



Establishment and Countermeasures of Smart City Security Risk Assessment Model

Zhengrui Qiu

Social Sciences and Humanities College, Northeastern University, USA.

How to cite this paper: Zhengrui Qiu. (2022) Establishment and Countermeasures of Smart City Security Risk Assessment Model. *Advances in Computer and Communication*, 3(2), 70-73. DOI: 10.26855/acc.2022.12.003

Received: October 28, 2022

Accepted: November 25, 2022

Published: December 30, 2022

***Corresponding author:** Zhengrui Qiu, Social Sciences and Humanities College, Northeastern University, USA.

Abstract

There are many risks and threats hidden in the process of building a smart city. A correct understanding and assessment of these risks is the basis for improving the security guarantee capability of a smart city. From the perspective of risk sources, identify the main risk sources of smart city security, build an ANP structural model by analyzing the interdependence between indicators, and calculate the indicator weight using super decision-making software. A smart city security risk assessment indicator system has been established. In order to reflect the dependency between the elements of the network layer, it is necessary to do a stability treatment on the weighting matrix, and calculate the limit matrix of the weighting matrix to reflect the global weight value of the smart city security risk assessment index, which includes four first level indicators, eight second level indicators, and 30 third level indicators, including environmental risk, data risk, user risk, and management risk. Among them, managers need to pay more attention to environmental risk, followed by management risk, data risk, and user risk, and propose smart city security risk response strategies.

Keywords

Smart city, Safety risk, Evaluation model

1. Introduction

Building a new smart city is an endogenous power to promote economic development, and is the theme of current and future urban construction and development. Big data, cloud computing, the Internet of Things, artificial intelligence, spatial information technology and other new generation information technologies are widely used in the construction of a new smart city. However, security issues have been accompanied by the development of new technologies, bringing many security risks and challenges to the smart city [1]. Through investigation, it is found that in the process of building a smart city in full swing, there are security risks such as the lack of top-level design and standards of network security, the long-term restriction of core technology products, the concentration of data into hacker attacks on the worst hit areas, less investment in network security, and insufficient awareness of network security protection. In particular, foreign enterprises have certain security risks in participating in China's smart city construction by providing products and services, participating in construction and operation and other forms. Therefore, this paper attempts to sort out and analyze the network security risks of smart cities and put forward countermeasures and suggestions, which is very necessary for China to deal with and prevent relevant risks as early as possible.

2. Smart City Security Risk Source Analysis

This paper introduces the causal analysis method and risk matrix method to model the risk identification and risk assessment of smart cities. The risk matrix method is an effective risk management tool proposed by the acquisition engineering team of the US Air Force Electronic System Center in 1995, which is used to identify the importance and potential impact of risks.

Production problems are generally studied from five aspects: people, equipment, materials, methods and environment; Management issues are generally studied from five aspects: people, policy, location, procedure, measurement and environment [2]. On this basis, this paper, in combination with the elements of smart city security risk assessment, makes some adjustments to the above methods, studies from the aspects of people, equipment, data, system, environment, etc., and obtains the risk categories of 5 major categories and 17 sub categories (see Table 1). When it is used for risk identification, brainstorming is used to find out the factors that affect the risk, sort them out according to their relevance and importance, and form a multi-level and multifaceted causal layer.

Table 1. Classification of Smart City Security Risk Assessment

Level I risk	Secondary risk	possibility	influence	Results of comprehensive risk assessment
people	Personnel changes in key departments	low	low	low
	Misoperation	in	in	in
	Key personnel are controlled	low	high	in
equipment	Systematic fault	low	high	in
	Device Incompatible	high	low	in
	technological revolution	low	in	low
data	Risk of leakage	in	high	high
	Tamper risk	low	high	in
	Monitoring risk	in	high	high
system	Regulatory risk	high	high	Very high
	Assessment mechanism	high	in	high
	emergency measure	in	high	high
	Means of recovery	in	high	high
	Information protection	in	high	high
environment	Strong service provider	in	in	in
	Competitor pressure	in	low	low
	network attack	high	high	Very high

3. Analysis of Smart City Security Risk Assessment Indicator System

3.1 Building ANP structural model

To build the ANP model, first of all, we need to judge the relationship between indicators. Through the Delphi method, seven experts in the field of information security were invited to fill in the questionnaire, including doctoral tutors in computer science and technology, information management and information systems. Each judge whether there is a mutual relationship between the indicators [3]. After four times of questionnaire filling and feedback, the final expert opinions tend to be consistent. The ANP structural model of smart city security risk assessment built according to expert opinions (see Figure 1).

3.2 Risk assessment index weight

The Super Decision super decision software is used to check the consistency of all judgment matrices of the network layer, and all results are less than 0.1, which passes the consistency check. Further calculation can obtain the unweighted super matrix weight and weighted super matrix weight of smart city security risk. In order to reflect the dependency between the elements of the network layer, it is necessary to do a stability treatment on the weighting matrix, and calculate the limit matrix of the weighting matrix to reflect the global weight value of the smart city security risk assessment index.

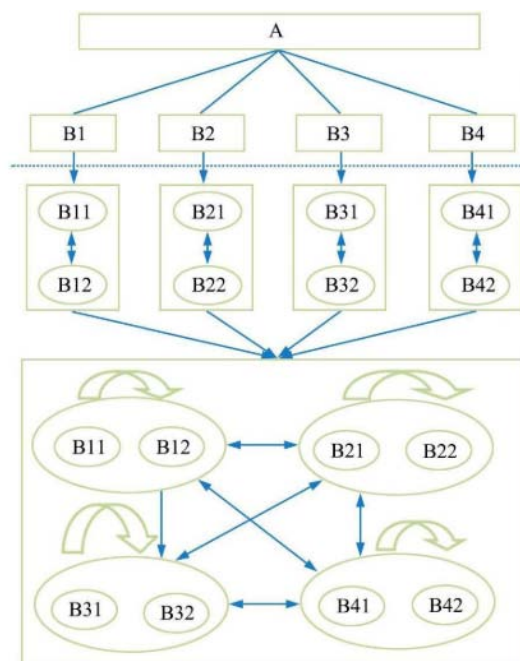


Figure 1. ANP structural model of urban security risk assessment.

3.3 Empirical results

It is found that the weight from environmental risk accounts for the highest proportion, followed by management risk, data risk and user risk. Among the environmental risks, urban information infrastructure has the largest weight, which indicates that urban information infrastructure has an important impact on the information security of smart cities. This is because urban information infrastructure is the carrier of a new generation of information security capability system with the security brain as the core, providing security guarantees for various businesses, and realizing the continuous evolution and growth of information security capabilities. However, in the construction of urban information infrastructure, the core information technology is still mastered by foreign IT giants, and there are security risks in terms of autonomy and controllability [4]. In the management risk, the weight of management staff is relatively large, which shows that the risk of information security leakage caused by information security violations by management staff is relatively large in the face of high standards and rich content of information security management requirements. Among data risks, data security accounts for a large proportion, which indicates that data security is insufficient and the resulting risks are also large. Data security risks are the focus of information security risk prevention in smart cities. Among user risks, the weight of security protection measures is similar to that of security precautions, which shows that user security protection and precautions play an equally important role in the information security of smart cities, can properly solve information security problems, and relatively reduce user information security risks [5]. Considering the overall weight of the secondary indicators of the network layer, it can be seen that urban information infrastructure, policy environment, management staff, and data security have the most significant impact on the information security of smart cities; Secondly, security precautions and protection measures have a significant impact on the information security of smart cities; The impact of management working mechanism and system security on the information security of smart cities is relatively small.

4. Smart City Security Risk Response Strategy

First, start with the top-level design, deploy the overall security work of smart cities, and define the construction goals and paths of smart city security; Establish the main body and responsibility of smart city security responsibility of governments at all levels; Establish safety supervision mechanism; Establish or improve relevant legal systems in terms of bidding, subcontracting system, equipment review, operation and maintenance, information protection, system upgrading, combating network security crimes, etc., to achieve network security management throughout the life cycle; Parallel smart city construction and security governance, synchronous design, synchronous construction, synchronous operation and maintenance; Accelerate the research and formulation of relevant standards, and issue relevant safety construction guidance and management measures as soon as possible before the standards are issued, so as to achieve rules and evidence as soon as possible, so as to lay the foundation for the construction of the entire smart city safety system [6].

Secondly, we should strengthen the independent innovation of core technology products, build a smart city security system, and promote innovation through various ways. Set up a policy oriented guidance fund, vigorously support the collaborative innovation of industry, university, research and application, strengthen talent training and incentive, increase the research and development of core technologies, and accelerate the improvement of the independent innovation ability of enterprises related to "smart cities" in China [7]. We will make every effort to promote development. Gather the strength of the government, state-owned enterprises, private enterprises, associations, chambers of commerce and other parties, give play to their comparative advantages, and jointly carry out the core technology research and development battle.

Finally, we should attach importance to security risk identification and assessment, establish a security risk assessment system for smart cities, and ensure that the risk assessment of smart cities is based on evidence and rationale. At the initial stage of the project construction, identify risks from multiple perspectives and in an all-round way, leaving no risk blind spots; In the process of project construction, reduce the risk to an acceptable level through the conclusion of risk assessment; In the later use and maintenance process, we will constantly identify, evaluate and reduce security risks. The dynamic risk identification and risk assessment methods will be implemented in every stage of the smart city project to ensure a safe and reliable smart government, smart people's livelihood and smart industry.

Conclusion

Risk assessment of smart city security is an important part of smart city's healthy development. The evaluation index system constructed by the institute provides new ideas for future smart city security risk assessment, and also provides theoretical guidance for smart city construction practice, which is conducive to promoting the standardization of smart city construction, management and evaluation. The assessment system can be used to calculate the security risk level of a certain region or city, so as to find weak links for improvement.

References

- [1] Gavurova B, Kelemen M, Polishchuk V. Expert model of risk assessment for the selected components of smart city concept: From safe time to pandemics as COVID-19 [J]. *Socio-Economic Planning Sciences*, 2022, 3(2):80-82.
- [2] Gao C, Zhang D. The Establishment and Verification of the Sensitivity Model of the Piezoresistive Pressure Sensor Based on the New Peninsula Structure [J]. *Journal of Microelectromechanical Systems: A Joint IEEE and ASME Publication on Microstructures, Microactuators, Microsensors, and Microsystems*, 2022(2):31.
- [3] Liu B, Pan J, Zong H, et al. Establishment and Verification of a Perioperative Blood Transfusion Model After Posterior Lumbar Interbody Fusion: A Retrospective Study Based on Data From a Local Hospital [J]. *Frontiers in Surgery*, 2021, 8:347-349.
- [4] Xu Y, Liu J, Wang J, et al. Establishment and verification of a nomogram prediction model of hypertension risk in Xinjiang Kazakhs [J]. *Medicine*, 2021, 5(7):96-100.
- [5] Hu K, Jin S, Ding H, et al. The Bridge between Screening and Assessment: Establishment and Application of On-line Screening Platform for Food Risk Substances [J]. Hindawi Limited, 2021.
- [6] Li Y W, Cao K. Establishment and application of intelligent city building information model based on BP neural network model [J]. *Computer Communications*, 2020, 153.
- [7] Jiang X, Zhang X, Zhang Y. Establishment and optimization of sensor fault identification model based on classification and regression tree and particle swarm optimization [J]. *Materials Research Express*, 2021, 8(8):085703 (12pp).