The consistent innovations and inventions in science and technology have made the intelligent development of community system a major trend. This article proposes a design and implementation of the overall framework of an Intelligent Community Governance System in the perspective of communication network such that intelligent information and software platforms to develop an information platform can be thoroughly utilized, thereby facilitating information sharing, service integration, and resource optimization. The framework deployed the theoretical bases supporting the development of smart communities, such that underlying infrastructure, supporting platform, and the basic database can be enhanced. The research results of this paper can provide some reference ideas for follow-up research.

1. Introduction

The intelligent community forum regards an intelligent community as one that is ready and willing to embrace change and help shape it provided it will ultimately benefit the community. Major indicators of an intelligent community include sustainability, digital equality, advocacy, broadband, e-government, and innovation. Designing an intelligent community requires a collaboration of these indicators. In the perspective of communication networking, an intelligent community is one that utilizes recent information technology to formulate smart communication devices to formulate a governance system that integrate together the human, goods, business transportation, communications, and energy, among other major elements that make community operations more comprehensive, smoother, and humane [10]. The design of an Intelligent Community Governance System in the perspective of communication networks directly links with big data, which forms the engine of an Intelligent Community Governance System. According to Stratigea (2020), big data facilitates data analysis that support community planning. This in turn supports informed decision-making for scientific community management. Further, intelligent community governance process is a dynamic and continuous process, meaning lots of big data will be accumulated in the process of precipitating the characteristics of the intelligent community. As such, big data forms the basis for the refined management and development insights for an intelligent community. The concept of intelligent community is the integration of the current so-called wireless city, e-community, and other regional concepts focusing on broadband infrastructure construction by the intelligent community forum. Specifically, an intelligent community must meet the following conditions: the community can adapt to the local economic development in the broadband economy. The development of the community must recognize the influence of broadband economy. The community should create an ideal environment. The community should be able to maintain the balanced development between community characteristics and community traditions in the rapidly changing economic environment. The community should not only emphasize the construction of broadband infrastructure but also invest a lot of human and material resources.

Based on the perspective of communication network, smart cities and intelligent community have attracted significant attention from both the government and academic research. A study by Zhang and Jiang [14] recommends an overall framework that integrates all services through
2.1. Connotation/Definition of an Intelligent Community

Tang et al. [12] presented a communication network-based algorithm that integrates media-based surveillance systems to the Internet of Things in the formulation of an Intelligent Community Governance System. However, most of these recommendations are limited on the basis that they fail to distinguish the connotation of a smart city from a smart or intelligent community, limited studies on the development of an intelligent community, and lack of a cost-effective design. As such, this article proposes the design of an effective Intelligent Community Governance System in the perspective of communication networking. The system is standardized, and it can be able to facilitate compatibility and information sharing for an intelligent community. The competitiveness of a community depends on the speed of broadband access to the Internet. The real smart community will not leave all broadband construction to private operators, instead of formulating efficient public policies and improving network construction.

2.2. Functional Requirements of an Intelligent Community Governance System

As such, the governance system must focus its attention on this category. According to Liu [7], different categories of residents exist in a community in terms of age, common needs, living standards, physical characteristics, and special needs. The communication network must therefore address all needs including efficient information, efficient residences, high security provision, food availability, logistics, and barrier-free community. Special needs of people require accurate monitoring, intimate service, visual talk-time, trusteeship and guidance. Smart community indicators provide a useful framework for community development to facilitate planning, development, and evaluation, so as to create a prosperous local economic market in the broadband economy. At the same time, the community can also use these indicators to turn the construction of broadband infrastructure into a platform for the development of knowledge labor force, so as to improve the innovation level of the whole community.

Property companies are also a major stakeholder in intelligent communities as they avail life services to residents. The intelligent management governance system must therefore avail information management services, security, electricity, water, and parking management among other digital services [12]. Other stakeholders such as business enterprises, logistic firms, and community medical institutions require the Intelligent Communication Governance System to avail services such as e-commerce platforms, unified and standardized delivery systems, warehousing services, and effective transportation management. The Intelligent Communication System must also be flexible enough to align the operation of these stakeholders based on the demands of the residents. This will facilitate better delivery of services to the smart community residents. The governance system must differentiate between unilateral and repeated services required by different residents. Intelligent system refers to an intelligent collection of modern communication and information technology, computer network technology, industry technology, and intelligent control technology. With the continuous development of information technology, its technical content and complexity are becoming higher and higher. The concept of intelligence has gradually penetrated into all walks of life and all
aspects of our life. Intelligent residential areas and intelligent hospitals have emerged one after another based on intelligent buildings.

2.3. Review of an Intelligent Community Management System in the Perspective of Communication Network. Figure 1 organizes the application areas for the needs of all intelligent community participants based on community property management, residential management, healthcare, logistic survives, e-government services, e-commerce, and community smart home services.

As indicated in Figure 1, the design of an Intelligent Communication Governance System in the perspective of communication networking requires the implementation of both individual functions and the understanding of the flow of information between different functions. Liu [7] divides the flow of information in an intelligent community system in different categories. These include the information collection, transmission, exchange and processing, and display unit. The information collection unit serves as a nerve ending for the intelligent community and comprises of various acquisition sections that can be used to capture community information. Such acquisition units include access control equipment, fire alarm, health monitors, water, and electricity detection units. The information transmission unit serves as a channel for the spread of intelligent community information flow that allows easy flow of information among corresponding units and the outside world. It comprises of various wireless transmitters. The storage unit serves as a warehouse for big data management within the intelligent community. It also stores data and serves as a data mining and filtering unit through which data can be analyzed to deduce intelligent community reports [8]. Finally, the information display unit incorporates various functions in the intelligent community that display crucial information to various users. It also serves as a display for the achievements and progress of the intelligent community. Intelligent communication network is an additional network structure based on the original communication network to provide new telecom services. The core of the intelligent communication network is how to efficiently provide users with a variety of new services. The development cycle of new services is shorter than that of traditional services, which means that the development and funding business can be greatly opened to users in advance, and a large amount of funds will be recovered as soon as possible, so as to improve the utilization rate of the network and enhance the intelligence of the network. This is the source power for the rapid development of the intelligent communication network.

2.4. Sources of Funding. The designed intelligent community requires infrastructure modernization that imposes a high and daunting price tag. To fund the development of the Intelligent Community Governance System will operate as a centrally sponsored scheme. This means that the central government will be responsible for financial provision by allocating the funds on the budgetary allocation [3]. Also, the private sector will also be used as a source of funding, where interested investors will build various infrastructures such as residential properties. Government contributions will be in the form of own-source revenues and intergovernmental transfers. However, the author denotes that financial support will only be needed during the development of intelligent community infrastructure. Other financial requirements will be catered for by the community in the form of taxes and fees.

2.5. Conflicts of Interest. Major conflicts of interest in the implementation of intelligent communities include lack of center state coordination, lack of a time figure associated with the design, and limited availability of required facilities. According to Ghosal and Halder [5], the fruitful implementation of the Intelligent Community Governance System requires coordination between various government departments. The design demands both horizontal and vertical government coordination. Another limitation is lack of a time plan on when the project is set to be complete. Intelligent community system is a big plan that requires time planning to ensure all activities are completed in time. Unfortunately, there lacks time planning on the project, especially given that the project is still at the infant stages. The security system includes three aspects: security system, standard specification system, and management security system. It constructs a security system from three aspects: technical security, operation security, and management security to ensure the availability, confidentiality, integrity, nonreputation, auditability, and controllability of the basic platform and each application system.

3. Design of the Intelligent Community Governance System

3.1. Overall Framework. The Intelligent Community Governance System contains four major parts, namely, the infrastructure, support platform, application layer, and user layer. The infrastructure part is responsible for processing and integrating the important components of the intelligent community such as people, places, things, events, and organization to generate a database for the smart community [2]. This platform acts as the basis for community development and allows the development of other intelligent application systems for the community. Figure 2 illustrates the design of the overall framework of an intelligent community management system. The construction design aims to utilize available government resources in a bid to combine the management and services based on communication network to satisfy the diverse range of community needs while promoting the development of the intelligent community. The basic database includes business database, sensing information database, log database, and exchange database. The cloud exchange platform mainly realizes the data exchange and computing of various heterogeneous networks, provides a software interface platform or provides computing services, or serves as a server.

3.2. Logical Architecture. Governing an intelligent community requires a collaboration of the Internet of Things with modern management ideas. An intelligent community management
Figure 1: Application areas for the Intelligent Communication Governance System in the communication perspective.

Figure 2: Design of the intelligent community management system.
system is responsible for various functions such as information release, video surveillance, property management, development of community card systems, parking management, electronic community patrol, visitor management, perimeter defense, and customer service, among other critical services in an intelligent community. The system is integrated with different systems, to ensure that all operations are aligned and that they are operational. Figure 3 illustrates the logical architecture of an intelligent community management system. Note that application service system includes personal information management system, log management system, emergency call system, video monitoring system, broadcasting system, intelligent sensing system, access control system, and remote service system. These systems complete direct services for all kinds of people in the community.

3.3. Application Blueprint for the Intelligent Community System. The Intelligent Communication Governance System is designed in the perspective of communication networks. This means that all sectors should converse with each other to enhance effective operation. The design system integrates external resources such as advertising firms, media operators, health centers, and public service centers to the community business operations via the property management services [10]. The system then allows intelligent community residents to use smart devices such as smartphones, information distribution terminals, and Pump Drive Assemblies to capture and spread information as shown in Figure 4. The system will focus on three core parts, namely, households, property management, and community businesses, given they are the key parts of an intelligent community. Households incorporate services that are accessible at the living environment of an intelligent company such as clean environment, education, medical, and home equipment. Property management will focus on the management of resident properties, while community business will focus on the business operations carried out by the intelligent business. Win (wireless intelligent network) is an advanced intelligent network platform proposed by ANSI to serve CDMA network. It is based on CS-2 of ITU-T and adopts the idea of integration to incorporate the functional entities of CDMA mobile network (including wireless access function and wireless terminal function) into the overall architecture of wireless intelligent network. It is possible for the wireless intelligent network platform to provide all-round, comprehensive, and multicharacteristic intelligent services to CDMA network.

4. Application of the Intelligent Community Governance System

The intelligent community management system seeks to accomplish two major tasks, application and service. The system fulfills all communication services in an intelligent community through various subsystems. These segments are interrelated and aim at availing effective governance in an intelligent community.

4.1. The Smart Home System. The smart home system is based on the intelligent requirements of the residents of the community. The system is designed to generate communication links between a smart term and the home equipment owned by intelligent community residents through a sensor network that sends communication signals. The system is designed such that if for instance there is a gas leak incident, the system immediately notifies both the fire department and the owner, such that security individuals are prepared to combat any accidents in time [9]. It also comprises a remote monitoring system that monitors residential areas to maintain the security of residents. The system also contains communication signals that facilitate communicative interactions among community residents. Figure 5 illustrates the composition of the smart home system. Smart home system is a kind of living environment for people. It takes residence as the platform and is equipped with smart home system to realize safer, energy-saving, intelligent, convenient, and comfortable family life. Take the residence as the platform, integrate the facilities related to home life by using generic cabling technology, network communication technology, smart home-system design scheme, security prevention technology, automatic control technology, and audio and video technology, build an efficient management system for residential facilities and family schedule affairs, improve the safety, convenience, comfort, and artistry of the home, and achieve an environment-friendly and energy-saving living environment.

4.2. The Smart Community Service System. This section focuses at ensuring intelligent community residents are fully satisfied with community life. It reviews payments, complaints, repairs, and consumer enquiries to ensure they are fulfilled satisfactorily. For instance, the system can formulate a service smart card that allows residents to cater for all community services. The smart card will enable customers to conduct an integrated range of operations, such as payments.

4.3. Smart Community Management System. This system will be used to facilitate the operations of the property company by fulfilling a full range of community management operations. This will ensure efficient and successful management of community operations and prevent challenges such as traffic and other delays; the system has a surveillance system, parking management system, and a visitor management system [1]. The surveillance system serves as a prerequisite to maintain the security of the intelligent community. The system will surveil over key community sections such as entrances, equipment rooms, and other key areas that require security. The parking management system will be used for effective parking management; in community facilities, it will be used to book parking, pay parking fees, and also notify residents when parking at a particular entity is full. This will make the flow of personal vehicles easy and effective. The visitor management system is set to replace the traditional visitor management style that is manual and makes it hard to govern visitors in the community. The system will be programmed such that it divides access rights based on the type of visitor. This means that a visitor to the intelligent community will receive a visitor’s card that only allows them to access the services dictated by the access system [15]. This
will also capture visitor information to prevent malicious visitors from accessing the community.

4.4. Integrated Energy Management System. Energy is crucial to the operation of an intelligent community. The integrated energy management system will be used to enhance a balanced supply of energy to community residents. This will be managed through an energy control center that will monitor and calculate the production and distribution of energy to the community residents. Also, the system will monitor energy consumption from various appliances such as building lighting, pumping, and air conditioning among others with the aim of maximizing energy utilization and saving on energy [13]. Further, the system recommends on energy-saving appliances, such as the use of the light-emitting diode which has longer service life, consumes less energy, and is safer. This ensures that the energy sources in the community are sustainable and that the community does not have to incur heavy costs on energy provision.

4.4.1. Energy-Saving Benefit Analysis. For instance, to determine the energy-saving benefits of replacing existent lamps,
we compare costs of two typical lamps as illustrated in Table 1. After that, we conduct a power-saving analysis of an ordinary consuming lamp, a U-shaped energy saver, and an LED lamp as indicated in Table 2. We then conduct a cost-benefit analysis for the three lamps subjected to the study to determine the best lamp as in Table 3. Based on the analysis, an LED lamp has the capacity to save 75.8% compared to an ordinary lamp and saves 63% compared to a U-shaped lamp.

5. Conclusion

Intelligent communities have a high potential to develop in the future by formation of an intelligent community management system that ensures that all operations are carried in a sustainable manner. This paper has designed such as a system from the perspective of communication networking and established that the system will be effective in the
management of an intelligent community. The intelligent community system incorporates various intelligent applications to permeate and ease all aspects of the community residents. Extensive experiments show that the proposed method is effective and advanced. Finally, the framework proposed in this paper can be directly applied to other fields to provide some reference ideas for follow-up research.

Data Availability
The data underlying the results presented in the study are available within the manuscript.

Conflicts of Interest
There is no potential conflict of interest in this paper.

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References


