Improving the Communication Channels of the
Chongqing 3D SDI in China

Final Report

Chongqing Survey Institute

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The name of the project: Improving the Communication Channels of the Chongqing 3D SDI in China.

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GSDI SMALL GRANTS APPLICANTS 2017.

1.3 The Background of the Project

Science and technology are the primary productive forces, and popular science education is of great significance in improving public scientific literacy and innovation capacity. *The Thirteenth Five-Year Plan for the Popularization of Science in Chongqing Municipality* points out that the "Thirteenth Five-Year Plan" period will play as the vital stage for the implementation of the *Outline of the National Action Scheme of Scientific Literacy for All Chinese Citizens (2006-2010-2020)* and the *Chongqing's Medium-and-Long-Term Science and Technology Development Plan*. This period is also important for Chongqing to promote mass entrepreneurship and innovation, and even crucial for comprehensively deepening reforms and establishing the center for innovation in western China. It is the new task to provide the public with more high-quality popular science services and foster new types of social citizens with better scientific literacy.

Science and technology continue to integrate into people's life to provide better services for the public. In recent years, with the development of communication as well as the computer and Internet technology, we are now in the ever highly digitalized cities. The concept of "digital city" has been deeply rooted in people's minds. GIS-based platforms such as digital map navigation, e-commerce, intelligent transportation, and e-tourism integrate the city's information resources in the field of economy, society, humanities, science and technology, as well as education, which will greatly promote the digital construction of cities, make the life more convenient, and contribute to the increasingly

smart cities. Finally, the digital cities are gradually developing into smart cities.

Constructing smart China is the strategic focus of development in surveying, mapping and geoinformation. By the end of 2012, the National Administration of Surveying, Mapping and Geoinformation adjusted the overall strategy of "the construction of Digital China, the monitoring of geographical conditions, the development of the industry, the construction of surveying and mapping power" to "the construction of Smart China, the monitoring of geographical conditions, the development of the geoinformation industry, the construction of surveying and mapping power". Constructing a smart China is an important part of the transformation and upgrading of surveying, mapping and geoinformation in the new era. It is also an important strategic measure to accelerate the informatization, facilitate the development of geoinformation industry, promote the transformation of surveying, mapping and geoinformation production and service appraoches, and enhance the ability of supporting and serving surveying, mapping and geoinformation.

The construction of new smart cities is an important task in the "13th Five-Year Plan" period, and is also an important part of the national strategies of new-type urbanization and innovation-driven development. *The National Plan on New Urbanization (2014-2020)* clearly points out the promotion of smart city construction. The construction of smart cities will facilitate cross-sector, cross-industry, and cross-regional government information sharing and business collaboration, strengthen the socialization of information resources development and utilization, promote smart information applications and new information services and contribute to the informationized urban planning and management, the smart infrastructures, the convenient public services, the modern industrial development, and the fine social security.

The development of smart cities in China is in its infancy, and the sense of obtaining of citizens in smart cities needs to be improved. At present, the construction of smart cities in the country has been gradually launched, and smart cities are showing the tendency of cluster development. *The Overall Plan for the Promotion of Smart City Construction in Chongqing (2015-2020)* points out that the construction of a smart city will help achieve a revolutionary transformation of the city from management to service, from governance to operations, and from fragmentation to collaboration. It is also of great significance to the simultaneous development of new industrialization, informatization, urbanization and agricultural modernization and enhance the core competitiveness and sustainable

development capability of the city.

"3D SDI" is rich in content, which will become an important foundation for the construction of smart cities. However, the public's understanding to it is still shallow. "Improving the Communication Channels of the 3D SDI in China" is based on the construction of digital Chongqing 3D SDI and conforms to the "13th Five-year Plan" of Chongqing's science popularization cause and the strategic focus of "Building a Smart China" initiated by the National Administration of Surveying, Mapping and Geoinformation. It is committed to serving and promoting the development and construction of Smart Chongqing, and providing the public with 3D SDI-related science knowledge and interactive experiences.

1.4 The Overview of the Project

The project of "Improving the Communication Channels of the Chongqing 3D SDI in China" is applied as a GSDI SMALL GRANTS APPLICANTS 2017 by the Chongqing Surveying Institute. The Chongqing Surveying Institute actively makes exploration, researches and practices in the fields of infrastructure, big data and platform software in the smart city construction in Chongqing, and build a professional software support system including the platform and experience center for Smart Nan'an Geospatial Information Services, the cloud computing platform of Smart Chongqing Geospatial Information Services, the integrated real-world maps of the sky, the earth, the indoor and outdoor areas, the smart communities, a three-dimensional geographic information platform for urban drainage and flood prevention, and the development and application of a three-dimensional digital navigation aid system.

Chongqing Surveying Institute utilizes the data advantages accumulated in the spatial information industry for many years to integrate the existing spatial information resources, collect and produce vector, image, three-dimensional, place name addresses and other new data products. It also handles and releases data consolidation, illustration, and section according to the relevant national standards for electronic maps, and builds up an online service system for massive spatial data. Through the integration of hardware, software, and data resources, a cloud service data center for spatial information is established to provide data, hardware and software environment support for the Project "Improving the Communication Channels of the Chongqing 3D SDI in China".

Based on the above conditions, the project of "Improving the Communication Channels of the Chongqing 3D SDI in China" will be carried out for people in the enterprises, public institutions, colleges, and communities. The activities will cover online science promotion, SDI Development Contest, offline technical presentations from experts and interactive experience of geoinformation products, which will provide conditions for the public to understand smart cities and cutting-edge technologies for smart cities and participate in the construction of smart cities, and help the development of smart cities in Chongqing.

2 Aims and Tasks

2.1 Aims of the Project

As an important carrier of economic and social development, cities are also the main gathering place of innovation elements. Scientific and technological innovation plays an increasingly prominent role in urban development and becomes the engine of future development of cities. The construction of smart cities with technologies such as the Internet and big data as the core is the main direction of current urban development and construction. The main goal of the "Improving the Communication Channels of the 3D SDI in China" project is to focus on popularizing and promoting the concept that "innovation" is the primary force guiding the development, stimulate the general public's interest and enthusiasm in the construction of smart cities, and inspire the new potential, innovation, and entrepreneurial vitality of the whole society. The specific goals are as follows:

2.1.1 To Enhance Public Awareness of 3D SDI in Public Services and Other Fields

The construction of 3D SDI has affected and changed the public's life to a certain extent. In order to further implement the national plan on new urbanization development, the activities will adopt a variety of publicizing approaches and experience events to let the public feel the progress made in science and technology and understand the application of advanced technology to the intelligent management and operation of cities, so as to mobilize the public's enthusiasm in participating in the construction of smart cities and decision-making in the major cities and promote the formation of a virtuous circle mechanism and a new normal for social self-regulation and self-government, which

will bring convenience and help to the citizens and thus benefit the people.

2.1.2 To Spread the Construction Concept of Open Smart Cities

The construction of smart cities requires government departments and enterprises to create applications that will be enjoyed and joined by ordinary people through open, collaborative, and innovative approaches. The core of these is the openness and sharing of resources, including governments' data resources and enterprises' intellectual resources. We will vigorously disseminate the national strategy of "promoting the open and sharing of data resources" through this activity. On the one hand, we will publicize the basic support role of government administrators in the construction of smart cities, including the establishment of basic platforms and the convergence of data resources. On the other hand, we will call on enterprises to actively participate in the construction of smart cities, and jointly integrate resources and establish a better business model and service model through the government, industry and society.

2.1.3 To Arouse Enterprises and Individuals' Enthusiasm for Carrying out Innovative Construction of Smart Cities

Premier Li Keqiang has reiterated in public occasions that it is needed to vigorously promote "mass entrepreneurship and innovation". Apart from mobilizing the participation of ordinary people, the activity will also attract participation from enterprises and professionals in related fields. The organizers will make use of existing advantages in resources and platforms, through the opening of some data and platform interfaces, to explore new application innovation ideas and solutions to social problems in the form of virtual reality modeling contests, thus forming an atmosphere in which the whole society collectively contributes to the construction of smart cities.

2.2 Main contents

In the form of online and offline activities, "Improving the Communication Channels of the Chongqing 3D SDI in China" will strengthen the interaction between various groups, focus on promoting the public's understanding of high-tech, as well as advocate the scientific lifestyle and innovation and entrepreneurship. The specific activities are as follows:

2.2.1 Online Activities

1) Popular Science on WeChat

We will launch the WeChat account for popular science, named Chongqing Smart City, within which there are modules like "Real-world Travel in Chongqing", "Fashion in Chongqing", "Smart City Construction Progress", "Q & A", "Smart Community" and others, notifying the relevant situations of smart city construction through virtual city online tour and information pushes. The content of the column will be mainly based on plentiful interactive operations, easy-to-understand texts, and intuitive photo albums.

2）SDI Development Contest

Preliminary data and open platform will be prepared, and the contest rules of virtual reality modeling contest will be released online. After the application is available, you can download the application form, fill in the basic information and send it within an e-mail to the official e-mail address of the contest. After successful application, replies will be sent through the e-mail, and the team number will also be notified. Necessary data resources and toolkit download link will be provided for the contested participants by the organizing committee. The modeling theme can be based on indoors and outdoors of ancient buildings, modern buildings, natural landscapes, as well as other virtual buildings. There are no restrictions on the use of equipment, processing software, and production methods. All materials include but not limited to texts, pictures, videos, websites, etc.

2.2.2 Offline Activities

1）SDI Presentations

Relying on the administrative functions of the Chongqing Municipal Urban Planning Bureau, experts in the field of virtual reality in smart cities will be invited during the "SDI Day" to carry out thematic lectures on popular science, including themes like "Virtual Chongqing and Smart Life", "Smart Planning in the Participation of the Public," "Approach Chongqing with Graphs," "Collection Presentation of the Survey Institute" and so on. With a focus on hot topics like science and technology and issues concerning citizens, there will be an interactive session of award-winning quiz at the final stage of each thematic lecture and cultural gifts on the theme of smart cities will also be distributed.

2）SDI Exhibitions

Echoing the theme of "Improving the communication channels of the Chongqing 3D SDI in China", the Surveying and Mapping Cultural Park of Chongqing will be chosen as a main venue to carry out popular science activities which are highly interactive with much more public participation. Thematic exhibition boards, products on map culture, unmanned aerial vehicle (UAV) system, street-

view scanners, monitoring equipment of urban Internet of Things, etc. will be set up in order to highlight the combination of science, art and humanity. Meanwhile, communication exchanges and interactions between government and corporate managers, enterprise technicians, researchers and students in universities and institutes will be promoted to an extent that demonstrates the fruitful achievements of innovations in terms of building a smart city.

Chosen as a parallel session for the project activities, Chongqing Survey Institute welcomes and invites participants to visit the site to investigate the results of the virtual reality construction of smart cities and get closer to the innovative culture and atmosphere of the enterprise. The Institute will demonstrate the achievements of the application and construction of Smart Chongqing in the 3D Demonstration Hall, including the virtual scenes of three-dimensional digital city, integrated real-world maps of the sky, the earth, the indoor and outdoor areas as well as smart community platforms, etc. At the same time, various types of booths will be set up at the venue to provide an interactive experience for users wearing virtual reality (VR) glasses, VR helmets, fully-equipped VR interactive armor systems, naked-eye three-dimensional reality equipment and other equipment.

3）Awards of 3D SDI Development Contest

Awards and commemorative prizes will be granted according to the implementation and score result of the publicity of achievements of the virtual reality modeling contest held online in the earlier stage.

2.3 Innovative Points of the Project

1) Rich "3D SDI" experience for the civil life

Based on the application needs of smart city construction, the achievements of the application that are closely integrated with the existing high-tech and public life experience will be displayed. The diversified terminals and modes of interaction will enhance the public experience and the perception of 3D SDI construction and application.

2) Popularization of new cutting-edge technologies & innovative application of a smart city;

The project highlights the promotion of cutting-edge technology and allows the public to feel the charm and influence of science and technology. In the light of the pain points of daily life needs, the project will elucidate the changes and innovations brought about by new technologies, which will greatly inspire the public's innovative thinking on the construction of a smart city.

3) To guide the opening of social public resources and cultivate the atmosphere of programming innovation among the social mass

The project shows our determination to take the lead in opening up our own data and platform to facilitate the society to utilize open resources to work out urban governance solutions. Through the organization of virtual reality modeling contest and the promotion of outstanding application achievements, the public will have a deeper understanding of open resources. At the same time, their programming capabilities will be fostered, heralding an innovative atmosphere of the social personnel.

4) To forward the promotion of 3D SDI in industries

Industry-related companies will be introduced to participate in the promotion activities of popular science to discuss the role and function of companies in the construction of 3D SDI. Through the promotion activities of popular science, the project aims to explore the needs of public life and urban management in order to promote the initiative of related companies in the construction of a smart city. Meanwhile, we hope that the project may serve as a bridge to motivate the communication and cooperation between functional departments of the government and the enterprises.

3 The Implementation of the Project

After the application for the project, related researches on the contents of the report were promptly carried out. What is more, we visited relevant units, companies and universities, etc. inside and outside the city to master the current development status in the field of "3D SDI" in China and the understanding of the various groups of people about it.

3.1 Preliminary Preparations

After the establishment of the project, a group of personnel was subsequently deployed to form a project team. Led by the vice president in charge of science and technology, the group includes multi-professional technicians, marketing personnel, logistic support personnel, etc. According to the work contents identified in the project charter, the preparations for the preliminary planning of the project, the preparatory work for the release of Popular Science Platform on WeChat, the technical presentation of the domain experts, the exhibition of high-tech products for space information, and the organization

and evaluation of the virtual reality modeling contest and other preparatory work were carried out.

3.1.1 3D SDI and the Survey of Smart City Popularization

1) Survey of counterpart units outside the city

The team members went to Kunming to participate in the "National New Smart City Evaluation Work Area Seminar" and carried out research on smart cities. At the seminar, experts from relevant national ministries and commissions including the National Development and Reform Commission and the Standardization Administration of the P.R.C. conducted an in-depth interpretation of the "New Smart City Evaluation Index". During the seminar on the construction of a new smart city, the present experts expressed their opinions about the Index from different perspectives. At the seminar, the project team members had a detailed consultation and opinion exchange, which contributes to a much more specific version of the target tasks such as index composition, evaluation methods, and index weights for the evaluation of a new smart city.

Figure 1 National New Smart City Evaluation Work Area Seminar

After that, the team members went to Beijing to participate in the high-end forum for surveying, mapping and geo-information to carry out the survey. More than 300 engineering technicians and researchers from related companies, colleges and research institutes in the field of surveying, mapping and geo-information throughout the country attended the meeting. The project team personnel engaged in lectures on space-time big data, social perception of smart city, applications of the laser radar and other topics, and exchanged ideas with participants. It allowed the personnel to get hold of the typical cases and way of development of domestic smart city data production and its industrial applications.

Also, they acquainted themselves with the latest technology and products in the field of information made by the companies.

In order to better master the new technologies of smart cities, the Southern Digital Technology Co., Ltd. was in invited to come to the Institute for exchanges. In-depth exchanges were carried out in terms of the construction of smart cities, the dynamic updating, management, and application of basic geo-information data. Furthermore, topics like information-based intelligent surveying and mapping were also discussed.

Figure 2 Technical Communication with Southern Digital Technology Co., Ltd.

2) Survey of related units in the city

The 2017 Chongqing Industrial Internet Summit and the second general meeting of the Chongqing Cloud Computing and Big Data Industry Association were held in Chongqing respectively. Leaders from the Chongqing Municipal Economic and Information Commission and the Chongqing Municipal SME Bureau, together with industry experts and corporate executives had a heated discussion on the innovative applications of industrial Internet, smart manufacturing development, industrial cross-border integration, artificial intelligence, sharing economy and other hot topics about industries. The technical personnel of the unit and the digital company attended the meeting and thoroughly learned about the application of technologies such as cloud computing and big data in the industry in Chongqing.

In addition, we also invited Jiang Yi, dean of the School of Computer Science and Technology of Chongqing University of Posts and Telecommunications, to come to our institute for communication.

The relevant experts from Chongqing University of Posts and Telecommunications introduced the basic situation of the College of Computer Science and Technology and the research development and achievements in mobile internet sensor networks and big data processing and mining. Discussion was also carried out in areas such as public creative space, urban intellisense, safety monitoring of urban underground pipe network, and construction of big data cloud platforms, etc.

Figure 3 Communicating with Chongqing University of Posts and Telecommunications

3) Research findings

Smart cities have become the latest form of urban development in the modern information society. Eight first-grade indexes in the evaluation of the construction of a new smart city were proposed by the country, namely the citizen-benefited service, precise governance, ecological livability, smart facilities, information resources, cyber security, reform and innovation, and citizen experience. These evaluation indicators not only highlight the purpose of "people-oriented, people-benefited and people-cared", but also aiming to build up the sense of gain, sense of satisfaction as well as sense of happiness among the citizens. The goal of the construction of a smart city is to create an urban living environment that is suitable for people to live in.

Chongqing boasts its improvement in Internet infrastructure "3D SDI" technology and service system. In this context, the promotion of professional and technical research in the fields of Internet

and big data and its industrial development have laid the foundation for the construction of smart Chongqing.

However, there are also some problems in the construction of a smart city supported by "3D SDI". Asymmetry and imbalance concerning information and resource acquisition between different regions, people, urban and rural areas, and departments makes information exchange and sharing channels blocked, which hinders the integration and sharing of information technology. Thus, it results in different perceptions of "3D SDI" among different subjects. In fact, smart cities should be people-oriented by utilizing the "3D SDI" technology to actively consult and respond to the needs and opinions of citizens in a timely manner. However, the lack of relevant knowledge among the public led to their weak participation in the "3D SDI" and construction of a smart city.

3.1.2 Publicity and Planning of Popular Science

According to the results of the survey on the popularity of smart cities, and in view of the current situation of the poor popularity of high technology in geo-spatial information in Chongqing，targeted activity planning will be carried out. In order to ensure successful implementation of the activities, a detailed implementation plan is made. And a preparation plan about the relevant venues and use of the facilities is also formed.

In order to ensure the publicizing effect, the publicized content and form are novel and eye-catching. The project team held a meeting discussing the publicity and planning. Some novel and available plans offered by team members are organized. And the planning arrangements are made in publicized content, form and organization of personnel.

Personnel Organization: A leading group is established. For the publicity and virtual modeling competition, three groups are set up:
the online publicity group includes three members, namely, one group leader, and one member in charge of establishment and maintenance of WeChat public platform. And one member takes charge of publicizing manuscripts. Offline publicity group includes eleven members, namely, one group leader, three members take charge experts' sessions, seven members take charge garden activities of popular science and interactive experiences. If any shortage of personnel takes place, they can temperately transfer workers from the unit.

Publicizing Content: Science Concept of Smart City, "3D SDI" cutting-edge technology (tilt photogrammetric technology, intelligent measurement system, low-altitude UAV aerial photography, etc.), "3D SDI" application system including wisdom community, Aishang Chongqing, Geo-King three-dimensional digital city, VR world and indoor and outdoor integrated scene and so on.

The forms of publicity are online and offline. The form of Online adopts new media and Internet technology so that the public can have an access to and know the website at any time. This form includes the push of WeChat's public platform, online data services, etc. The form of Offline adopts the methods of on-site explanation, demonstration and interaction, thus, the public can experience and know through watching, listening and experiencing. This form includes technological session made by experts, exhibition of spatial information products, etc. And the exhibition of spatial information products will be divided into smart garden and interactive experience.

WeChat popular science platform, technological session made by experts, the exhibition of space information products will be conducted to the public in all directions, full-scale and dynamic forms for carrying out smart city education. The detailed implementation plan for each segment is as follows:

1) WeChat Popular Science Column

WeChat public platform releases Chongqing 3D SDI popular science column, promotes popular science knowledge, 3D SDI cutting-edge technology, and the public can experience online smart city products applications.

In July, WeChat public platform application will be established, functional column design of WeChat public platform will be made. People will take charge the regular organizing of publicized manuscripts or writing of related articles about the smart city. Maintenance personnel will be responsible for backstage functional module maintenance and information push.

2) Popular Science Publicity Made by Experts

The appropriate time and place is chosen for the technological session made by experts which include participating in academic reports, publicizing inside and outside the city, publicizing in communities, colleges, and carrying out communication and exchanges targeted at professional and technical personnel and so on.

3) Exhibition of Spatial Information Products

The exhibition of spatial information products highlights the combination of science, art and humanity. It takes the Publicity Day of National Surveying and Mapping Law as the time node to carry out popular science garden activities and interactive experience.

If we carry out popular science garden activities, appropriate venue for conducting special science popularization activities should be selected. We need to set up theme panels, map cultural products, UAV system, street-view scanning vehicle, monitoring equipment of urban Internet of things, etc. Through the field exchange, we can show the achievements made by the establishment and innovation of smart city.

Smart city interactive experience is based on wearable devices, including VR helmets and VR glasses which can increase interactivity and public participation. Through VR world and indoor and outdoor integrated real scene platform devices, the Geo-King 3D digital city platform device, people can roam and browse by way of 3D digital city map. People also are enabled to view the development and changes of Chongqing's past, present and future, immerse themselves in virtual reality experience of the garden, enjoy personal experience of the new changes that new and high technology will bring to life, and understand the development of intelligent measuring equipment.

In July, the hardware and software systems needed for the project are tested.

In August, preparation will be made for popular science garden activities and the interactive experience of smart city, including making exhibition board, selecting suitable venue, inviting and notifying the participants;

Activities of popular science garden and the interactive experience of smart city will be held on 29th, August, the Publicity Day of National Surveying and Mapping Law.

3.1.3 Planning of SDI Development Contest

Under the smart city, the public is not only the object of service, but also the participant in the construction of smart city. In view of the low participation of the public in the construction of smart city, the SDI Development test is launched. Thus, the interested public are enabled to participate in the construction of the three-dimensional digital city. We can improve participation degree, make the public understand the production process of 3D digital city and grasp modeling technology, thus promoting the construction of data and application of smart city in Chongqing. In order to ensure the

effective implementation of SDI Development Contest, discussion has been conducted by the project team in the meeting so as to set up a modeling competition group and make detailed activity plans, including rules of the competition, the evaluating indicators of the results and the organization of the competition.

1) SDI Development Contest Detailed Rules and Regulations

This original intention of this competition is that using existing resources and advantages of the platform, through opening the access to part data and platforms, we can explore new application of innovative ideas and solutions for social problems in form of virtual reality modeling contest. The public's interest and enthusiasm for building a smart city will be triggered. New potential and vitality of innovation and start-ups can be aroused in whole society, thus, an atmosphere of building a smart city in joint efforts can be formed. For the better participation for the public, the content and participants of this competition in not severely restricted; For less trouble in registration and accreditation, we set a criterion on registering means and the submission of works; As to the participants, certain prizes will be given. And we also set up some awards. Details are as follows:

Competition Content: Themes of modeling can be indoor and outdoor virtual modeling, such as ancient buildings, modern buildings, natural landscapes, etc., and other virtual modeling. You are allowed to use any equipment, processing software and production methods. All the materials of your works include words, pictures, videos, website and so on and so forth.

Participating Object: All citizens of Chongqing

Registration Method: According to the actual situation, you can freely form a team for registration, but no more than 3 people in on group. Send you information by mail to the official mailbox of the contest. If you succeed in application, you will be replied by mail, and informed the team number.

Submission of Works: Team number-Name of your modeling scheme

The Awards: one First Prize, three Second Prize, six Third Prize. The winning team or individual will receive corresponding bonus of competition (Bonus will be calculated in RMB).

2) Formulation of Evaluating Indicators of the Works

Because different modeling software and modeling methods can be used in the work, the modeling results scheme can be in different types, such as Max model, Panoramic and BIM modeling,

etc. In order to ensure fairness and justice, evaluating indicators of the results are divided into several aspects, including modeling precision, geometric complexity, texture clarity, attribute integrity, overall artistic perception and so on. We will make comprehensive judgement for the submitted works and schemes through such indicators.

3) Organization and Arrangement of Contest

Personnel organization: Modeling contest group has 6 members, namely, one group leader, one member in charge of registration, one member is responsible for collection and organization of the works, three members for technical training and instruction. If any shortage of personnel takes place, they can temperately transfer workers from the unit.

Specific Arrangements of Contest:

Announcement of SDI Development Contest will be released in mid-July;

Registration will be closed in early August and related training of modeling contest will be held;

The works will be submitted and gathered in mid-September;

In mid-October, experts will be organized to review the modeling works submitted;

In late October, the prize-winning works of SDI Development Contest will be published.

In mid-November, bonus will be paid to winners, and commemorative prizes will be awarded to the active participants.

3.1.4 Equipment and Preparation for Materials

To ensure the stable implementation of the activity and provide the public with demonstration and interactive experience, the necessary facilities and equipment should be prepared. During the publicity period, it is necessary to distribute popular science leaflets, use posters and display boards for exhibitions. Some practices of professional software should be authorized during the exhibition of the system demonstration.

1) Facility Preparation

VR Mobile Head Display Device: VR glasses plus smart phones, it's simple in structure. As long as putting the smart phones, you can enjoy the view. You are enabled to observe the scene in all directions and given a three-dimensional sense of space, thus, the users seem to enjoy that experience in person.

VR Integrated Head-wear Equipment: external VR helmet pluses high-end PC main-engine (compatible computer), so as to provide the users with professional virtual reality interactive experience;

Naked-eye 3D Display Equipment: Multi-view naked-eye auto-stereoscopic display. Through specific optical occlusion and optical path transmission control method, we are enabled to watch the stereo scene under the circumstance of naked-eyes with several people at the same time. The real effect of visual reality effect of spatial depth and images which flow outside of the screen can be easily presented. The specific preparation scheme for equipment preparation is shown as in Table 1.

Table 1 Facilities and Equipment

Facilities and Equipment	Planned preparation（quantity）	Existed equipment and facilities in the company	The need to rent or purchase
VR glasses	20 sets	10 sets（SHINECON Qianhuan X1 Y006）	Purchasing 10 sets
Smart phone（for matching use of VR glasses）	4	2 sets（Huawei Honor 8）	Purchasing 2 smart phones
External VR helmet	4 sets	1 set（HTC vive）	Purchasing 3 sets
High-end PC main-engine(compatible machine)	4 sets	2 sets（assemble）	Purchasing 2 sets
Naked eye 3D display device （65 inches）	2 sets	1 set	Renting 1 set

2) Publicity Materials Preparation

Publicity materials are used for science popularization and spatial information product introduction in smart cities. Leaflets, posters and display boards are needed for information dissemination. The plan is made as shown in Table 2.

Table 2 Publicity Materials List

Publications / documentation / information dissemination / intellectual property matters	plan
Popular science leaflets	500
posters	20
Display board	10 sets
Professional software	Purchasing VR panoramic production software

3.2 WeChat Popular Science Platform Online

3.2.1 Application for WeChat Official Account

In order to facilitate the publicity of 3D SDI science popularization and the construction of smart city, and provide the public with the application service of smart city, and allow the public to experience Geo-King 3D digital city, the project team decides to adopt new media technology for promotion. WeChat has become a lifestyle. The WeChat service accounts provide the public with a quite good platform. Thus, the project team has submitted an application to the Survey Institute for WeChat official account for servicing the popular science city and smart community. After the application is approved by the Survey Institute, according to the online application process of service account, the online publicity group has applied for the WeChat official account. The basic information of this official account is as follows:

Name: Geo-King 3D Digital City Platform

Official Account Category: Service Account

Applicant: Chongqing Survey Institute

The Main Release Content: 3D SDI popular Science Information, Smart City Services, Geo-King Three-dimensional Digital Platform Application Services.

3.2.2 Construction of WeChat Official Account

According to the main content of WeChat public platform, there is a section design of Geo-King 3D digital platform official account, the main section is divided into Smart City, Smart Community and My Community and so on. The specific functional design of each section is as follows:

1) Smart City Section

Smart city section is used for publicity of popular science and experience of smart city. It also provides the public with information for people knowing the smart city and its development, cutting-edge technology and related activities. Thus, the Smart City section is divided into several columns, namely, Popular Science Homepage, Progress in Construction, Real Scene Chongqing, Aishang Chongqing, Q&A, and so on.

Popular Science Homepage: The entrance of popular science homepage, which offers the overview of popular science information.

Progress in Construction: Push the introduction of smart city's cutting-edge technology, related policy and documents of smart city and virtual modeling competition progress of smart city;

Real Scene Chongqing: Release panoramic map of Chongqing real- scene park view series, and the public can enter the park which attracts them for a panoramic view of park at any time;

Aishang Chongqing: Provide three-dimensional geographic information services, detailed two-dimensional, three-dimensional online services and check real-scene information of popular sites;

Q&A: the section of answer and question. Users ask questions about their doubts or related questions, and the maintenance personnel will answer their questions in detail .

Figure 4 Smart City Section of Official Account

2) Smart Community Section

The Smart Community Section offers community services, it aims to provide the public with a safe, comfortable and convenient life with modernization and smartness, and offer a new form for community management and service based on information and intelligence.

Homepage: the main entrance of the community service management platform, on entering the community homepage, you can carry out such operations, such as problems of civil to-do , problem reflection, living payment check-out community news, the three-dimensional map, the group work system and so on;

Reflecting Hall: the owner can take photos and upload these photos to reflect these problems, such as hidden danger of safety, random parking of vehicles, environmental hygiene, illegal construction, road operation, facilities damage and so on;

Community Notice: related notice of community services;

Community News: community news, you can know the changes of community news.

Online Map: Community online map inquiry, merchandise discount recommendation, positioning and other services.

Figure5 Smart Community Column

3) My Community

My Community Section aims to personal issues, it's divided into three columns, namely, I Want to Reflect, I Have Something to Do and My information column.

3.3 Expert Technical Publicity

In order to promote the construction of smart city and make better use of the popular science propaganda, we carried out experts' technical publicity and communication activities targeting at different groups, taking into account the difference among different groups. Expert technology publicity is an important part of this science popularization activity. We held communication and publicity activities for different objects in forms of multi-level, multi-subject and multi-field. Meanwhile, we hope to improve our scientific quality and technology standard during the process and at the same time let the technologies flow in as they go out , which is also a purpose for the in-city and out-city publicity activities.

The expert technical publicity has achieved good results through the face-to-face communication and presentation of lectures. On the one hand, we achieved better understanding of the development and the advanced technology of the smart cities in China and at the same time improved our scientific and technological quality. On the other hand, together with our achievements in the construction of smart cities, we presented the knowledge points and the application of science and technology and shared the idea, technology as well as the future development of smart city through raising questions and interactive communication. Everyone was initiative and active to get deeper understanding of smart city with full of imagination and expectation for the future.

3.3.1 Out-City Technical Publicity

On the one hand, the out-city publicity activities are to popularize our achievements in the virtual reality of the smart city and on the other hand, to learn from the advanced ideas of others to guide the propaganda work of science popularization in our city. In the aspect of the development and construction of large data, Guizhou has been approved to build the first national-level big-data comprehensive test area. As the first city-level data operation centers in Yinchuan, Guizhou and Yinchuan, they are all at the front of the big data construction, providing us with a good opportunity for reference.

1) Publicity and Communication Activities in Guizhou

In August 4th, the experts of the project group went to Guizhou to deliver a lecture. Combined with the research and practice of indoor and outdoor spatial information modeling, BIM technology and spatial information integration of the recent years, the experts carried out five detailed reports about the background of the indoor and outdoor spacial information fusion and application research in the age of big data, the indoor and outdoor three-dimension spacial information collection, indoor and outdoor spacial information fusion, as well as the indoor and outdoor integrative application and prospect.

At present, the digital city is transforming towards the smart city, which requires comprehensive perception, comprehensive integration, comprehensive probe, comprehensive sharing and comprehensive cooperation. This also reflects the importance of the expansion of indoor space while existing technology is mostly two-dimensional map, which is limited in data type, three-dimensional structure and application field. In this context, the research and exploration of our institute in this direction, based on the surveying and mapping of large geographic data, combined with a variety of indoor data acquisition methods to complete the collection of three-dimensional indoor structure, elements, properties and optimize the independent research and development of three-dimensional platform. Meanwhile, the preliminary realization of seamless connection of indoor and outdoor spacial information is achieved for the further connection of the economic and social data to carry out the application of indoor and outdoor integration. The research has got wide attention, sharing ideas with participants. During the activities, we also gained understanding of the progress of Guizhou's construction in this respect, providing new ideas for further construction.

Figure 6 Publicity and Communication Activities in Guizhou

2) Publicity and Communication Activities in Yinchuan

In August 17th, the experts in the project team went to Yinchuan, Ningxia to report and discuss the exploration and practice of survey technology in the era of space-time big data. The report begins with the brain storm of how to depict a city from three aspects: the survey industry and the space-time big data, the survey technology exploration and the intelligent application practice under the new situation.

At present, the progress of new mapping geographic information technology and equipment has given rise to new forms of geo-spacial expression such as tilt photography, street view, BIM, laser-point cloud and so on. In the era of time-space big data, the innovative applications of cross industry are increasing, and the non-survey data are widely converged and applied, such as big data of government affairs, Internet, sensor as well as navigation and positioning. In the aspect of how to make full use of the existing data resources, the participants reported the technological exploration in the fields of mobile measurement equipment, multidimensional city platform and the test platform of the Internet as well as   the series of intelligent applications based on the research, such as the optimization of the planning case, the construction of intelligent operation and maintenance, the construction of the major infrastructure and the inspection of operation, unmanned vehicle navigation data production

service and so on.

This exchange has played a demonstrative and promotional role in the application of new technology in business production, and promoted the transformation of urban survey units in the construction of smart cities, which provides new ideas for the construction of spatial data in smart cities.

Figure 7 Publicity and Communication Activities in Yinchuan

3.3.2 In-City Technological Publicity

In order to promote the construction and development of the smart city in Chongqing and improve the popularization of the knowledge of smart city and smart community, the in-city publicity activities aim at the government departments, enterprises and institutions to carry out the propaganda of the achievements on construction and the technical exchange. Meanwhile, science lectures related to the smart city and the smart community are held for universities, streets and communities.

1) Exchanges and Communication with Related Government Department

We invited the Traffic Committee of Jiangbei District of Chongqing to our institute. In the 3D studio, the technical personnel explained the three dimensional auxiliary city design, the three-dimensional auxiliary municipal road engineering design, the three-dimensional auxiliary geological survey and the urban infrastructure intelligent safety monitoring cloud platform as well as the application of these technologies in our city project. Besides, we discussed the high and new

technology with the committee, which laid the foundation for the popularization and application of high technology.

2) Exchanges and Communications with Enterprises and Institutes

We invited the Planning and Design Institute of Wanzhou district for exchange activities. We have carried out an in-depth discussion on the auxiliary planning and management verification methods, the underground pipeline survey technology, the 3D high technology research and development as well as the monitoring cloud platform, which promoted the technical exchanges and cooperation between the two units.

Figure 8 Exchange Meeting with the Planning and Design Institute of Wanzhou District

3) The lecture and exchange at the enterprise zone

The technical staff of our institute gave a lecture about the "smart city" in Shuangfu New District. What is "smart city"? Our technical staff first played a short video about the wonderful imagination of "smart life" and then combined with some of their own understanding and smart applications around us, giving an account of the "smart city", in which the wisdom of people are gathered to give intelligence to the objects. The two sides can interact and complement each other to realize the new model and new form of urban development that is optimized for economic and social activities. Our staff made a detailed introduction from the typical examples of "smart city" construction (the zero carbon smart city Masdar of the United Arab Emirates and New Songdo City of Korea, etc.) and the

demonstration applications on a small scale in foreign countries (the typical management of urban traffic congestion, waterlogging, service, etc.) to the construction status of smart cities in China (smart Shanghai, smart Yinchuan, etc.), and then to the construction of smart chongqing (smart Nanan District, smart Lianghe District, smart Yongchuan District, etc.). According to the current condition of location, transportation, economy, population and development demands in Shuangfu New District, we put forward some construction thoughts and technology system of smart Shuangfu and also some suggestions to adjust the thinking and practice of the big platforms and centers, and carried out refined smart practice. Lastly, we made a detailed description for everyone in the smart applications such as smart community, smart planning, smart traffic, smart decision-making and so on.

The audience were impressed by the lecture and the project of smart Shuangfu. The leaders of Shuangfu New District expressed their interest in the construction of the new smart district and made a discussion on the regulation of rain and pollution and platform construction, etc.

Figure 9 the lecture and exchange at Shuangfu New District

4) The lecture and exchange at the sreets

On September 21st, the launching ceremony of the smart community construction of the Shiyou Street was held in the Shiyou Street Subdistrict Office. More than eighty people including the relevant

department leaders of Yuzhong District, the representatives of major social units in the jurisdiction and community cadres of the Shiyou Street attended the meeting. The Secretary of the Political and Legal Committee of Yuzhong District, He Jiguang, attended the ceremony.

Chen Han, the new dean delivered a speech at the meeting, introduced our powerful service ability and available support resources from the work foundation, construction experience, three-dimension technique, big data applications, etc. And he expressed his decision to cooperate with smart community construction of Shiyou Street and promote social smart management to a new level.

The Shiyou Street reached cooperation with our institute, making good use of our advantages in three-dimensional geographic information, big data, cloud computing and so on, and pioneered in smart community platform construction of Yuzhong District and built the first "smart street " in Chongqing.

Figure 10 the lecture and exchange at Shiyou Street Community

5) The lecture and exchange at the community

After getting in touch with the Hongen Temple Community and obtaining the support, our insititute carried out the scientific and technological exchange of "smart city makes life better" in the citizen school of the community. The technicians introduced a lot of information about smart city to the advanced communist representatives in the citizen school of Hongen Temple Community, including the concept of smart city as well as related applications and services, such as smart

transportation, smart travel, smart parking and smart community, etc. They made a presentation about some geographic information products used in the construction of smart city, and demonstrated 3D digital city on the spot as well as indoor and outdoor integrated landscape map. They also taught participants how to use Geo-King three-dimensional digital city platform and WeChat public platform to learn more about technology and to enjoy the online map service and experience the smart community, etc. The participants highly appraised the visual impact brought by the 3D digital city as well as the application of the real scene map, and were full of yearning for the smart city.

After the exchange, technicians distributed maps produced by our institute on the spot. The staff of the citizen school of the Hongen Temple Community expressed the hope that they would like to strengthen contact with our institute and organize more exchange activities to learn more about the science as well as technology related to smart city and feel the tide of city wisdom in the 21st century.

Figure 11 the lecture and exchange at the citizen school of Hongen Temple Community

6) The lecture and exchange at colleges and universities

Our institute has cooperated with universities such as Chongqing University as well as Southwest University and has carried out lectures for teachers and students at colleges and universities for many times. On August 29th, the technicians went to Chongqing University to carry out lectures, the content

of which includes the review and reflection of smart city, the development situation and construction plan of smart community, etc. The technicians also made a detailed report about the ideal image and people's understanding of smart city, two developing modes of global smart city, "five-level" goal of China's smart city, seven major application systems of smart Chongqing, the general framework of a typical smart city and the demand for smart person to build smart city. After listening carefully to the report, the teachers and students at the scene conducted in-depth exchange and discussion, and some of them also put forward their own views and ideas.

Figure 12 Lecture in Chongqing University

3.4 Space Information Products Exhibition

After many years of spatial data collection and construction, our institute has formed a series of spatial information products such as 2D, 3D, ground, underground, panoramic, indoor/outdoor integration, and historical atlas. Meanwhile, it has improved the spatial information collection equipment to make the information collection equipment more efficient and intelligent.

Spatial information provides data support for smart cities to serve the public better. We have exhibited and displayed many a space information product such as "3D Digital City", "VR World and

Indoor/Outdoor Integration System", "low-altitude photography image", "Love for Chongqing", and "Unmanned Intelligent Measurement System" and many other carriers. Besides, we have made the cartoon exhibition board and carried out relevant thematic popular science and interactive experience.

3.4.1 Thematic Activities for Popular Science

The National Surveying and Mapping Law Propaganda Day is on August 29th. This year is the first year when the new "Surveying and Mapping Law of the People's Republic of China" is issued and implemented. We, with this opportunity, hold the thematic exhibition activities for 2017 Surveying and Mapping Law Publicity Day on Guanyinqiao Square in Chongqing. Exhibition areas consist of many parts such as display board area, surveying and mapping equipment exhibition area, surveying and mapping frontier experience area, and legal consulting service area etc. Themes include 3D digital city, fantasy future life exhibition, low-altitude aerial drone and so on.

1) 3D Digital City

We have set up 3D digital city comics exhibition and demonstration equipment in the exhibition area. The comics exhibition describes the functions of 3D digital city platform in the way of animation and dialogue. The technicians provide on-site demonstrations and guide the public to personally operate and experience. The construction outcomes of 3D digital city, with 3D visualization technology to achieve the virtual simulation, fully cover the main city, integrating terrain, image, vector, real scenery, 3D building model, underground pipeline model, building information model (BIM), and spatio-temporal data to ensure that the scene is consistent with the real street scene. Owing to that, many viewers have developed a keen interest in the outcomes. And they roam and browse the entire scene of Yuzhong District like watching a movie, checking the plans for Hongyadong and Raffles City and appreciating the lofty mountains and rippling rivers.

Figure 13 3D digital city comics exhibition and demonstration equipment

Figure 14 On-site demonstrations of the technicians

Figure 15 Personal operation and experience of the public

1) Fantasy Future Life Exhibition

Fantasy Future Life Exhibition, taking the integrated real-life system with heaven and earth, indoor and outdoor as a platform, utilizes the real-life map of sky, ground, indoor and outdoor as the carrier to present three-dimensional geographic information and socio-economic information from different perspectives. Fantasy Future Life Exhibition with the help of the advanced multi-dimensional multimedia technology, gives the audience lively and dreamy immersive experience.

We also make the relevant comics exhibition for this theme. We set up demonstration equipment in the exhibition area, which enables the public to thoroughly experience the 3D realistic virtual world with the VR glasses. Thanks to the immersive real-life application experience, the majority of the public admire it so much.

Figure 16 The public experience heaven and earth, integrated indoor and outdoor scene with VR glasses

Figure 17 The child experiences heaven and earth, integrated indoor and outdoor scene with VR glasses

Figure 18 Exhibition area for the Fantasy Future Life Exhibition

 2) Low-altitude Drone Aerial Photography

Low-altitude drone aerial photography is a new technology that has just emerged in recent years, which can facilitate to see figures and sceneries in the world from different angles. Low-altitude drone aerial photography images can be made the digital orthophoto, tilt photography models and panoramic maps.

This technology are interested by many people. The technicians set up drones in the original unit base at No. 231, and conduct on-site operation demonstrations of drones as well as display some outcomes of the flying images. After the public watch the scene, some people say that they often see such images during earthquakes and floods, which is acknowledged by everyone. In addition, the technicians give a detailed introduction on the use of low-altitude drone aerial photography for

surveying, planning, emergency monitoring, and ecological protection.

Figure 19 The technicians set up drones

Figure 20 Low-altitude drone aerial photography images

3.4.2 Smart City Interactive Experience

The interactive experience gives people the most intuitive experience with the 3D interaction of human and drone. By feeling the virtual reality in a more realistic way, people can acquire an immersive experience when they wear the wearable device. Our institute has invested heavily in the construction of interactive experiences by establishing the 3D demonstration hall, purchasing several sets of wearable devices such as VR glasses and helmets, and building planning exhibition halls such as Diaoyuzui and Jiulongpo. All these efforts provide venues and equipment for smart city interactive

experience in the popular science activities.

The popular science project has carried out many demonstrations and interactive experiences in the 3D demonstration hall. The public here have been provided VR wearable devices and led to visit the smart city experience center in Nan'an District.

The exhibition of spatial information products has attracted a large number of people in the form of the thematic popular science and interactive experience. This exhibition has left a deep impression on the public who intuitively feel the convenience given by the space information and new technologies in the interactive experience. After the experience, the public, speaking highly of it, expect to speed up the construction of smart cities and look forward to a better life in the future.

1) 3D Demonstration Hall

The 3D multifunctional demonstration hall in our institute, which is equipped with a curtain projection system, provides a highly immersive virtual simulation display environment on the audio-visual aspect. The demonstration hall has deployed the Geo-King 3D Digital City Platform, AiShang Chongqing: Chongqing Geographic Information Public Service Platform, Integrated real-life Map System of heaven and earth & indoor and outdoor, and Smart City Spatial Information Service Cloud Platform etc., which provide the conditions for interactive experience. Many demonstrations and interactive experiences have been conducted in the demonstration hall for the government personnel who come here for exchanges, research, and visits (from the National Geographic Information Bureau of Surveying and Mapping, City Planning Bureau, Jiangbei District Communications Committee, etc.), enterprise and public institutions personnel (from the Wuhan Institute of Surveying and Mapping, Tianjin Institute of Surveying and Mapping , Remote Sensing and Mapping Institute of Henan Province, Wanzhou District Planning and Design Institute, and other surveying and mapping institutes, Southern Digital Technology Co., Ltd., etc.), experts and scholars (from universities and research institutes such as Wuhan University, Chongqing University, Chongqing Jiaotong University, Southwest University, European Space Academics (ESA)), college students (Wuhan University students summer practice, Chongqing University) and the public (developers of the virtual reality modeling contest).

Figure 21 Interactive experience demonstrated in the demonstration hall

2) VR Interactive Experience

The content created by VR is virtual and realistic, engaging people in it to have a sense of immersion like entering other universe. VR create a closed virtual platform which is 100% realistic. VR helmets and VR glasses, as the example, bring you into the virtual 3D space to conduce the illusion of "complete presence" by cutting off the route by which your vision is input to the real world.

At present, VR, which is widely used in the 3D digital city and the integrated real-life scene of heaven and earth & indoor and outdoor, is quite impressive. The public, wearing the VR device, can see the main roads, communities, parks, and shopping malls in Chongqing, as if they go to the streets personally. Majority of the public are attracted in the VR interactive experience by visiting parks, going shopping, seeing the night scene in the virtual reality.

Figure 22 VR interactive experience of the public

Figure 23 VR indoor panoramic

3) Visit Smart City Experience Center

The Smart City Experience Center, where we can understand the smart city and perceive the future life, is located in Jiangnan New City, Nan'an District. Our institute is responsible for the design and construction of physical sand table, 3D digital sand table and LED touch technology. After the entry of the Smart City Virtual Modeling Contest, we invite participants to visit the Smart City Experience Center in Nan'an District. Nan'an District physical sand table and large-scale LED 3D digital model in the first-floor give the participants an overall shocked feeling from the smart city at the first moment of the experience center. Then they can see the full picture of the future smart Nan'an through the real-life simulation and feel the convenient life style in the smart life of the by entering the smart home. After experiencing the various services of the smart community, the participants feel the convenience from smart medical service and office and the great impact on all aspects of clothing, food, housing and other aspects from the smart city of the future.

3.5 SDI Development Contest

In the SDI Development Contest, we carry out preliminary scheme and divide the contest into the contest process and the contest awards during its process according to the scheme.

3.5.1 Contest Process

After the completion of the contest scheme, the organizers of the contest modeling group formulate detailed rules, issuing notices of the contest, opening the registration channel, conducting relevant training for the participants. After the submission deadline, the organizers arrange the results.

On July 11th, the organizers of the contest modeling group issue a notice about holding SDI Development Contest. And then they send the details to relevant universities and push them through the WeChat public platform.

On August 2nd, they summarize the list of registered applicants and the registration status of the competition. The 56 participants are divided into a total of 37 groups. The participants are undergraduates and postgraduates from different universities and modeling enthusiasts from multiple institutions.

On August 8th, the participants are invited to carry out modelling and specification training in our institute. The technicians explain some aspects such as texture creation, model naming, and detail processing in the modeling, and the opened data and platform interfaces which are also operated and demonstrated later. After the training, the participants are led to visit the base and office environment of the institute.

On September 17th, the participants are informed to timely submit the modeling results by email and telephone. Then the submitted modeling results are required to be arranged.

A total of 35 entries have been received when the submission deadline comes. The themes and contents are rich, including exquisite works of different themes which are made by various techniques, such as ancient and modern architectural modeling, roads and bridges modeling, sculptures of Buddha statues modeling, character modeling, and real-life modeling etc.
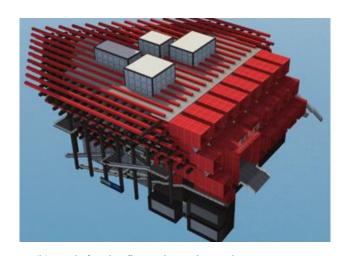
3.5.2 Contest Awards

After arranging the submitted results, the organizers of the contest modeling invite experts to review the results. And then they publicize the awards, and distribute bonuses and prizes.

On October 15, we invite experts, who come from Southwest University, Geographical National Condition Monitoring Center, Chongqing Institute of Surveying and Chongqing Digital City Technology Co., Ltd., to review the submitted modeling results based on modeling accuracy, geometric complexity, texture clarity, attribute integrity and overall artistic perception. The review is divided into

first and second review. The award-winning works are screened out in the first review, and they are scored in the second review. Based on the scores of the works, the works are ranked from the first to the third prize. On October 31, the award result of the SDI Development Contest is publicized on the WeChat public platform. On November 15th, awards ceremony of the virtual reality modeling contest is organized in the institute where the winners are awarded the prizes and the unwinned participants are distributed the commemorative prizes.

(b)Work for the first prize: Chongqing Art Museum

(a)Work for the first prize: Ancient Buddha Modeling

Figure 24 Some prize-winning works of the Virtual Reality Modeling Contest

More public and modeling enthusiasts are able to understand the 3D modeling process and modeling specifications in the form of the Virtual Reality Modeling Contest. The contest encourages them to participate in the construction of 3D digital city by modeling in person, and leads them to be more familiar with and feel 3D simulation and virtual reality technology. The contest has not only helped the participants explore the idea for innovation and solutions to social problems, but also arouse people's interest and enthusiasm for the construction of smart cities. Besides, it inspires the new potential of the whole society, innovative and entrepreneurial vitality, and accelerates the collective efforts of the whole community to jointly innovate to promote the rapid development of the smart city.

4 Project Completion Performance

4.1 WeChat publicity platform

WeChat public platform "Geo-King 3D Digital City Platform" is opened. The platform "Smart City" covers the Popular Science Homepage, Construction Progress, Real-life Chongqing, Aishang Chongqing, Q&A and other columns.

Construction Progress: Nine articles are pushed for the public to well understand the advanced technology of "smart city", which include "study smart city to enhance international exchanges", "walk into the 3D digital city to enjoy a free day trip in Chongqing", "smart city for the future", "achieve dreams to stun the world － construction achievements of Chongqing 3D geographic information have been praised by authoritative global magazines", "tilt photography: view the world from another perspective", "the mobile surveying technology has a broad prospect－drawing smart cities", "Chongqing drone tilt photography and modeling technology has attracted the widespread attention from media" etc.;

Real-life Chongqing: Maps of sixteen real-life park tour in Chongqing are pushed to provide the panoramic experience of the smart park tour for the public. Aishang Chongqing: Aishang Chongqing provides online 2D and 3D maps which adopt 3D simulation and virtual reality technology to render users map inquiry, map retrieval and other services;

Q&A: The column gives the answers to the questions raised by the public for their better understanding of the advanced "Smart City" technology.

The platform "Smart Community" covers many columns such as homepages, reflection halls, community notifications, community news, and online map. It fully utilizes streets' function on the community's governance and innovation, and serving the people in the era of Big Data by integrating people, events, places, objects, and feelings in the community. The platform provides intelligent and convenient services to community members and new forms of management to community managers.

4.2 High-tech Exhibition

The popular science activities demonstrate a large number of high-tech products for the public,

including map cultural products such as real-life Chongqing and AiShang Chongqing, as well as drone systems, streetscape scanners, urban internet of things monitoring and other measuring equipment, 3D digital city virtual scenes, and integrated real-life map of heaven and earth & indoor and outdoor, unmanned ship intelligent measurement systems and other hardware & software devices. WeChat public platform displays smart cities, smart communities and other popular science information in which the data covers 3D digital terrain, 3D urban models, 3D underground pipelines, 3D underground structures, 3D panoramic, tilt photography models and other spatial data. The sophisticated comics exhibition boards for the equipment are also made.

4.3 SDI Development Contest Achievements

A total of 35 entries are received before the results submission deadline (September 17, 2017) for SDI Development Contest. The themes and contents are rich, including exquisite works of different themes which are made by various techniques, such as ancient and modern architectural modeling, roads and bridges modeling, sculptures of Buddha statues modeling, character modeling, and real-life modeling etc.

The 10 award-winning works have been selected by the experts after the review, including 1 first prize, 3 second prizes, and 6 third prizes. The award-winning works are publicized in the official account 3D SDI popular science.

Details of the rules and award-winning works of the SDI Development Contest can be seen on the WeChat public platform "Geo-King 3D Digital City Platform".

4.4 Social and Economic Benefits

The social benefits of this popular science demonstration activity are extensive although it does not produce direct economic benefits. The service targets of the project have exceeded the expected audience, including managers from government departments, district and county management departments, management and technical personnel from enterprises, college teachers and students, middle school students, and the public. Relevant promotion effects are expected to achieve for different audiences. For administrators from the government, the district, the county and the enterprise, popular

science activities mainly adopt the form of expert presentation which introduces innovative applications of new technologies in urban governance and public services, including the application of smart community technology, 3D supporting urban planning management, integration of indoor and outdoor spatial information and smart operation management. All the above efforts have expanded management personnel's understanding of smart applications and promoted the development of smart cities. For enterprise technicians, college teachers and students, the virtual reality modeling contest has attracted many interested people to participate in popular science activities. The SDI Development contest, carried out by mobilizing social forces, utilizes public resource platforms and urgent needs. It has stimulated the public's enthusiasm for innovation and improved the ability of technicians to build virtual reality models. This popular science demonstration activities, focusing on the general public, give them the opportunity to feel the changes caused by the construction of smart cities by the way of close, colorful interactive experiences and popular science presentation which have mobilized the public's enthusiasm to participate in the construction of smart cities and major decisions on the city, and promoted social self-regulation, the virtuous circle of autonomy and the formation of the new normal.

The popular science demonstration activity seeks to reach a consensus on the idea of building a smart city that is open, shared, and collaborative. And then a better business model and service model with remarkably potential market scale can be established by jointly integrating resources of government, industry, and society.

4.5 Completion Performance

The project carries out a total of 15 activities, trainings and lectures. Among them,3 thematic popular science activities are conducted (829 thematic popular science for national surveying and mapping law publicity day, fantasy future life exhibition, popular science and publicity for low-altitude drone aerial photograph), 3 times interactive experience activities (3D demonstration hall virtual reality experience of Chongqing Survey Institute, 3D digital city, VR interactive experience in the integrated real-life scene of heaven and earth & indoor and outdoor, visit and experience in the smart city experience center in Nan'an District), 8 times technical exchanges and presentations of experts (of which 2 times conduct outside the city, 3 times conduct with the government, enterprises and

institutions in the city, one lecture at a college, and 2 sub-district community presentations). The SDI Development Contest, with 56 applicants, receives 35 works. 10 award-winning works are selected, publicized and issued bonus after the experts review.

The project adopts and produces 396 various exhibits and exhibition boards in which 26 sets of exhibits (including VR glasses, VR helmets, large screens for virtual reality, 3D demonstration equipment, 3D digital city application software, and smart community management ends and mobile terminals) are displayed, 20 exhibition boards (popular science comics exhibition boards for technical products), and 350 brochures (promotion brochures for smart community).

A total of 9 new media and new technologies are applied, among which the new media includes WeChat and Website. The WeChat Official Account Geo-King 3D digital city platform has opened push dozens of relevant popular science articles, and the function boards of smart city and community are designed. The new technologies include Virtual Reality (VR), Geographic Information System (GIS), drone aerial photography, Building Information Modeling (BIM), tilt tilt photograph surveying technology, Internet of Things monitoring technology, indoor and outdoor real-life visualization technology.

The number of key personnel involved in the project is 33, of which 6 participate in the modeling contest, 3 for online platform maintenance, 11 for offline promotion activities, 6 for logistics support on equipment and supplies, and 7 volunteers for activities.

The audiences cover more than 1,000 people from government, enterprise parks, institutions, communities/sub-districts, universities, and the public etc.

Table 3 Statistics for Project Indicators Completion Performance

Subjects	Completion Performance	Introduction
Number of conducted activities, training, lectures	15	3 thematic popular science activities, 3 interactive experience activities, 8 technical exchanges and presentations of experts (of which 2 times conduct outside the city, 3 times conduct with the government, enterprises and institutions in the city, one lecture at a college, and 2 sub-district community presentations), Modeling Contest
Number of displayed exhibits, exhibition boards	396 sets	Exhibits: 26 sets Exhibition boards: 20 pieces Brochures: 350

Number of applied new media and new technologies	9	new media: WeChat, Website; new technologies: virtual reality (VR), Geographic Information System (GIS), drone aerial photography, Building Information Model (BIM), tilt photograph surveying technology, Internet of Things monitoring technology, indoor and outdoor real-life visualization technology
Number of participants in the activity	33	Modeling contest: 6; online maintenance: 3; offline promotion: 11; logistics support: 6; volunteer: 7
Audiences	1000+	Including members from government, enterprise parks, institutions, communities/sub-districts, universities, the public, etc.

5 Safeguard Measures

5.1 Organization guarantee

The Chongqing Survey Institute attaches great importance to this popular science activity. It recruits elites from relevant fields to set up a project team which is led by the leading group. The specific project is implemented by the online promotion group, the offline promotion group and the modeling contest group. The online promotion group is responsible for constructing and maintaining the online WeChat public platform, pushing the popular science articles. The offline promotion group conducts the expert technology presentations, popular science thematic activities, offline interactive experiences and publicity exhibition board production. And the modelling contest group deals with formulating the contest detailed rules, notifying the registration, related training, forming the evaluation index, expert review for results, and publicizing the award achievements.
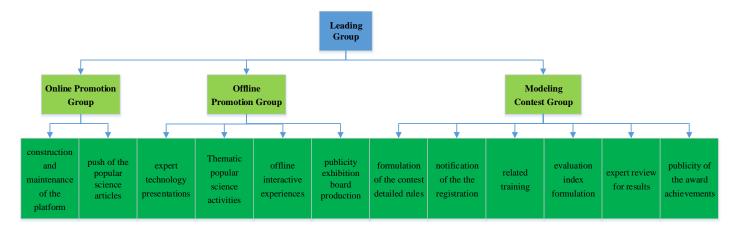
Figure 25 the structure of the project team

The project team develops an effective management system to ensure the efficient work. The specific management system includes the meeting system, the information notification system, the work log system, and the work inspection system.

1) Meeting system

The meeting system consists of regular meetings and irregular internal working meetings. The meeting held once a month mainly involves reports on the progress of each division of work,

implementation summary, discussion of issues, and ideas for the next stage.

2) Information Notification System

In order to maintain the effective communication and non-distortion of project-related information, the division of labor does not divide the person-in-charge to report to the leadership team and other person in charge on the monthly basis.

3) Work log system

The division of work, which is the responsibility of the principal for the work, implements the work log plan.

4) Work Inspection System

In order to guarantee the quality of the project, three levels of quality and progress inspections are conducted by the leading group, the principal responsible for the division of work, and the inspected report is submitted to the leading group.

5.2 Security

According to the relevant national security regulations and other regulations, the confidentiality system of results should be established and the departmental responsibility system should be adopted. And other security measures, such as data backup, data recovery, remote disaster recovery, should be taken to ensure data security.

Network security should be ensured by other measures such as the screening and introduction of security detection technology, user authentication technology, network management software, virus prevention etc.

5.3 personnel security

The project team consists of 14 main researchers, among whom there are 2 with the senior professional title, 7 with the high professional title, 5 with the middle professional title, 4 doctors, 7 masters, and 3 undergraduates. Members of the project team are shown in the following figures:
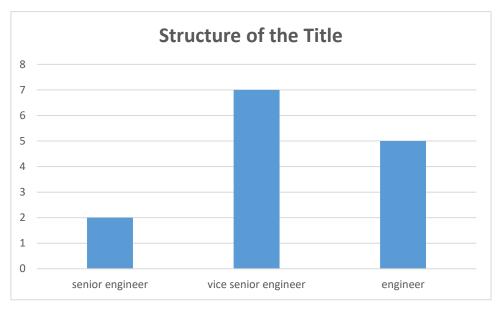
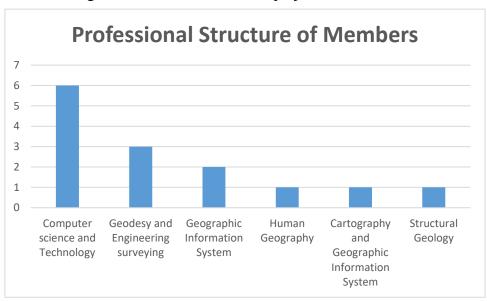Figure 26 Title structure of the project team members

Figure 27 Professional structure of the project team members

6 Summary

In the early stage of the project, the project team has investigated the construction of 3D SDI in the city, and other provinces and cities in China. And the team recognizes the problems in the construction of 3D SDI for serving smart city. The problems present as following. Due to the asymmetric information and unbalanced access to resources between different regions, populations, urban and rural areas and sectors, the information exchange and sharing channels are blocked so as to hinder the integration and sharing of information technologies, and cause different perceptions of the same smart city projects by different subjects. The result is that the public lack knowledge of 3D SDI and have a little expectation of participating in the project.

According to the results of the investigation and the project declaration, the popular science activities have been carried out the specific planning and preliminary preparations for popular science publicity and virtual modeling contest, and safeguard measures are established. During the implementation process, the "Geo-King 3D Digital City Platform" is applied to build and experts are organized to Guizhou, Yinchuan to report for exchanges. Some government departments, enterprises and institutions the city are invited to exchange information in our institute. Technical staff are arranged to conduct lecture exchange in enterprise parks, sub-districts or communities, and universities. Spatial information products have been displayed in the way of thematic popular science activities and interactive experiences, and the virtual reality modeling contest has also been held. The activities adopts online and offline, and enables the public to perceive 3D perceptions of high-tech and future life in smart cities by seeing, listening, experiencing, and participating etc.

The public, who are numerous, actively participate in the activity. The activity, which plays an active role in establishing the better business and service model, has made great efforts in technical exchanges, information sharing, and resource integration and produced the extensive social benefits.

Because of limited personnel, time, energy, and funding, activities are limited. With the rapid development of the technology, 3D SDI involves in a wide range of high-tech and

advanced knowledge. The construction of 3D SDI with rich concept, is very efficient, and the popular science activities need to be further expanded in breadth and depth. Although the number of benefited people in this activity has exceeded the expectation, it is only a small proportion for the general public. The project is about to end, but the in-depth development of 3D SDI and related popular science activities are expected to be continued.