOT, and related the Government policy in China, and the simple introduction of Sinyeong City.

2.2 Theoretical the Operating Concept of The Smart City Framework

2.3 Simple introduction of city S

2.4 Previous studied (Updated Information System Success Model)

2.5 Information Quality (IQ)

2.6 System Quality (SQ)

2.7 Service Quality (SEQ)

2.8 IOT User Satisfaction (US)

2.9 Conceptual Framework

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2.1 General Information, Overview and Evolution Smart City, IOT, and related the Government policy in China

2.1.1 Smart City

Since the beginning of the 21st century, the United States, Britain, Germany, the Netherlands, Japan, Singapore and South Korea have first carried out the practice of smart cities, and many classic cases have been born.

Dibike, the first smart city in the United States is also the first smart city in the world. It is characterized by paying attention to intelligent construction In order to maintain the livable advantage of Dibike city and make greater commercial development, the municipal government, in cooperation with IBM, plans to use the Internet of things technology to digitize and connect all urban resources, including water, electricity, oil, gas, transportation and public services, so as to intelligently respond to the needs of citizens through monitoring, analysis and integration of various data, And reduce the energy consumption and cost of the city. The city took the lead in completing the data construction of hydropower resources, installing CNC hydropower meters for

residents and shops in the city, not only recording the use of resources, but also using low flow sensor technology to prevent resource leakage. The data recorded by the instrument will be timely reflected on the comprehensive monitoring platform for analysis, integration, and public display (Big data application cases of the world's top ten smart cities, 2018). Some other smart cities developing Smart Transportation like: London, Stockholm, Copenhagen, and Lyon (Big data application cases of the world's top ten smart cities, 2018). Some cities focus on Smart Environment and Smart Government such as: Amsterdam and Singapore.

According to this situation, China government decided to the use of various information technologies or innovative concepts to open up and integrate urban systems and services to improve the efficiency of resource utilization, optimize urban management and services, and improve the quality of life of citizens.

A smart city is an advanced form of urban informatization based on the next-generation innovation of a knowledge society based on the full application of the new generation of information technology in all walks of life in the city. It realizes the in-depth integration of informatization, industrialization and urbanization, helping to relieve the pressure of big cities and achieve precision and dynamic management, and enhance the effectiveness and improvement of urban management the quality of life of citizens (China smart city, 2016).

2.1.2 Internet of Things (IOT)

That is, the "Internet of Everything Connected" is an extended and expanded network based on the Internet. It is a huge network formed by combining various information sensing devices with the Internet. Interconnection (Jia, 2010)The basic characteristics of the Internet of Things From the perspective of communication objects and processes, the information interaction between things and people and things is the core of the Internet of Things. The basic characteristics of the Internet of Things can be summarized as overall perception, reliable transmission, and intelligent processing (Ganzhixiang, 2010).

Overall perception-can use radio frequency identification, QR code, smart sensors, and other perception devices to perceive and acquire various types of information about objects.

Reliable transmission-through the integration of the Internet and wireless networks, real-time and accurate transmission of object information for information exchange and sharing. (Ganzhixiang, 2010)

Intelligent processing—use various intelligent technologies to analyze and process the

data and information that are sensed and transmitted to realize intelligent monitoring and control. According to the above characteristics of the Internet of Things, combined with the viewpoint of information science, around the flow of information, the functions of the **Internet of Things** to process information can be summarized:

(1) The function of obtaining information. It mainly refers to the perception and recognition of information. The perception of information refers to the perception and sensitivity to the attribute state of things and their changing methods; the recognition of information refers to the ability to express the state of things felt in a certain way.

(2) The function of transmitting information. It is mainly the link of information sending, transmission, receiving, etc., and finally the task of transferring the acquired state information and the way of change from one point in time (or space) to another point, which is often referred to as the communication process.

(3) The function of processing information. Refers to the process of information processing. The use of existing information or perceived information to generate new information is actually the process of making decisions.

(4) The function of effect information. Refers to the process by which information is ultimately effective. There are many forms of expression. The more important thing is to always keep the object in a pre-designed state by adjusting the state of the object and its transformation method. (Ganzhixiang, 2010).

The relationship between the two is just inseparable. A smart city is an organically integrated large-scale system, covering more thorough perception, more comprehensive interconnection, and deeper intelligence. Among them, the Internet of Things is a very important element in a smart city, which supports the entire smart city system.

The Internet of Things provides a solid technical foundation for smart cities; it provides the city's perception ability and makes this perception deeper and smarter. Through environmental perception, water level perception, lighting perception, urban pipeline network perception, mobile payment perception, personal health perception, wireless Sinyeong City portal perception, intelligent transportation interactive perception, etc.., smart cities can realize the intelligent management of municipal administration, people's livelihood, industry, etc. One of the main goals of the Internet of Things is to realize smart cities. Many industries and applications based on the Internet of Things serve the mainstream applications of smart cities. In other words, smart cities are the bullseye of the Internet of Things.

2.1.3 Smart City Research System

2.1.3.1 Foreign Research System

As far as the existing evaluation research on smart cities has been carried out in countries where the Internet of Things has developed earlier, the research subjects are also showing a diversified trend, involving countries, enterprises, universities, forums, etc., but the wisdom released by these research subjects the urban indicator system is basically composed of multiple levels of indicators. The first-level indicators mainly cover 4 to 7 levels, and the second-level indicators are subdivided based on the first-level indicators, and the number of final-level indicators ranges from 60 to 200. The indicators are enriched and diversified. Among them, the most widely used information index system is the Network Readiness Index (NRI) proposed by the World Economic Forum in its Global Information Report, which provides a worldwide benchmarking tool Government makers and stakeholders can use this index to determine the country's strengths and weaknesses. (Guo, 2013, The Research Report on Standards System of China Smart City).

2.1.3.2 Domestic research system

In China, research on smart cities started relatively late, and the main research subjects are now divided into universities and the government. The government involves the Ministry of Industry and Information Technology, the Ministry of Housing and Urban-Rural Development, the Chinese Academy of Engineering, and the National Bureau of Statistics. The main research systems include the "National Informatization Indicators Composition Plan" of the Ministry of Industry and Information Technology and the "China Information Capability Report" of the Bureau of Statistics.

The former covers 20 indicators and uses sample surveys to collect statistics. All indicators involve the level of infrastructure construction. The latter index system consists of five indexes (infrastructure index, knowledge index, environment and effect index, information consumption index, usage index), and ten indexes. In addition to infrastructure construction, it also covers education investment and R&D investment. (Guo, 2013, The Research Report on Standards System of China Smart City).

2.1.4 China's Smart City Development Status

2.1.4.1 Development History of China's Smart City

2.1.4.1.1 Enlightenment stage (before 2010)

Before 2010, the core of China's urbanization construction was still the "digital city", and the concept of "smart city" had not been officially introduced. The digital city is the application of computer technology, multimedia technology and large-scale storage technology, relying on broadband networks, remote sensing, and global positioning. System, geographic information system, engineering measurement technology, simulation-virtualization and other technologies, the multi-dimensional, multi-resource, multi-temporal content of the city is digitalized and virtualized on the network, including social resources, natural resources, infrastructure, humane economy aspects. (Development status of China's smart city in 2019 with PPT and interpretation).

Compared with the “smart city”, the “digital city” has a big difference.

1) The digital city mainly emphasizes the relationship between people and the land, forming a relatively rich geographic information database, while the smart city integrates the traditional Internet, Internet of Things, Mobile Internet, etc. to achieve more three-dimensional and extensive business collaboration.

2) The main constituent factors of digital cities are government, enterprises, residents, geographical environment, etc., and the participants are relatively single. Compared with smart cities, they lack market participation and lack of interaction.

3) Digital cities stay in a single stage of data collection, accumulation, and application, while smart cities emphasize data analysis and decision-making assistance, transform data into service design, put people first and enhance user needs.

2.1.4.1.2 Trial Stage (2010-2015)

Since 2010, with the rise of the Internet of Things and mobile internet, IBM officially put forward the concept of "smart city", which has attracted worldwide attention. After that, China also participated in the wave of smart city construction. Since 2011, China has successively communicated smart cities from top to bottom. The spirit of construction, from various central government ministries and commissions to provinces and cities, many places have successively promulgated macro-policy guidance, application industry guidelines, smart city planning, etc. In order to cooperate with the vigorous development of smart cities, relevant support funds have also emerged to create a good construction Environment. In 2012, the Ministry of Housing and Urban-Rural Development officially launched the smart city

demonstration work. In January 2013, the Ministry of Housing and Urban-Rural Development announced that the first batch of pilot cities covered 90 cities, districts, counties, and towns. The Development and Reform Commission, the Ministry of Science and Technology, the Ministry of Industry and Information Technology and other ministries and commissions have been established in China. Smart city pilots, as of 2015, there have been 686 pilot cities planned. (Research Report on smart city development in China in 2019)

The establishment of pilot cities announced that China has entered the stage of smart cities from the digital city era. At this stage, China's smart city construction has gained popularity and achieved positive progress and results. But at the same time there are some problems at this stage,

1) The overall planning height is insufficient, smart cities have regional limitations, and the development of administrative regions as sections leads to the failure of information sharing to expand the scope of sharing.

2) Overly blindly relying on technology, planning fails to integrate with people's livelihood and conditions, and implementation is difficult.

3) Local governments at all levels have a relatively shallow understanding of smart city construction, and they only rely on local enterprises at all levels to achieve it. However, the support policies provided by the government may not match the needs of enterprises, or core resources have not yet been provided to enterprises, leading to actual development the project is extremely difficult. What is more, people use the name of "building a smart city" to enclose land, buy land, and engage in real estate development.

4) The people have not really popularized and explained the true concept of smart cities, which has caused the people not to pay attention to it, and even resisted in some places.

2.1.4.1.3 Construction expansion stage (2016 to present)

In order to maximize information sharing, in January 2015, (Three stages of smart city development in China). Beijing established a national big data center, and in July, a national disaster preparedness data center was established in Guizhou; in December of the same year, the Central Internet Information Office and the National Internet Information Office proposed the "New Smart City "Concept, and pilot projects in Shenzhen, Fuzhou and Jiaxing. In March 2016, the "Outline of the 13th Five-Year Plan for National Economic and Social

Development” issued by the General Office of the Central Committee and the General Office of the State Council clearly stated that “focus on intelligent infrastructure, facilitation of public services, and refined social governance, make full use of modern information technology and big data to build a batch of new demonstrative smart cities". On April 19 of the same year, General Secretary Xi Jinping pointed out at the “Network Security and Informatization Work Symposium” that “it is necessary to use informatization to promote the modernization of the national governance system and governance capabilities, coordinate the development of e-government, build an integrated online service platform, and classify Promoting the construction of a new type of smart city. In October of the same year, in the collective study of the Politburo of China, he emphasized the need to “implement e-government, build a new type of smart city, etc., as the starting point, and use data concentration and sharing as a means to build national integration The national big data center promotes technology integration, business integration, and data integration to achieve cross-class, cross-regional, cross-system, cross-department, and cross-business system management and services." In December 2016, the State Council issued the "Thirteenth Five-Year" National Informatization Plan, which clarified the action goals for the construction of new smart cities: "By 2018, 100 new model smart cities will be constructed by classification; and by 2020, The construction of a new smart city must strive to achieve outstanding results." (Three stages of smart city development in China).

This series of political measures can be guided through and implemented in an all-round way; it is precisely because of the socialist physique of our country that, compared with developed countries such as Europe and the United States, although we "started late", we are not slow.

2.1.5 Level differentiation of smart cities

At present, while the global smart city construction is expanding on a large scale, it has gradually highlighted its own development direction and regional characteristics, such as Vienna’s smart grid, Toronto’s circular economy, Tokyo’s mobile intelligence, London and Sweden’s smart transportation, and Paris. Bicycle sharing in Germany, electric vehicles in Germany, innovative clean technology in Copenhagen, photovoltaic industry in Barcelona, etc (List of foreign smart city classic cases 2017). Since China has a large area, the basic orientation of the construction of new smart cities should also be classified and classified according to different regions, levels, and types of urban development positioning and emphasis, different

urban economic and social, geographical location, natural environment, and industrial basic conditions. They are not all the same. Therefore, the construction level and development goals of smart cities are quite different, and there is no single unified solution applicable to all cities. It is necessary to comprehensively consider the urban development positioning, economic and social development level, population size, and location characteristics, adjust measures to local conditions, find the correct positioning, and find targeted development paths for various cities. In general, super-large cities should be supported to benchmark against international advanced levels and build world-class smart city clusters; provincial-level cities should play a radiating and leading role to form regional economic and social activity centers; prefecture-level cities and county-level cities should focus on urban and rural planning, Narrow the digital divide and promote balanced development; promote the distinctive and differentiated development of new cities and new districts and small towns (Grinding and Classification Method and Architecture for new smart city, 2016).

Among all types of smart cities, the new city and new district will be the first to explore and innovate in the next stage. Xincheng New District is a new carrier of new urbanization and a test field for the development of smart cities. The construction of digital twin cities with urban information models as the key technology may become the next outlet. The digital twin city is a city information model (CIM) based on data-driven, software-defined, platform support, and virtual-real interaction. It enables digital cities and real cities to plan and construct simultaneously, realize the digitization of the whole process and all elements, and achieve the real-time state of the city. The coordination and intelligence of urban management decision-making and service.

2.1.6 The implementation of smart cities is imperative.

From a formal point of view, "Smart City" was originally a marketing tool and product promotion strategy of IBM, (5g era has come, and smart city is imperative, 2019), and a measure for its self-help in response to the financial crisis, just like the "V2 missile" invented by Nazi Germany at the end of World War II. The purpose is nothing more but being used as a weapon to avoid defeat, but the strategic forward-looking and advanced nature of it cannot be ignored. With the introduction of the "smart city" concept, China can not only take this opportunity to accelerate development, but also use brand-new wisdom to open up new industries and new markets and embark on a leap-forward development path. China’s characteristic social and political system,

Determines the superiority of development.

Policy support is of great significance to the promotion of smart city construction: the "government-led" factors of China's urbanization are greater than the "market evolution" factors, and policies play a decisive role in urban planning. Since 2010, national and local "Twelfth Five-Year" development plans have been issued one after another, and many cities have made the construction of smart cities their future development priorities.

Driven by government policy and support, after 2016, the country put forward the concept of a new smart city, emphasizing data-driven, people-oriented, overall planning, and practical results. Key technologies include Nb-IoT, 5G, big data, and labor. Intelligence, blockchain, smart city platforms and operating systems, etc., information systems are evolving in the direction of a horizontal and vertical combined system, and the way of information sharing has changed from sports to sharing based on functions. In terms of the mode of promotion, a government-guided and market-led pattern is gradually formed. The 25 national ministries and commissions are fully coordinated on the government side, and telecom operators, software vendors, integrators, and Internet companies gather in the market.

And since the first national smart city standard "GB/T 33356-2016 New Smart City Evaluation Index" was released in 2016, (China Academy of Communications) China has issued five national smart city standards in 2017. And in 2018, there were 11 smart city standards released, covering top-level design, platforms, technology applications, and data fusion. This has become a critical year for the comprehensive establishment of smart city standards and regulations. The multi-level, omni-directional, and intensively issued standard system points out the direction for the healthy and orderly development of new smart cities, and also lays the basic conditions for the collaboration and cooperation of various industry entities. This means that smart cities will move from the exploration stage to the standardized development stage, which will further bring Innovation of smart city industrial ecology.

2.2 Theoretical the Operating Concept of The Smart City Framework

In the global scope, the development of smart city rises in Europe and America. Although China started late, with the support of the government and the participation of enterprises, the construction of smart city has also made phased progress. As of March 2017, 95% of China's sub-provincial cities, 83% of prefecture-level cities, totaling more than 500 cities, have

proposed or are building smart cities. (Heavy! Summary of smart city pilot and construction in China and 31 provinces and cities in 2020). However, as time goes by, because many smart cities are still under construction and development, central policies cannot be implemented in time, people gradually lose confidence in these new technologies and new projects, resulting in a series of butterfly effects. tapping into the IoT is just one component. By achieving an accurate and reliable decision without human intervention, it is indispensable to combine IoT with Artificial Intelligence (AI) in 'Smart Machines' to simulate intelligent behavior Now combining AI and IoT information systems is the prerequisite and guarantee to ensure the success of information system. The determinant of information system success is to identify the factors that will affect it which is also the aim of this study to accomplish a combination between IoT and Artificial Intelligence in the proposed Smart Cities of China (SCC).

With the increase of product usage of utilizing IoT technology, the citizens would recognize the products' compatibility across the board by taking help of application and apply IoT technology in other products. At this point, the government would take the help of IoT. The IoT enabled devices expected more data would generate. Moreover, these data analyzed through the application of Artificial Intelligence (AI) will make used by the government to make a quick decision. Thus, the successful applicant will bring a lot of benefits to both government and citizens. Government of China has already announced its drafted policy through Ministry of Industry and Information Technology, which stated that IoT would open a new business paradigm pulling colossal revenue. The data shows that the scale of China's Internet of things market is expanding, the industrial system is improving, and government-driven projects are developing rapidly. In 2015, the size of China's Internet of things industry reached 150 billion dollars, an increase of 29.3% year on year. To make an elimination until 2020, (Development status, situation, and policy suggestions of new smart cities in China) the overall scale of China's Internet of things will exceed 300 billion US dollars. The concept of a smart city varies according to regional environmental policy. Compared with other countries such as Europe, China has different understanding meanings (2017 list of foreign smart city classic cases). To better promote smart cities, we have established several pilot model test areas throughout China, which makes our city construction more diverse and tolerant. Regularly, Users typically go through two phases when making a choice. In the initial phase of the trial period, information about the experience and benefits of use will be processed. Then, at the decision-making stage, information obtained through different channels will be processed and compared. Thus, to maximize decision quality

(Mowen, 1995; Bettman, Johnson, & Payne, 1990; Bharati & Chaudhury, 2004). There are three crucial factors, accurate information, stable system, and high-quality service that determine the user's satisfaction with usage. However, one thing to note here is that "want to use" is an intention, and "continuous use" is an Occurrence. In the emerging IoT environment, users' persistent use of IoT applications is similar to traditional repeat purchases. Similarly, when users increase their satisfaction with the Internet of Things, they will also enhance the user's behavior and increase the user's intention to use, thereby increasing the actual usage of the Internet of Things. This leads to another aspect called net profit, also known as net income or net loss (Holsapple & Lee-Post, 2006), which is not only related to personal income, but also closely related to the country. All these problems will involve the information system's analysis and confidentiality and security. Once the user accepts and uses the IoT equipment provided by the government, it will generate massive data (also called big data) and then use artificial labor. The analysis of data by smart tools will be more conducive to the government's rapid, accurate, and timely decision-making, and ultimately the decision-making beneficiaries are users who use these services. The entire process loop is shown in below.

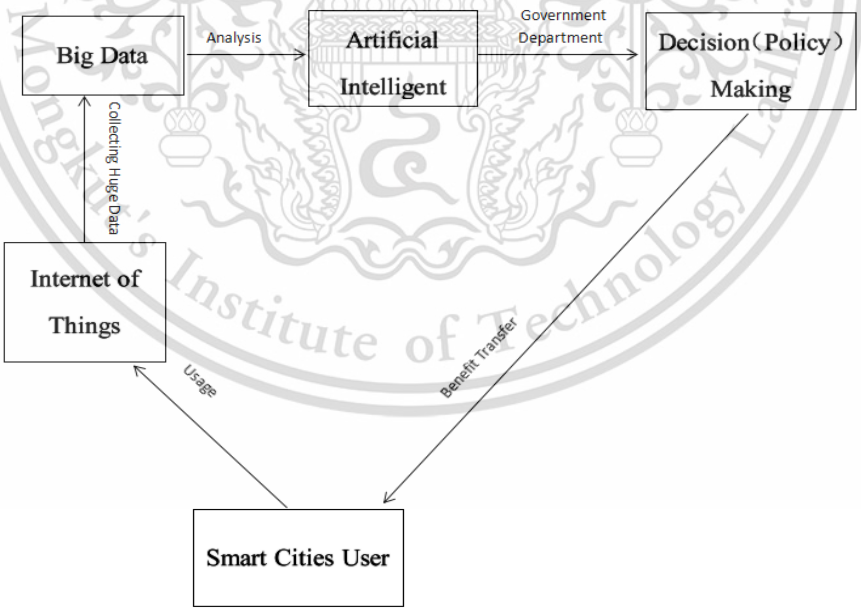

Figure 2.1. Flow Chart

2.3 Brief Introduction of City Sinyeong

It is one of the important central cities and inland megacities in central China approved by the State Council, and an important comprehensive transportation hub in the country. With the continuous development of urbanization, the permanent population of City S reached 550,246, the urbanization rate is 74.6%, and it is also one of the first pilot projects for building smart cities in 2013.

At the same time, the construction and configuration of urban infrastructure and livelihood facilities cannot be effectively improved. For example, roads are congested, parking is difficult, many road sections are flooded or damaged in large areas after rain and snow, and the underground pipe network is not well drained etc.

Although the application of the Internet of Things in various aspects such as smart transportation, smart energy, smart people's livelihood, etc has solved many problems and relatively improved the intelligence level of the city, it still faces many issues. How to improve users' satisfaction with the use of the Internet of Things, enhance users' awareness of participation, and enhance users' willingness to use the Internet of Things will be an important content for improving the construction of smart cities. Without the support of citizens, the proposals and constructions advocated by the government will ultimately make the project fail.

2.4 Previous Studied (Updated Information System Success Mode)

This theist is under the help of updated information system success model and developed. (DeLone and McLean, 2012a, 2012b; DeLone & McLean, 2013) This model explains how these aspects affect the user's willingness through the analysis of the information system quality, service quality and user satisfaction of the Internet of Things. It also shows that when the user's willingness to use will increases, the number of users will increase, then the net profit will also increase. It's another topic, not mention in this research.

To provide a general and comprehensive definition of IS success that covers different perspectives of evaluating information systems, DeLone and McLean (1992) had classified them into six major categories. Thus, they created a multidimensional measuring model with inter-dependencies between the different success categories, an updated IS success model (DeLone &

McLean, 2002; DeLone & McLean, 2003).

The updated model consists of six interrelated dimensions of IS success: information, system and service quality, (intention to) use, user satisfaction, and net benefits. The arrows demonstrate proposed associations between the success dimensions. The model can be interpreted as follows: A system can be evaluated in terms of information, system, and service quality; these characteristics affect the subsequent use or intention to use and user satisfaction. As a result of using the system, certain benefits will be achieved. The net benefits will (positively or negatively) influence user satisfaction and the further use of the information system. It's another topic, not mention in this research.

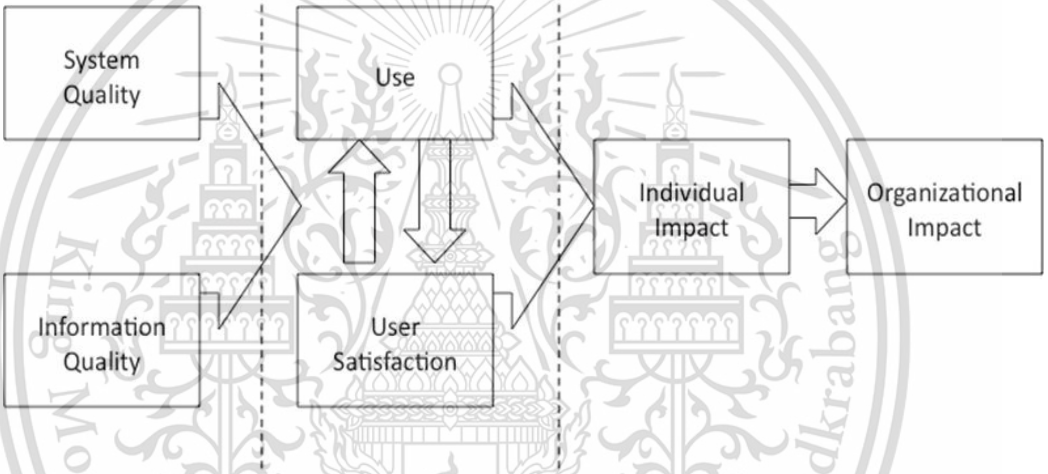

Figure 2.2. Information system success model

Source: Information system success model (DeLone & McLean, 1992)

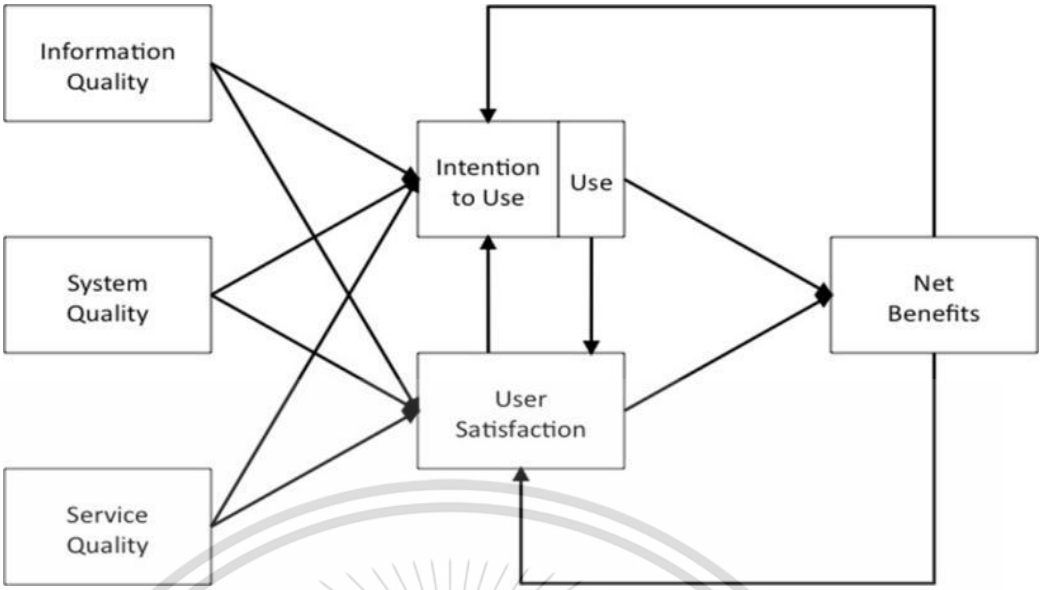

Figure 2.3. Updated Information Systems Success Model

Source: Updated Information Systems Success Model (DeLone & McLean 2002, 2003)

2.5 Information Quality (IQ)

IoT integration device is a new concept for the public. IoT technology helps citizens better improve our lives and work styles. And the quality of information is the key to the growth of the Internet of Things. Information quality refers to the accuracy (Bailey & Pearson 1983; Mahmood, 1987), completeness (Miller & Doyle, 1987) and consistency of information. Users will subjectively evaluate the information, and they own the initiative on their hand. (Petter, DeLone, & McLean, 2008). Therefore, the reliability, authenticity and effectiveness of information will directly improve users' satisfaction with information quality. In other words, it will also increase the public's trust and dependence on IoT integrated devices. (Mohammadi & Hossein, 2015).

Hypothesis 1: Information quality positively affects IOT user satisfaction**.**

2.6 System Quality (SQ)

A quality system should be stable, accessible, and compatible with De Lone&McLeon model (Holsapple & Lee-Post, 2006). User evaluation and recognition of system performance are

particularly critical. Easy to operate (Belardo, Karwan and Wallace (1982), stable compatibility (Srinivasan, 1985), easy access (Bailey & Pearson, 1983) became the standard for measuring system quality. The willingness and satisfaction of users to use the Internet of Things will depend on whether the system can provide stable services, simple operations, and accurate information feedback. If the system is of good quality, it will significantly increase the potential users' satisfaction and willingness to use the system. (Rana, Dwivedi, Williams, & Weerakkody, 2016; Sharma, Gaur, Saddikuti, & Rastogi, 2017). On the other hand, when potential users consider whether to use the system, most of them expect to maximize the benefits with minimal effort, so their satisfaction will also improve. (Bettman et al., 1990). In summary, the following assumptions can be drawn.

Hypothesis 2: System quality positively affects IOT user satisfaction**.**

2.7 Service quality (SEQ)

The idea of using IoT device is an innovation, and the technology is intended to solve problems of the citizens of SCC and to satisfy their demand. Moreover, to have a well-organized structure and transparent information are the determinants to create a good service image to the citizens of SCC (Smart city in China) (Mowen, 1995) .Thus , relative departments should concentrate on presenting cogent updated information to the user in order to increase their satisfaction level and motivate the intention of potential users (Petter, DeLone, & McLean, 2008). Furthermore, users will assess the system quality according to its accuracy (Bailey & Pearson, 1983; Mahmood, 1987), extent of completeness (Miller & Doyle, 1987), extent of relevance(King & Epstein, 1983),as well as individual's customer requirement. (Doll & Torkzadeh, 1988). It is therefore of supreme importance to back by users guarantee. Based on the discussions above, we can make the following assumptions as following.

Hypothesis 3: Service quality positively affects IOT user satisfaction**.**

2.8 Internet of Things User satisfaction (US)

Satisfaction can be explained as a difference in actual usage between user expectations and actual technology. (Grigoroudis, Litos, Moustakis, Politis & Tsironis, 2008). Also, satisfaction with user trials in the IoT phase includes evaluation of user reviews throughout the

system. If the user thinks that the system is not working properly, it means that the user is not satisfied. Users will not be willing to reuse. To master the status quo of satisfaction is important as it helps users to use IoT-'based devices and focus on the most important aspects of the users, so as to build and enhance users' loyalty and retain them. Therefore, the IQ、 SQ、 SEQ is very important for user satisfaction. The following assumptions can be drawn from the discussion in Sections 2.5 ~ 2.7.

2.9 Conceptual Framework

The above model directly and clearly expresses the relationship between information quality, system quality, service quality and user satisfaction. according to the line with the extensive review of prior research, a conceptual framework as shown

Figure 4 shows a theoretical model based on 3 hypotheses that derive from the research concepts of various available documents, as well as the concepts derived from the successful model of updating information systems.

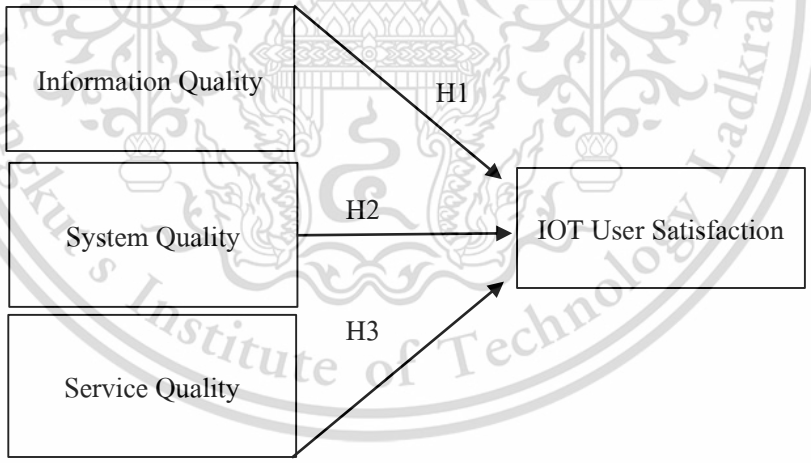

Figure 2.4 Conceptual Framework

2.10 Chapter Summary

This article mainly introduces the general information of smart cities, outlines and evolves IOT smart cities, as well as government policies related to China, urban development in recent years, and a profile of Sinyeong City. It also explains the relationship between the Internet

of Things and smart cities, through literature verification and review references, and proposes a conceptual framework and conjectures based on the Updated Information System Success Model and proves what factors will affect the user experience. In chapter three was presented the methodology and instrument that used to collect and investigate in this study.

Table 2.1 Reference

System Quality (SQ)	Sharma, S. K., Gaur, A., Saddikuti, V., & Rastogi, A. 2017	Srinivasan, A. 1985	Empirical study on Database user's satisfaction model of information resources content quality (2013)	The impact of the quality of accounting information system outputs on customers satisfaction in Jordanian Commercial Banks IBRAHIM ALH AJAJ (2016)
Information Quality (IQ)	Empirical study on Database user 's satisfaction model of information resources content quality (2013)	The impact of the quality of accounting information system outputs on customers satisfaction in Jordanian Commercial Banks IBRAHIM ALHAJA J (2016)		
Service Quality (SEQ)	The impact of service quality on user satisfaction (2019)			

User satisfaction (US)	The impact of service quality on user satisfaction (2019)	Empirical study on Database user ‘s satisfaction model of information resources content quality (2013)	The impact of the quality of accounting information system outputs on customers satisfaction in Jordanian Commercial Banks IBRAHIM ALHAJAJ (2016)	

CHAPTER 3

RESEARCH METHODOLOGY

This chapter is part of the research methodology. This quantitative study uses survey research. There is a method to collect data by used questionnaires which proceeded as follows:

3.1 Research Design

3.2 Research Instrument

3.3 Population and Sample

3.4 Data Collection

3.5 Data Analysis

3.6 Data Validity and Confidentiality Consideration

3.7 Research Presentation

3.8 Chapter Summary

3.1 Research Design

This is quantitative research, through online questionnaire surveys.

3.2 Research Instrument

The tools used in this quantitative study, the researchers used the questionnaire and studied, the methodology from related research results which are similar and then used to improve. In order to match with the desired point of the researchers that will conduct this study in order to get the query elements from data collection to be more complete the questionnaire in this quantitative study is divided into 4 parts total 31 questions as follows.

Part 1: Questionnaire Basic part related to the personal characteristics of citizens, the questionnaires were selected according to the checklist included gender, age, education level, salary level, the area, consist of 5 questions.

Part 2: The basic source of knowledge about the Internet of Things or smart cities, which project is the most concern. Etc consist of 5 questions.

Part 3: Questionnaire about the factors satisfaction survey and including IOT user satisfaction consist of 16 questions.

Part 4: Questionnaire about the factors affecting the IOT user satisfaction including short answer questions consist of 5 questions.

For the questionnaire as a measurement study the factors affecting citizen user satisfaction

By allowing respondents to use a scoring scale to assess the level of opinion on a given question Five levels (Rensis A. Likert, 1961), as follows:

Table 3.1: Rating scale

Satisfaction Level	Meaning
5	Very satisfied (strongly agree)
4	Satisfied(agree)
3	Neutral
2	Unsatisfied(disagree)
1	Strongly unsatisfied (strongly disagree)

Explain the criteria for average satisfaction. Use according to the width of the delimiter. The formula as follows:

Calculation formula

Width of the interval class = $\frac{Highest\ value - Lowest\ value}{number\ of\ class}$

Substitute $= \frac{5-1}{5}$

$=0.8$

Table 3.2. Criteria for levels of satisfaction

Rating	Level of Satisfaction
4.21 - 5.00	Very Satisfied (strongly agree)
3.41 - 4.20	Satisfied(agree)
2.61 - 3.40	Neutral
1.81 - 2.60	Unsatisfied(disagree)
1.00 - 1.80	Strongly Unsatisfied (strongly disagree)

Check the quality of the questionnaire by looking for reliability. In order to bring Questionnaire survey, by using the method to obtain the coefficients according to the following method to test the sample.

Converted to Cronbach model through statistical program (SPSS). Representative. The constant of the questionnaire, its value is between $0 \leq \alpha \leq 1$. Value very close to 1 means has a high reliability value. In this quantitative study, the researchers obtained.

Cronbach is equal to 0.936%, which is the reliability value of the questionnaire. Therefore, can be used in this quantitative study.

3.3 Population and Sample

The population in this quantitative study are citizen in the Sinyeong City, 550,246 people in 5 area. Age lower than 17, and 60 UP are not target group 20%of 500K. Due to the impact of COVID-19, the whole city cannot be surveyed, so the survey is based on one ten thousandth of the total population, so total sample is 550 people, choose Taro Yamane's formula to calculate the sample size with the confirmation that the researcher determined at the level of 95 percent, which determines the error not more than 5 percent or at the significance level 0.05 (Yamane, 1973).

Calculation formula

$$n=\frac{N}{1+N(e)^2}$$

By

n = number of sample sizes

N = number of total populations

e = sampling errors

Substitute

$$n=\frac{550}{1+550(0.05)^2}$$

=231.578947 persons

Sampling

Because the number of people is **231.578947,** The researchers finally selected 233 people by rounding, and the number of people with an error percentage is 5%, which is 11.65 equal 12 people. Therefore, in this quantitative study sample group will be 245 persons.

3.4 Data Collection

Since 2020 is the most special year in the world, many collection sites are still restricted areas due to the impact of COVID-19. The collection time is from August 2020 to April 2021. The researchers use the Stratified random sampling method to find samples at each area of the sample group obtained from the Sinyeong City.

Calculation formula

$$\text{Number of Groups in each area} = \frac{The\ population\ of\ each\ \ area\ x\ Total\ population\ of\ Sample}{Total\ population}$$

Table 3.3: Sample groups classified by District.

Unit: Person

District	Population	Sample
1. JS	212	94
2.EQ	103	46
3.HJ	91	40
4.GC	80	36
5.GX	64	29
Total	**550**	**245**

3.5 Data Analysis

In data analysis, study the factors affecting IOT user satisfaction in Sinyeong City. The researchers used the Statistical Package or SPSS program for calculation, divided into 2 parts as follows:

3.5.1 Descriptive Statistics

3.5.1.1 Analyze the data of personal characteristics factor such as gender, age, education level, salary level, and the cognition and concept of Internet of things, the part concerned about smart city, etc. By presenting in the form of the table of frequency including percentage, mean and standard deviation.

3.5.1.2 Analyze the data of factors that affect IOT user satisfaction levels. By presenting in the form of mean and standard deviation**.**

3.5.2 Inferential Statistics

In hypothesis testing, research tools are used for statistical analysis as follows:

3.5.2.1 Multiple regression is used to test the hypothesis and the relationship between the factors that affect the level of IOT user satisfaction in Sinyeong City.

3.6 Data Validity and Confidentiality Consideration

In order to ensure the accuracy and long-term timeliness of the questionnaire data, we deliberately obtained the recording consent of some very important interviewees and used a small tape recorder to record all conversations. However, due to the occupational characteristics of these important interviewees, we have hidden and deleted some conversations, including some commercially sensitive information and state secrets and security data, but the rest of the information sources are open and accessible, so as to ensure Reliability and completeness of research.

3.7 Research Presentation

Researchers will present data results through descriptive analysis and tables. Regarding the factors that respondents pay more attention to in IoT user satisfaction, the data providers are all research objects (respondents).

3.8 Chapter Summary

This chapter focuses on the methods and tools used to collect, analyze and evaluate questionnaire survey data. The researchers selected five areas of Sinyeong City through purposeful sampling. Since each region has a large population, I sampled one-tenth of the population representing each region, and then conducted a sample questionnaire survey based on the proportion. I am very grateful to these subjects for their selfless help during the outbreak. And I am very grateful to the investigator who helped me with the sampling work. The researchers analyzed and summarized the data received in the interview in the form of descriptive analysis and tables to understand which factors affect the satisfaction of Internet of Things users in City Sinyeong.

CHAPTER 4

DATA ANALYSIS AND FINDINGS

Investigating the factors affecting the IOT user satisfaction in Sinyeong City. The objectives of this quantitative research are to study the factors affecting the citizen IOT user satisfaction. In case of provide some suggestions to the local government. Result and discussion that the researchers presented the results of the data analysis divided into three parts including:

4.1 Result and discussion personal characteristic of Respondents

4.2 Result and discussion of the level of IOT user satisfaction of respondents

4.3 Result and discussion of the factor that affecting IOT user satisfaction of respondents

4.4 Chapter Summary

4.1 Result and Discussion Personal Characteristic of Respondents

Table 4.1: Frequency and percentage of personal characteristics

Personal Characteristics	Frequency	Percent
Gender		
Male	116	47.3%
Female	129	52.7%
Total	**245**	**100%**
Age		
Below 18 years old	4	1.6%
19-25 years old	71	28.9%
26-44 years old	104	42.4%
45-59 years old	61	24.8%
Over 59 years old	5	2.3%
Total	**245**	**100%**
Educational level		
High vocational certificate or equal	88	36%
Bachelor's degree	122	50%

Personal Characteristics	Frequency	Percent
Higher than bachelor's degree	35	14%
Total	**245**	**100%**
Salary		
No income	21	8.57%
Less than 2000 yuan	8	3.27%
2000-3000 Yuan	20	8.16%
3000-5000 Yuan	70	28.57%
5000-8000 Yuan	69	28.16%
Over 8000 Yuan	57	23.27%
Total	**245**	**100%**
Each District		
JS	94	38%
EQ	46	19%
HJ	40	16%
GC	36	15%
GX	29	12%
Total	**245**	**100%**

The total number of respondents was 245, of which 129 were female, accounting for 52.7%. 116 were males, accounting for 47.3%

According to age, most of the interviewee are 26-44 years old 104 people equal to 42.4 percent. Next, 19-25 years old 71 people equal to 28.9 percent. Next, 45-59 years old 61 people equal to 24.8 percent. And over 50 years old 5 people equal to 2.3 percent, blow 18 years old 4 people equal to 1.6 percent, respectively.

According to the education level, most of the respondents are bachelor's degrees122 people equal to 50 percent. Next, a high vocational certificate or equal 88 people equal to 36 percent. And higher than bachelor's degree 35 people equal to 14 percent, respectively.

According to salary, most of the interviewee receive a salary of 3000-5000 Yuan 70 people equal to 28.57 percent. Receive salary 5000–8000 Yuan, 69 people equal to 28.16 percent. Receive salary over 8000 Yuan 57 people equal to 23.27 percent. Receive salary no income 21

people equal to 8.57 percent receive salary 2000-3000 Yuan people equal to 8.16 percent and receive salary less than 2000 Yuan 3.27 percent.

From each district, most interviewee from JS 94 people equal to 38 percent. EQ interviewee 46 people equal to 19 percent. HJ 40 people equal to 16 percent. GC interviewee 36 equal to 15 percent GX interviewee 29 equals to 12%.

All respondents were randomly selected from each district and included most occupations in the society, such as: student, teacher, worker, policemen, doctor, and nurse etc.

4.2 Result and discussion of the level of IOT user satisfaction of respondents

According to the data analysis from questionnaires 245 sets the level of IOT user satisfaction of respondents from Sinyeong City. The results can be summarized as

Table 4.2 Mean, Standard deviation, and the satisfaction level of affecting factors

Factors	**Mean**	**Std. Deviation**	**The Level of Satisfaction**	**Frequency**
Information Quality	4.359	0.515	Strongly Agree	1
Service Quality	4.199	0.446	Agree	2
System Quality	4.140	0.489	Agree	3
Total	**4.233**	**0.483**	Strongly Agree	

The researcher found that the factors affected the user's satisfaction of IOT in each district the over were at Strongly agree level equal to 4.233. When considered in each aspect, it was found that all aspects were satisfied at an agree level. The aspect that has the highest mean is the information quality among to 4.359. Next, the service quality equal to 4.199 and the system quality equal to 4.140 respectively.

Table 4.3 Mean, Standard deviation, and the level of satisfaction of citizen from Sinyeong City in information quality factor

Question	Mean	Std.Deviation	The level of satisfaction
Information quality			
1. Information available through the system will be relevant	4.281	0.556	Strongly Agree
2. Information processed by the system will be secured	3.934	0.569	Agree
3. Data generated by IoT will be accurate.	4.351	0.599	Strongly Agree
4. Accurate IoT information sources will increase trust and satisfaction	4.869	0.337	Strongly Agree
Total	4.359	0.515	Strongly Agree

From table 4.3 The researcher found that the factors affected the users satisfaction of IOT in terms of information quality were at strongly agree level equal to 4.359.When considered in each aspect, it was found that most of aspects were satisfied at the strongly agree level .The aspect that has the highest mean is gain trust from user because of more accurate information among to 4.869.Next, the data accuracy equal to 4.351 ,the information available through the system will be relevant equal to 4.281 and the security of information equal to 3.934, respectively.

Table 4.4 Mean, Standard deviation, and the level of satisfaction of citizen from Sinyeong City in system quality factor

Question	Mean	Std. Deviation	The level of satisfaction
System quality			
1. IoT enabled devices are easy to use	4.097	0.619	Agree
2. Using IoT enabled devices truly enjoy	3.314	0.630	Neutral
3. Sinyeong City hall will use system which data generated by IoT-enabled devices for quick and accurate decision making	4.914	0.280	Strongly Agree
4. The system connected by IoT-enabled devices is a lifestyle changing system that is conducive people's livelihood	4.236	0.425	Strongly Agree
Total	4.140	0.489	Agree

From table 4.4 The researcher found that the factors affected the users satisfaction of IOT in terms of system quality were at agree level equal to 4.14. When considered in each aspect, it was found that most of aspects were satisfied at an agreed level. The IOT enabled devices for quick and accurate decision making ,it would help citizens living that has the highest mean among to 4.914.Next, more conducive to the people's livelihood and also changed my lifestyle equal to 4.236 ,IOT enable devices convenient to use equal to 4.097 and prefer using IOT devices equal to 3.314, respectively.

Table 4.5 Mean, Standard deviation, and the level of satisfaction of citizen from Sinyeong City in service quality factor

Question	Mean	Std. Deviation	The level of satisfaction
Service Quality			
1. Service quality of IoT-enabled system is reliable	4.123	0.463	Agree
2. A good service quality increases number of users using IoT	4.240	0.490	Strongly Agree
3. Perfect service quality increases satisfaction and spending budget on IoT.	4.257	0.437	Strongly Agree
4. Service quality improvement helps government promote IoT's construction and application that support citizens	4.179	0.395	Agree
Total	4.199	0.446	Agree

From table 4.5 The researcher found that the factors affected the users satisfaction of IOT in terms of service quality were at agree level equal as 4.199(actually, we can treated this as 4.200. But in case of to ensure the data accurate, it still marked 4.199).When considered in each aspect, it was found that all aspects were satisfied at an agreed level. The aspect that has the highest mean is users would like to invest money on service quality among to 4.257. Next, good service quality increase participation equal to 4.240, the improvement of service quality will benefit the government promotion of the construction and application of the IOT and the support of citizens equal to 4.179 and the service quality will be reliable on IOT enable devices equal to 4.123 respectively

Table 4.6 Mean, Standard deviation, and the level of satisfaction of citizen from Sinyeong City in IOT user satisfaction

Question	Mean	Std. Deviation	The level of satisfaction
User satisfaction			
1. IoT applications do me a great help	3.428	0.779	Neutral
2.Accurate sources of information, easy-to-operate system, and good service enhance satisfaction with IoT	4.587	0.493	Strongly Agree
3. IoT application is a must-have application in today digital world	4.534	0.547	Strongly Agree
4. Information quality, system quality, service quality are must-consider aspects of IoT application development to increase user participation, user satisfaction, and support from government.	4.722	0.475	Strongly Agree
Total	4.318	0.574	Strongly Agree

From table 4.6, the researcher found that the factors affected the user's satisfaction of IOT in terms of user satisfaction were at strongly agree level equal to 4.318. When considered in each aspect, it was found that most of aspects were satisfied at an agreed level. The aspect that has the highest mean is the development of the Internet of Things can improve user experience satisfaction, participate in and obtain more support from government policies among to 4.772.Next,Accurate sources of information quality, easy-to-operate system quality, and good service quality will enhance your satisfaction with the use of the Internet of Things equal to 4.587,the IOT application quickly build in hometown equal to 4.534 and the satisfaction of current IOT application in the city equal to 3.428 respectively.

4.3 Result and discussion of the factor that affecting IOT user satisfaction of respondents

According to the data analysis, the researchers used multiple regression to study the relationship between factor that affecting the level of IOT user satisfaction of respondents from Sinyeong City. The data of the sample from the questionnaire consisting of 245 sets and set the significance level at 0.05. The analysis results are as follows:

Table 4.7 The efficiency of the multiple regression analysis

Model	R	R square	Adjusted square	Std.error of the estimate
1	0.937	0.878	0.877	0.345

From table 4.7 the researchers found that the R square value equal to 0.878 means that all 3 factors can be used to describe affecting IOT user satisfaction of respondents from Sinyeong City which can be explained by 88%. Then, the remaining 12% is caused by the influence of other variables.

Table 4.8 The results of multiple regression analysis of the model ANOVA

Model	Sum of squares	Df	Mean square	F	Sig.
Regression	206.965	3	68.988	579.633	0.00
Residual	28.684	241	0.119		
Total	235.649	244			

From table 4.8, there are hypotheses as follows:

Hypothesis 0: Independent variables cannot affect IOT user satisfaction from Sinyeong City.

Hypothesis 1: At least 1 independent variable can affect the IOT user satisfaction from Sinyeong City.

According to the data analysis, the researchers found that the sig. value equals to 0.000 which is less than the predefined significance level (α) equal to 0. 05.Therefore, at least 1 independent variable can explain the users' satisfaction of IOT in each district from Sinyeong City.

Hypothesis 0 was rejected.

Table 4.9 The results of multiple regression analysis of the factors affecting IOT user satisfaction

Model	Under standardized coefficient		Standardized coefficient	T	Sig.
	B	Std.Error	Beta		
(Constant)	0.742	0.123		6.023	0.011
System Quality	0.722	0.054	0.690	13.343	0.010
Service Quality	0.480	0.055	0.519	8.648	0.013
Information Quality	-0.303	0.065	-0.266	-4.665	0.001

According to the table 4.9 when considering the sig. value can be summarized that the factors affecting the users' satisfaction of IOT in each district with a statistical significance of 0.05, which are all factors. As for the information quality has the negative number, cause has one reason that people worry about the information source could be data-leak. The results from the multiple regression analysis can summarize the research hypothesis as follows:

H1: Information quality positively affects IOT user satisfaction in Sinyeong City from China.

According to the results of this quantitative study, it is found that the sig value of the T test is equal to 0.00 is less than the determined significance level (α) equal to 0.05. Therefore, it supports Hypothesis 1, and it can be concluded that Information quality is positively affects IOT user satisfaction in Sinyeong City.

The data generated through the Internet of Things is accurate, and most of it relates to the personal use of citizens. After processing by the system, the information can be quickly fed back to the user or the back-end system. The whole process is fair and traceable. Accurate data will

also enhance the government's credibility and increase users' support for new projects implemented by the government.

This result of this quantitative study consistent with the research Empirical study on Database user's satisfaction model of information resources content quality (2013) However, it has also been suggested that over-reliance on accurate data and artificial intelligence will cause one day if we are exposed to external influences such as hacker attacks, wars, and natural disasters that destroy data centers, which will cause urban paralysis or more crises. Researchers will summarize in Chapter 5.

H2: System quality positively affects IOT user satisfaction.

According to the results of this quantitative study, it is found that the sig value of the T test is equal to 0.00 is less than the determined significance level (α) equal to 0.05. Therefore, it supports Hypothesis 2 and it can be concluded that system quality is positively affects IOT user satisfaction in Sinyeong City.

A safe, stable, easy-to-operate and easy-to-compatible system is very capable of obtaining the support of citizens, regardless of their age, gender, income or education level, not only the government, various institutions, hospitals, universities, enterprises and other departments. Such a system has a high utilization rate, so the quality of the system directly affects the satisfaction of IoT users.

This result of this quantitative study consistent with the research The impact of the quality of accounting information system outputs on customers satisfaction in Jordanian Commercial Banks IBRAHIM ALHAJAJ (2016).

In addition, other corresponding problems have also been found in the research, such as how to improve the system speed and reduce the crash after the update. The pros and cons will be summarized in the next chapter.

H3: Service quality positively affects IOT user satisfaction.

According to the results of this quantitative study, it is found that the sig value of the T test is equal to 0.00 is less than the determined significance level (α) equal to 0.05. Therefore, it supports Hypothesis 3 and it can be concluded that service quality is positively affects IOT user satisfaction in Sinyeong City.

A perfect service quality can directly affect user satisfaction. This is like the three stages of marketing, opening the market, tapping the market, and maintaining the market which mean each stage is inseparable. Service quality means maintaining the user. When users have problems

or questions, it should have a quick responding, solve problems in time or discover problems in advance, meanwhile improving user demands, not only increase their satisfaction level but also motivate the using intention of potential users.

This result of this quantitative study consistent with the research. The impact of service quality on user satisfaction (2019).

But in this process, there is another very important factor that is cost. During the survey process, it was found that most people still hope to use the least cost in exchange for the greatest benefit. The conclusion will be presented in the next chapter.

4.4 Chapter Summary

This chapter mainly focuses on the survey data and the proof of the validity of each conjecture. Corresponding problems were also discovered during the investigation.

After the multiple regression analysis, the R square value equal to 0.878 which means that all 3 factors can be used to describe affecting IOT user satisfaction of respondents from Sinyeong City which can be explained by 88%.

CHAPTER 5

CONCLUSION AND DISCUSSION

A quantitative study of the factors affects the IOT user satisfaction in Sinyeong City. The objective is to study the satisfaction level of affecting factors and the factors that affecting the IOT user satisfaction of citizen in the Sinyeong City from China. In order to use the research results to be used to provide some suggestions to the local city hall to improve the smart city construction in City S. After the literature review and collect data from the sample by surveying through paper questionnaires. Received a complete questionnaire data total of 245 sets. Therefore, the data has been used to analyze the statistical results according to the research objectives and research hypothesis, which can be summarized as follows:

5.1 Conclusion

5.1.1 Personal characteristic information of the sample

The total number of respondents was 245, of which 129 were female, accounting for 52.7%. 116 were males, accounting for 47.3%. Most of them are below 45 years old, 179 people equal to 72.9%. Most of the respondents are bachelor's degrees 122 people equal to 50%. Most of them receive salary between 3000~8000Yuan 139 people equal to 56.73%.

5.1.2 Satisfaction level of affecting factors

According to the results of this quantitative study, concluded satisfaction level of affecting factors in each district was at strongly agree level and with an average equal to 4.233. The citizens are most satisfied with information quality at the strongly agree level and with an average equal to 4.395. It was found that people are mostly satisfied with the information source to be accurate in terms of gain more trust and satisfaction to the citizens. Next, they are satisfied with system quality agree level and with an average equal to 4.140. It was found that the citizen satisfied with quick and accurate which generated by IOT enable devices. Next, they are satisfied with service quality at the agreed level and with an average equal to 4.199. It was found that they are satisfied with high quality of service, which make them willing to spend money on it.

5.1.3 The level of IOT user satisfaction

From the results of this quantitative study, found that the user satisfaction of IOT in each district was at strongly agree and with an average equal to 4.318. It was found that all factors were mostly satisfied at the strongly agree level. By the first factor that has the highest value is the importance of information quality, system quality and service quality to user satisfaction for the citizens equal to 4.722. Then the Accurate sources of information quality, easy-to-operate system quality, and good service quality will enhance your satisfaction with the use of the Internet of Things equal to 4.587. Next, they are satisfied will accelerate IOT development equal to 4.534. And they are satisfied with current IOT application in the city equal to only 3.428, respectively.

5.1.4 The factor that affecting to IOT user satisfaction in Sinyeong City from China

From the results of multiple regression analysis, the researcher found that the sig. value equals to 0.000 which is less than the predefined significance level (α) equal to0.05. Therefore, reject H0, which means that at least 1 independent variable can explain the users' satisfaction of IOT in each district from Sinyeong City. There are 3 factors that affecting users' satisfaction of IOT in each

5.1.4.1 Information quality

According to hypothesis 1, information quality affects user satisfaction of IOT in each district from Sinyeong City. The result of this quantitative study found that the has a sig. value equals to 0.000, which less than the significance level (α) that determined equal to 0.05and Beta Coefficient value equal to -0.266. Therefore, it can accept hypothesis 1 and can be concluded that the information quality affect the user' satisfaction of IOT in each district from Sinyeong City. The accuracy of information is the most important part in information quality, high quality of information makes people to make clear and accurate decision in daily life. On the other hand, information must be secure enough to protect the IOT system and also people personal information not lost or get compromised.

5.1.4.2 System quality

According to hypothesis 2, system quality affects user satisfaction of IOT in each district from Sinyeong City. The result of this quantitative study found that the has a sig.

value equals to 0.000, which less than the significance level (α) that determined equal to 0.05and Beta Coefficient value equal to 0.690. Therefore, it can accept hypothesis 2 and can be concluded that the system quality factor is the most affect the user' satisfaction of IOT in each district from Sinyeong City. In terms of system quality, most people think that data generated by IOT enable devices will help the government to have more accurate and quick decision for development, it helps the citizen too. In deep, people also think that the system connect with IOT enable devices are more conductive to people's livelihood and bring a lot of advantages to people live. On the other hand, IOT enable devices is easy to use, and most people are enjoying using these devices and enjoying the system which connected with IOT.

5.1.4.3 Service Quality

According to hypothesis 3, service quality affects user satisfaction of IOT in each district from Sinyeong City. The result of this quantitative study found that the has a sig. value equals to 0.000, which less than the significance level (α) that determined equal to 0.05and Beta Coefficient value equal to 0.519. Therefore, it can accept hypothesis 3 and can be concluded that the service quality affects the user' satisfaction of IOT in each district from Sinyeong City. In terms of service quality, high quality of service makes people feel satisfied with IOT, and people are willing to spend money on it, in order to enjoy more high-quality service. Moreover, good service quality makes people feel more participation to use IOT. On the other hand, the improvement of service quality will benefit the government promotion of the construction and application of the IOT and the support of citizens, in addition, high service quality will make people feel reliable to use IOT enable devices.

5.2 Recommendations for Sinyeong City Hall

Suggestions to Sinyeong City Hall, the survey of citizens' satisfaction with the Internet of Things is an important force in promoting the development of smart cities, and the Internet of Things is an inseparable part of the stage of smart city construction. The results of this quantitative study show

Factors Affecting Internet of Things User Satisfaction in China Sinyeong City can be beneficial to the scientific level of governance decision-making, enhance the government's ability to efficiently govern, promote the ability of government resources to integrate, and improve the

quality of public services; optimize the organizational structure of the public sector, and enhance the ability of innovative governance. Avoid the waste of resources and gain public support.

5.2.1 Information quality factors

Big data governance thinking should be established, and a data sharing mechanism should be established. Promote the optimization of organizational structure and promote cross-departmental collaboration. Because the city hall lacks big data awareness, has not yet formed various data integration and sharing analysis mechanisms, lacks communication and exchange with other information sources, lacks an information exchange platform, and there is a serious competition for interests among various local government administrative departments. In order to protect their rights, they will not share data with other departments. This inefficient communication and data blockade. This will lead to a waste of manpower, which is not conducive to the subsequent analysis and processing of the artificial intelligence system.

After the data collection is completed, it is necessary to ensure its security, privacy, and no leakage. This is a concern of many citizens.

5.2.2 System quality factors

Relevant departments should pay more attention to the system speed, stability, compatibility, and ease of operation of the system. Some citizens reported that the system could easily crash after the update was completed and data could not be read. Some elderly people also responded that it should be easy to operate, easy to understand and teach.

5.2.3 Service quality factors

Relevant departments should reduce user usage costs, broaden the participation channels of the public and other enterprises, promote diversified and coordinated governance services, deal with problems in a timely manner, improve service quality, and enhance service awareness. Due to the single theme of participation and the concentration of power, many departments have no sense of service and cannot implement preferential policies in a timely manner, resulting in low public participation. They do not believe in the benefits of new projects and are unwilling to spend money or support the government.

5.3 Limitation of the study

1) Because of the large population base of Sinyeong City, this research can only take quantitative method of each region for research, and there are still limitations to a certain extent. Due to the epidemic situation, the scope of sampling survey is still small, Some older people and teenagers under 17 can't be counted, and many areas cannot go deep. In addition, in the survey, it is found that some elderly people have cognitive impairment and practical difficulties in accepting new things. In the process of sending the questionnaire, people over 45 years old also belong to specific groups. But there is not much difference in the final survey result of what factors affect the IOT user satisfaction.

2) Because of Covid19, have to do online questionnaire / cannot face to face interview

5.4 Suggestions for further research

After the investigation, we should not only use the scope of the investigation to Sinyeong City, but also expand to other cities and even the province (if conditions permit) after the conclusion is improved.

Making full use of this framework that complete the construction of smart cities on this basis in case to get more public support. On the other hand, link big data as a guide to help whom in power formulate better policies.

On the Internet of Things questionnaire, the opinions of more people should be collected first to develop a more targeted questionnaire and improve the overall survey.

The Internet of Things is the foundation and core of building a smart city. For the Internet of Things, we need to further study its available areas. Internet of Things research is not only used for urban construction, but whether it can be used for national military defense.

5.5 Potential implications

This study has potential implications for both government and practitioners

If the relevant bureau can achieve the goal of accurate information, stable system and improved service quality, it will inevitably increase the willingness of users to use new innovative technologies such as IoT and the usage rate of IoT equipment, just as Alipay and WeChat

payment are popular throughout China. This can be achieved if appropriate training is provided to the relevant authorities. Potential users should be made aware of the advantages of using products related to IoT technology. They should be made aware that using this technology will help generate large amounts of data. From these massive data, the government will be able to use AI to analyze it and make perfect decisions. This will ultimately benefit SCC citizens. Hence it is very important to generate data using devices that support the Internet of Things.At the same time, increasing R&D investment funds in related industries will stimulate the enthusiasm of IoT R&D personnel. Secondly, the research results will be confirmed. Thirdly, through the IoT equipment, the financial status of SCC will continue to grow, thus forming a virtuous circle (its an another topic, not mention in this paper). Therefore, if China can fully combine the successful IoT cases, mature technologies of other countries, formulate relatively comprehensive policies, adapt to local conditions, differentiate the regions, and integrate the policies of smart cities into the Internet of Things to ensure the IoT technology in SCC. Supposing the application of new technology is successful, then this will become another standard model similar to “China invention” (note that: China’s new four major inventions are high-speed rail, mobile payment, shared bicycle, online shopping).

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APPENDIX

APPENDIX A

QUESTIONNAIRES SURVEY

Part 1: Personal Characteristics

Directions: Please check ✓ in the box ( ) next to the answer of your choice based on what you actually given the statement.

1.Gender

( ) Male ( ) Female

2.Age

( ) Below 18 years old ( ) 19-25years old

( ) 26-44 years old ( ) 45-59 years old

( ) Over 59 years old

3. Education Level

( ) High Vocational Certificate or equal

( ) Bachelor Degree

( ) Higher than bachelor degree

4.Salary

( ) No Income ( ) less than 2000 yuan

( ) 2000-3000 yuan ( ) 3000-5000 yuan

( ) 5000-8000 yuan ( ) Over 8000 yuan

5.District

( ) JS ( ) EQ

( ) HJ ( ) GC

( ) GX

Part 2 Questionnaire survey

Please check ✓ in the box ( ) next to the answer of your choice based on what you actually given the statement(some questions answer can be more than one).:

1. Do you know the Internet of Things?

( ) Yes, knew it well ( ) Yes, knew it

( ) Neutral ( ) No, not that much

( ) totally not

2. How much do you know about the concept of "smart city"?

( ) Yes, knew it well ( ) Yes, knew it

( ) Neutral ( ) No, not that much

( ) totally not

3. Which of the following smart city construction projects are you most interested in? (more than one answer is acceptable)

( ) Smart Energy ( ) Smart Transportation

( ) Smart Environment ( ) Smart Security

( ) Smart Travel ( ) Smart Medical

( ) Smart Home

4. In which areas do you hope that the future application of smart cities will further help

improve? (more than one answer is acceptable)

( ) Transportation ( ) Working efficiency of government

( ) Tele-medicine ( ) Tele-work

( ) Tele-education ( ) Smart Medical

( ) Smart livelihood

5. How did you learn about the Internet of Things in smart cities? (more than one answer is acceptable)

( ) From TV ( ) From family members or friends

( ) From newspaper or magazine ( ) From internet

Part 3 Questionnaire survey

Direction: Please check ✓ in the table and rate yourself honestly based on what you actually given statement by using the following the scale:

5 = Strongly Agree

4 = Agree

3 = Neutral

2 = Disagree

1 = Strongly Disagree

Question	Level of satisfaction				
	5	4	3	2	1
Information quality					
1. Information available through the system will be relevant.					
2. Information processed by the system will be secured.					
3. Data generated by IoT will be accurate.					
4. Accurate IoT information sources will increase trust and satisfaction.					
System quality					
1. IoT-enabled devices are easy to use.					
2. Using IoT enabled devices truly enjoy.					
3. Sinyeong City hall will use system which data generated by IoT-enabled devices for quick and accurate decision making					
4. The system connected by IoT-enabled devices is a lifestyle changing system that is conducive people's livelihood					
Service quality					
1. Service quality of IoT-enabled system is reliable					
2. A good service quality increases number of users using IoT					
3. Perfect service quality increases satisfaction and spending budget on IoT.					
4. Service quality improvement helps government promote IoT's construction and application that support citizens					

Users' Satisfaction					
1. IoT applications do me a great help					
2.Accurate sources of information, easy-to-operate system, and good service enhance satisfaction with IoT					
3. IoT application is a must-have application in today digital world					
4. Information quality, system quality, service quality are must-consider aspects of IoT application development to increase user participation, user satisfaction, and support from government.					

Part 4 Questionnaire survey

Direction: Please check ✓ in the table and rate yourself honestly based on what you actually given statement by using the following the scale:

5 = Strongly Agree

4 = Agree

3 = Neutral

2 = Disagree

1 =Strongly Disagree

Question	**Level of satisfaction**				
	5	**4**	**3**	**2**	**1**
1. Information quality positively affect the IOT user satisfaction					

2. System quality positively affect the IOT user satisfaction					
3. Service quality positively affect the IOT user satisfaction					
4. IoT user satisfaction level is affected by all information quality, system quality, service quality factors.					

5. Comments / Suggestions (If any)

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Thank you.

APPENDIX B

CASE PROCESSING SUMMARY

	N	%
Cases Valid	245	100
Exclude	0	0
Total	245	100

a. Listwise deletion based on all variables in the procedure.

Cronbach's Alpha	N of Items
0.936	20

Frequency and percentage of personal characteristics

Personal Characteristics	Frequency	Percent
Gender		
Male	116	47.3%
Female	129	52.7%
Total	**245**	**100%**

Age		
Below 18 years old	4	1.6%
19-25 years old	71	28.9%
26-44 years old	104	42.4%
45-59 years old	61	24.8%
Over 59 years old	5	2.3%
Total	**245**	**100%**
Educational level		
High vocational certificate or equal	88	36%
Bachelor's degree	122	50%
Higher than bachelor's degree	35	14%
Total	**245**	**100%**
Salary		
No income	21	8.57%
Less than 2000 yuan	8	3.27%
2000-3000 Yuan	20	8.16%
3000-5000 Yuan	70	28.57%
5000-8000 Yuan	69	28.16%
Over 8000 Yuan	57	23.27%
Total	**245**	**100%**
Each District		

JS	94	38%
EQ	46	19%
HJ	40	16%
GC	36	15%
GX	29	12%
Total	**245**	**100%**

Mean, Standard deviation, and the satisfaction level of affecting factors

Factors	**Mean**	**Std. Deviation**	**The Level of Satisfaction**	**Frequency**
Information Quality	4.359	0.515	Strongly Agree	1
System Quality	4.140	0.489	Agree	3
Service Quality	4.199	0.446	Agree	2
Total	**4.233**	**0.483**	Strongly Agree	

Mean, Standard deviation, and the level of satisfaction of citizen from Sinyeong City in information quality factor

Question	Mean	Std.Deviation	The level of satisfaction
Information quality			
1. Information available through the system will be relevant	4.281	0.556	Strongly Agree
2. Information processed by the system will be secured	3.934	0.569	Agree
3. Data generated by IoT will be accurate.	4.351	0.599	Strongly Agree
4. Accurate IoT information sources will increase trust and satisfaction	4.869	0.337	Strongly Agree
Total	4.359	0.515	Strongly Agree

Mean, Standard deviation, and the level of satisfaction of citizen from Sinyeong City in system quality factor

Question	Mean	Std. Deviation	The level of satisfaction
System quality			
1. IoT enabled devices are easy to use	4.097	0.619	Agree
2. Using IoT enabled devices truly enjoy	3.314	0.630	Neutral
3. Sinyeong City hall will use system which data generated by IoT-enabled devices for quick and accurate decision making	4.914	0.280	Strongly Agree
4. The system connected by IoT-enabled devices is a lifestyle changing system that is conducive people's livelihood	4.236	0.425	Strongly Agree
Total	4.140	0.489	Agree

Mean, Standard deviation, and the level of satisfaction of citizen from Sinyeong City in service quality factor

Question	Mean	Std. Deviation	The level of satisfaction
Service Quality			
1. Service quality of IoT-enabled system is reliable	4.123	0.463	Agree
2. A good service quality increases number of users using IoT	4.240	0.490	Strongly Agree
3. Perfect service quality increases satisfaction and spending budget on IoT.	4.257	0.437	Strongly Agree
4. Service quality improvement helps government promote IoT's construction and application that support citizens	4.179	0.395	Agree
Total	4.199	0.446	Agree

Mean, Standard deviation, and the level of satisfaction of citizen from Sinyeong City in IOT user satisfaction

Question	Mean	Std. Deviation	The level of satisfaction
User satisfaction			
1. IoT applications do me a great help	3.428	0.779	Neutral
2.Accurate sources of information, easy-to-operate system, and good service enhance satisfaction with IoT	4.587	0.493	Strongly Agree
3. IoT application is a must-have application in today digital world	4.534	0.547	Strongly Agree
4. Information quality, system quality, service quality are must-consider aspects of IoT application development to increase user participation, user satisfaction, and support from government.	4.722	0.475	Strongly Agree
Total	4.318	0.574	Strongly Agree

The efficiency of the multiple regression analysis

Model	R	R square	Adjusted square	Std.error of the estimate
1	0.937	0.878	0.877	0.345

The results of multiple regression analysis of the model ANOVA

Model	Sum of squares	Df	Mean square	F	Sig.
Regression	206.965	3	68.988	579.633	0.00
Residual	28.684	241	0.119		
Total	235.649	244			

The results of multiple regression analysis of the factors that affecting IOT user satisfaction from Sinyeong City

Model	Under standardized coefficient		Standardized coefficient	T	Sig.
	B	Std.Error	Beta		
(Constant)	0.742	0.123		6.023	0
System Quality	0.722	0.054	0.690	13.343	0

Service Quality	0.480	0.055	0.519	8.648	0
Information Quality	-0.303	0.065	-0.266	-4.665	0

APPENDIX C

GOVERNMENT DATA

4-1-1 2019年按行业分全国城市市政公用设施建设固定资产投资（按省分列）

计量单位：万元 Measurement Unit:10,000RMB

地区名称	本年完成投资	供水	燃气	集中供热	轨道交通	道路桥梁	地下综合管廊	排水	污水处理	污泥处置	再生水利用
Name of Regions	Completed Investment of This Year	Water Supply	Gas Supply	Central Heating	Urban Rail Trainsit System	Road and Bridge	Utility Tunnel	Sewerage	Wastewater Treatment	Sludge Disposal	Wastewater Recycled and Reused
全国	**201263041**	**5600744**	**2426995**	**3329712**	**58556287**	**76553456**	**5581094**	**15623608**	**7556335**	**581239**	**480574**
北京	12451203	229793	154399	274904	3464541	2408804	564183	1163097	604318	12111	141509
天津	3716352	27242	4704	47709	2176268	550976	103223	297405	126843	1318	3149
河北	4336395	109567	148871	326922	719488	1324243	138453	424824	116473	7850	22128
山西	3090314	148332	39887	395194	0	1363278	1200	136675	99065	13387	12370
内蒙古	3432269	104274	17868	277118	606600	1823086	102968	178518	56253	8561	30251
辽宁	1863930	171978	94741	235919	771341	375102	280	75762	40737	0	0
吉林	1869898	68605	39334	95429	440709	704086	165135	218050	115088	0	1833
黑龙江	1755839	117253	57662	208359	526860	554148		117516	49647		1460
上海	4937185	75428	257383		2067600	1075072		989428	644428	345000	
江苏	19684223	464541	263614	600	7186516	7910407	458101	1198960	477448	43350	600
浙江	17170521	613809	166616	0	8596321	5049728	181029	465509	285289	282	7716
安徽	7407386	297619	141155	32698	1405751	2966890	94987	731867	285503	11980	11700
福建	8965227	414529	80148	0	3195314	3232222	213700	578316	277329	0	24786
江西	6986550	191982	50666	0	838984	2766892	349824	914137	424794	6713	11690
山东	12890364	399971	240432	626262	3251101	4833690	721608	980179	416260	29027	10414
河南	8989313	160816	87222	380555	1238691	3994769	180757	533103	194112	1270	12706
湖北	14047981	171721	32467	0	0	8941351	180285	1685443	434206	1132	0
湖南	4763631	366044	39441	0	0	2927824	144693	294524	161989	5177	0
广东	18131893	356480	131052	0	7390493	4295874	855964	1942458	1510359	22453	133212
广西	4929528	143674	56656	0	989090	2279923	193588	308811	45198	2141	0
海南	1131119	33196	0	0	45900	784863	14836	149777	136538	12203	0
重庆	8033701	185509	48602	0	3099960	3183058	76224	478709	145808	11000	0
四川	15105502	314321	66327	0	6232592	5740528	151072	893907	570570	20155	0
贵州	3644873	100918	3361	3300	340877	2673169	50923	77324	27354	0	0
云南	4204933	72797	37829	0	1640821	1398861	228850	199834	85713	102	7355
西藏	21599					12099		200			
陕西	4015803	97759	76292	141180	1650710	906593	85161	257425	121917	3085	3540
甘肃	1666686	38781	20518	121877	278271	528921	45123	102339	58783	42	8302
青海	1153508	34181	5049	0	95000	778296	167143	22021	3034	1900	0
宁夏	368348	3296	4086	20315	74	136932	90716	54979	5421		2000
新疆	2219385	67977	58320	133722	306416	942165	171067	149728	54475	21000	33853
新疆兵团	257581	18355	2296	7650		87607	50000	2785	1400		

5 全国历年城市供水情况(1978-2019)
5 National Urban Water Supply in Past Years (1978-2019)

年份 Year	综合生产能力（万立方米/日） Integrated Production Capacity (10,000 m^3/day)	供水管道长度（公里） Length of Water Supply Pipelines (km)	供水总量（万立方米） Total Quantity of Water Supply (10,000 m^3)	生活用量 Residential Use	用水人口（万人） Population with Access to Water Supply (10,000 persons)	人均日生活用水量（升） Daily Water Consumption Per Capita (liter)	供水普及率（%） Water Coverage Rate (%)
2001	22900.0	289338	4661194	2036492	25832.8	216.0	72.26
2002	23546.0	312605	4664574	2131919	27419.9	213.0	77.85
2003	23967.1	333289	4752548	2246665	29124.5	210.9	86.15
2004	24753.0	358410	4902755	2334625	30339.7	210.8	88.85
2005	24719.8	379332	5020601	2437374	32723.4	204.1	91.09
2006	26965.6	430426	5405246	2220459	32304.1	188.3	86.67 (97.04)
2007	25708.4	447229	5019488	2263676	34766.5	178.4	93.83
2008	26604.1	480084	5000762	2274266	35086.7	178.2	94.73
2009	27046.8	510399	4967467	2334082	36214.2	176.6	96.12
2010	27601.5	539778	5078745	2371488	38156.7	171.4	96.68
2011	26668.7	573774	5134222	2476520	39691.3	170.9	97.04
2012	27177.3	591872	5230326	2572473	41026.5	171.8	97.16
2013	28373.4	646413	5373022	2676463	42261.4	173.5	97.56
2014	28673.3	676727	5466613	2756911	43476.3	173.7	97.64
2015	29678.3	710206	5604728	2872695	45112.6	174.5	98.07
2016	30320.7	758623	5806911	3031376	46958.4	176.9	98.42
2017	30475.0	797355	5937591	3153968	48303.5	178.9	98.30
2018	31211.8	865017	6146244	3288618	50310.6	179.7	98.36
2019	30897.8	920082	6283010	3389936	51778.0	180.0	98.78

注：1.1978年至1985年综合供水生产能力为系统内数；1978年至1995年供水管道长度为系统内数。

2.自2006年起，用水普及率指标按城区人口和城区暂住人口合计为分母计算，括号中的数据为往年同口径数据。

11 全国历年城市排水和污水处理情况(1978-2019)

11 National Urban Drainage and Wastewater Treatment in Past Years (1978-2019)

年份 Year	排水管道长度（公里） Length of Drainage Pipelines (km)	污水年排放量（万立方米） Annual Quantity of Wastewater Discharged (10,000 m^3)	污水处理厂 Wastewater Treatment Plant		污水年处理量（万立方米） Annual Treatment Capacity (10,000 m^3)	污水处理率（%） Wastewater Treatment Rate (%)
			座数（座） Number (unit)	处理能力（万立方米/日） Treatment Capacity (10,000 m^3/day)		
2001	158128	3285850	452	3106	1196960	36.43
2002	173042	3375959	537	3578	1349377	39.97
2003	198645	3491616	612	4254	1479932	42.39
2004	218881	3584601	708	4912	1627966	45.67
2005	241056	3595162	792	5725	1867615	51.95
2006	261379	3625281	815	6366	2026224	55.67
2007	291933	3610118	883	7146	2269847	62.87
2008	315220	3648782	1018	8106	2560041	70.16
2009	343892	3712129	1214	9052	2793457	75.25
2010	369553	3786983	1444	10436	3117032	82.31
2011	414074	4037022	1588	11303	3376104	83.63
2012	439080	4167602	1670	11733	3437868	87.30
2013	464878	4274525	1736	12454	3818948	89.34
2014	511179	4453428	1807	13087	4016198	90.18
2015	539567	4666210	1944	14038	4286251	91.90
2016	576617	4803049	2039	14910	4487944	93.44
2017	630304	4923895	2209	15743	4654910	94.54
2018	683485	5211249	2321	16881	4976126	95.49
2019	743982	5546474	2471	17863	5258499	96.81

注：1978年至1995年污水处理厂座数及处理能力均为系统内数。

7 全国历年城市燃气情况(1978-2019)

年份 Year	人工煤气 Man-Made Coal Gas				天然气 Natural Gas				液化石油气 LPG				燃气普及率 (%)
	供气总量（万立方米） Total Gas Supplied (10,000 m^3)	居民家庭 Households	用气人口（万人） Population with Access to Gas	管道长度（公里） Length of Gas Supply Pipeline	供气总量（万立方米） Total Gas Supplied (10,000 m^3)	居民家庭 Households	用气人口（万人） Population with Access to Gas	管道长度（公里） Length of Gas Supply Pipeline	供气总量（吨） Total Gas Supplied (ton)	居民家庭 Households	用气人口（万人） Population with Access to Gas	管道长度（公里） Length of Gas Supply Pipeline	Gas Coverage Rate (%)
2001	1369144	494191	4349	50114	995197	247543	3127	39556	9818313	5583497	13875	10809	60.42
2002	1989196	490258	4541	53383	1259334	350479	3686	47652	11363884	6561738	15431	12788	67.17
2003	2020883	583884	4792	57017	1416415	374986	4320	57845	11263475	7817094	16834	15349	76.74
2004	2137225	512026	4654	56419	1693364	454248	5628	71411	11267120	7041351	17559	20119	81.53
2005	2558343	458538	4369	51404	2104951	521389	7104	92043	12220151	7065214	18013	18662	82.08
2006	2964500	381518	4067	50524	2447742	573441	8319	121498	12636613	6936513	17100	17469	11 (88.58)
2007	3223512	373522	4022	48630	3088365	662198	10190	155271	14667692	7280415	18172	17202	87.40
2008	3558287	353182	3370	45172	3680393	779917	12167	184084	13291072	6292713	17832	28590	89.55
2009	3615507	307134	2971	40447	4050996	913386	14544	218778	13400303	6887800	16924	14236	91.41
2010	2799380	268764	2802	38877	4875808	1171596	17021	256429	12680054	6338523	16503	13374	92.04
2011	847256	238876	2676	37100	6787997	1301190	19028	298972	11658326	6329184	16094	12893	92.41
2012	769686	215069	2442	33538	7950377	1558311	21208	342752	11148032	6081312	15683	12651	93.15
2013	627989	167886	1943	30467	8882417	1726620	23783	388466	11097298	6130639	15102	13437	94.25
2014	559513	145773	1757	29043	9643783	1968878	25973	434571	10828490	5862125	14378	10986	94.57
2015	471378	108306	1322	21292	10407906	2080061	28561	498087	10392169	5871062	13955	9009	95.30
2016	440944	108716	1085	18513	11717186	2864124	30856	551031	10788042	5739456	13744	8716	95.75
2017	270882	73733	752	11716	12637546	2825027	33934	623253	9988088	5447739	12616	6200	96.26
2018	297893	78957	779	13124	14439538	3135097	36902	698043	10153298	5447936	11782	4841	96.70
2019	276841	56168	675	10915	16085570	3470004	39025	767946	10408110	4917008	11297	4452	97.29

8 全国历年城市集中供热情况(1981-2019)
8 National Urban Central Heating in Past Years(1981-2019)

年份 Year	供热能力 Heating Capacity		供热总量 Total Heat Supplied		管道长度（公里） Length of Pipelines (km)		集中供热面积
	蒸汽	热水	蒸汽	热水	蒸汽	热水	
	(吨/小时)	（兆瓦）	(万吉焦)	(万吉焦)			（万平方米）
	Steam (ton/hour)	Hot Water (mega watts)	Steam (10,000 gigajoules)	Hot Water (10,000 gigajoules)	Steam	Hot Water	Heated Area (10,000 m^2)
1981	754	440	641	183	79	280	1167
1982	883	718	627	241	37	491	1451
1983	965	987	650	332	67	586	1841
1984	1421	1222	996	454	71	761	2445
1985	1406	1360	896	521	76	954	2742
1986	9630	36103	3467	2704	183	1335	9907
1987	16258	27601	6669	3650	163	1576	15282
1988	18550	32746	5978	4848	209	2193	13883
1989	20177	25987	6782	4334	401	2678	19386
1990	20341	20128	7117	21658	157	3100	21263
1991	21495	29663	8195	21065	656	3952	27651
1992	25491	45386	9267	26670	362	4230	32832
1993	31079	48437	10633	29036	532	5161	44164
1994	34848	52466	10335	32056	670	6399	50992
1995	67601	117286	16414	75161	909	8456	64645
1996	62316	103960	17615	56307	9577	24012	73433
1997	65207	69539	20604	62661	7054	25446	80755
1998	66427	71720	17463	64684	6933	27375	86540
1999	70146	80591	22169	69771	7733	30506	96775
2000	74148	97417	23828	83321	7963	35819	110766
2001	72242	126249	37655	100192	9183	43926	146329
2002	83346	148579	57438	122728	10139	48601	155567
2003	92590	171472	59136	128950	11939	58028	188956
2004	98262	174442	69447	125194	12775	64263	216266
2005	106723	197976	71493	139542	14772	71338	252056
2006	95204	217699	67794	148011	14012	79943	265853
2007	94009	224660	66374	158641	14116	88870	300591
2008	94454	305695	69082	187467	16045	104551	348948
2009	93193	286106	63137	200051	14317	110490	379574
2010	105084	315717	66397	224716	15122	124051	435668
2011	85273	338742	51777	229245	13381	133957	473784
2012	86452	365278	51609	243818	12690	147390	518368
2013	84362	403542	53242	266462	12259	165877	571677
2014	84664	447068	55614	276546	12476	174708	611246
2015	80699	472556	49703	302110	11692	192721	672205
2016	78307	493254	41501	318044	12180	201390	738663
2017	98328	647827	57985	310300	276288		830858
2018	92322	578244	57731	323665	371120		878050
2019	100943	550530	65067	327475	392917		925137

注：1981年至1995年热水供热能力计量单位为兆瓦小时；1981年至2000年蒸汽供热总量计量单位为万吨。

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