

# Application of Credit System Construction in Urban and Rural Planning Institutions with Development of Big Data

## -- Taking Nanjing as an Example

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### Abstract

**This paper focuses on the application of credit system development within urban and rural planning divisions against the backdrop of big data. It seeks to investigate the role and significance of big data technology in the credit evaluation of urban and rural planning entities. This study proposes a novel set of credit evaluation indicators derived from big data and constructs a specific credit evaluation model comprising three levels, one primary indicator, three secondary indicators, and twelve tertiary indicators, through a case study of Nanjing city. The research findings offer novel concepts and methodologies for the design and evaluation of credit systems, as well as significant references for improving the credit evaluation system of urban and rural planning entities.**

### Keywords

**Big Data; Credit System; Urban and Rural Planning Entities; Nanjing City.**

## 1. Background, Purpose and Significance of the Study

### 1.1. Background of the Study

With the rapid development of the economy and society, the credit system plays an increasingly important role in daily life and social governance. From inclusive finance to corporate credit systems and individual credit evaluation, every aspect depends on the social credit system. As emerging technologies such as big data, the Internet, and the Internet of Things advance rapidly, the development and implementation of credit systems confront new opportunities and obstacles.

Nanjing, located in eastern China, is the provincial capital of Jiangsu Province and one of China's most significant political, economic, cultural, and transportation hubs. Nanjing is a modern metropolis with highly developed manufacturing, financial, information technology, and service industries. In recent years, it has also attracted numerous domestic and international high-tech businesses and professionals. The construction of the credit system and urban-rural planning play an increasingly important role in Nanjing's urban and rural development as the city continues to grow. As the primary force in urban and rural planning, urban and rural planning entities are responsible for essential responsibilities such as planning and design, land use, and environmental protection, highlighting their significance in modern urban and rural development.

In 2004, the Nanjing Credit Office issued "Opinions on Comprehensive Promotion of Industry Credit System Construction in Nanjing," which promoted the development of Nanjing's social credit system[1]. In addition, it outlined future construction expectations for credit systems in various industries. In 2017, Nanjing distinguished itself as one of the nation's first demonstration cities for social credit system construction. In 2018, Nanjing actively hosted observation and training activities for credit information-sharing platforms and credit portal

website construction at all levels nationwide. In addition, Nanjing has been honored at numerous events, including the Urban Credit Construction Summit Forum. In 2020, Nanjing officially promulgated the "Nanjing Social Credit Regulations," placing the construction of the social credit system and mechanisms on a rule-of-law-based path. In 2021, the government of Nanjing issued the "Nanjing Social Credit System Construction Plan for the 14th Five-Year Plan,"[2]further emphasizing the significance and promotion efforts of the national government in credit system construction, thereby propelling the construction of the social credit system at the societal level to unprecedented heights.

## 1.2. Purpose and Significance of the Study

The rise and development of big data technology have provided unprecedented opportunities for the construction and application of credit systems. The collection, storage, and analysis of massive amounts of data make credit assessment and risk management more accurate and feasible. The application and popularization of the Internet and the Internet of Things technology make access to information more convenient - all these factors make it possible to track and record credit behavior effectively.

Urban and rural planning entities are crucial in promoting urban and rural development, protecting resources and the environment, and realizing sustainable development. Constructing a reliable credit system can enhance the credibility of urban and rural planning entities, facilitate the implementation of unit rating procedures, and promote efficient operation of certification and planning work. Therefore, it is of great practical significance to study the application of credit systems in urban and rural planning preparation entities under the background of big data.

This paper will take Nanjing City in Jiangsu Province as an example to explore the multiple applications of credit systems in urban and rural planning entities under the background of big data. By conducting in-depth research on the current status of credit system construction in Nanjing's urban and rural planning entities, combined with the feasibility, characteristics, and advantages of big data technology, we will explore feasible application paths and methods. At the same time, this paper will also assess the expected effect and impact of the credit system's application and quantify the credit rating by designing credit evaluation standards and weights at different levels.

## 2. Overview of Big Data and Credit Systems

### 2.1. Characteristics and Practical Applications of Big Data

Big data refers to the integration of large volume, high velocity, low density, and the great variety of data, including both structured and unstructured data. In recent years, the development of big data and its associated technologies has been rapid, with nearly doubling growth every two years. According to relevant statistics, the global data storage volume reached approximately 40ZB in 2022, with around 10% of the data stored in structured formats and 90% in unstructured formats[3]. Big data encompasses a massive quantity of data that traditional data processing tools struggle to handle efficiently. However, with the rapid development of big data analysis and application technologies, distributed computing, cloud computing, machine learning, and data mining techniques have been invented and expanded to facilitate the rapid processing, storage, analysis, and application of big data.

In various industries today, as technology continues to advance and mature, the barriers to entry for big data technologies have gradually lowered. More and more organizations and enterprises are applying big data technologies to process and analyze massive amounts of data. Big data has become an essential component of technological innovation and traditional empowerment.

In the financial industry, big data technologies are being applied in areas such as risk assessment, real-time market monitoring, and intelligent investment analysis. Currently, financial institutions are increasing their investment in big data technology application research, relying on big data technology platforms to build unified data pools for financial institutions and enhance the effective utilization of data assets, which will play a crucial role in improving the core competitiveness of financial institutions.[3] In the retail industry, big data technology can help enterprises conduct marketing analysis, consumer behavior prediction, and supply chain optimization. In the healthcare sector, big data technologies can support personalized healthcare, disease surveillance, and drug development. In the energy and transportation fields, big data technologies can be utilized for energy management optimization, traffic condition forecasting, and smart city planning.

It is evident that the development and application of big data technologies have become essential driving forces for innovation and development in various industries. By fully mining and analyzing massive amounts of data, big data technologies can assist organizations and enterprises in making more accurate decisions, discover new business opportunities, and improve work efficiency and user experience. With the continuous evolution of big data technologies and the expansion of application scenarios, it is foreseeable that the integration of this technology with credit system construction will become feasible and play a crucial role.

## **2.2. Concept and Role of the Credit System**

A credit system refers to a standardized and trustworthy system for recording, evaluating, and managing the credit information of individuals, organizations, or social entities. Its core lies in the collection and analysis of credit data for various entities or individuals, generating objective and accurate credit evaluation results. Based on these results, the credit system provides decision-making references and risk controls for economic transactions, financial services, and social governance.

The social credit system is a social mechanism composed of three components: the public credit system, the corporate credit system, and the individual credit system. A sound social credit system is built upon a robust legal framework, effective market supervision, and punishment mechanisms. It relies on open credit information and operates through credit service companies in a market-oriented manner. It establishes mechanisms and a social environment for restraining dishonest subjects and behaviors under market economy conditions [4].

The credit system plays a vital role in modern society. An efficiently functioning social credit system can promote the optimization and prosperity of social integrity. By publicly recording and evaluating the credit behavior of individuals or organizations, the credit system incentivizes people to abide by principles of honesty, establish good credit records, and facilitate the positive development of social order. Additionally, the credit system is indispensable in social governance. Governments and regulatory bodies can track and evaluate the credit information of individuals or organizations to promptly identify and address dishonest behavior, safeguard market order, protect consumer rights, and advance the modernization and standardization of social governance.

## **3. The Application of Big Data in the Construction of Credit Systems for Urban and Rural Planning Preparation Entities**

According to the "Qualification Management Regulations for Urban and Rural Planning entities" issued by the Ministry of Housing and Urban-Rural Development of the People's Republic of China in 2012, in order to strengthen the overall management of urban and rural planning entities, standardize related work in urban and rural planning, and ensure the quality of planning, hierarchical qualification authorization and management are implemented for urban

and rural planning entities. Relevant departments primarily consider factors such as the legal entity qualification, registered capital, number of professional technical personnel (including senior professional titles in urban and rural planning and other fields, intermediate professional titles in urban and rural planning, etc.), number of registered planners, compliance with requirements for computer graphic input-output devices and software, and office space area [5]. Based on these factors, urban and rural planning entities are granted three levels of qualifications: Class A, Class B, and Class C. The scope of their business activities is determined according to their respective qualification levels.

With the continuous development of the economy and society, the importance of credit systems in evaluating and assessing enterprises, organizations, and individuals has become increasingly prominent. Incorporating a quantifiable and traceable credit system into the management and qualification assessment of urban and rural planning entities injects new energy into their overall planning and development. The application of big data technology also facilitates the streamlined and optimized collection and analysis of various indicators in the traditional credit system. It brings about new quantifiable indicators that were difficult to achieve with traditional techniques and enables real-time tracking and updates of credit indicators.

### **3.1. Big Data Empowers Traditional Credit Evaluation Indicators**

Traditional credit evaluation indicators are typically collected through manual investigations and questionnaire surveys, which are time-consuming, labor-intensive, and often limited by sample size. However, with the help of big data technology, investigators can access a much larger volume of data from sources such as social media, transaction records, and publicly available data. This large-scale data collection not only provides a more comprehensive range of information types but also significantly shortens the time required for data collection, enabling more timely and effective credit assessments.

Furthermore, big data technology can provide more accurate credit evaluation results by conducting an in-depth analysis of traditional credit evaluation indicators. Traditional analysis of credit data and information often relies on statistical methods and empirical judgments, which are subject to certain subjectivity and limitations. In contrast, big data technology can leverage algorithms such as data mining, machine learning, and artificial intelligence to conduct in-depth exploration and analysis of large-scale credit data. By uncovering hidden patterns and trends in the data, investigators can establish more accurate credit evaluation models, thereby improving the precision and reliability of credit assessments.

Additionally, big data technology can introduce new measures and dimensions to traditional credit evaluation indicators, enriching the scope and content of credit assessment. Through the analysis of credit big data, big data technology can identify new correlated evaluation indicators beyond traditional metrics. For example, the level of online activity of key personnel in a company or their propensity for online shopping. These new indicators can provide a more comprehensive reflection of an individual's or organization's credit status, helping investigators better understand the credit risks and reliability of the subjects being evaluated.

### **3.2. Big Data Brings more Accurate New Credit Evaluation Indexes**

For urban and rural planning entities, traditional credit evaluation indicators are often limited to historical and written financial data and project completion status, making it challenging to assess the credit level of these entities comprehensively. However, the application of big data technology, with its data analysis and mining capabilities that traditional methods lack can provide more accurate and novel credit evaluation indicators for urban and rural planning entities.

For example, leveraging the development and application of big data technology, investigators can use the volume of business for urban and rural planning entities at specific times or points

as a new credit evaluation indicator. By collecting and analyzing data on the number, scale, and completion status of projects, big data analysis techniques can objectively assess the operational activity and business capabilities of urban and rural planning entities. These data reflect the workload and capacity of the entities during specific periods, providing more accurate and real-time references for credit evaluation.

Additionally, big data technology can reveal potential credit risks of urban and rural planning entities. By analyzing historical data, market dynamics, and information from external data sources, big data technology can identify risk factors and credit issues that urban and rural planning entities may face. The identification of these potential risks helps investigators assess the credit reliability and stability of the planning entities more accurately and provides decision-making authorities with more comprehensive credit-based decision-making grounds.

### **3.3. Big Data Makes it Possible to Track and Update Credit Evaluation Indicators in Real Time**

Traditional credit evaluation indicators often rely on historical static data and periodic reports, which cannot reflect the latest credit situation of urban and rural planning entities in a timely manner. However, the introduction of big data technology offers a new solution by enabling real-time tracking and updating of credit evaluation indicators.

By integrating data from various channels and sources, including unit systems, project management platforms, market monitoring data, and social media, big data technology, empowered by the Internet, can obtain real-time data on the operational status, business activities, and reputation of urban and rural planning entities. This allows credit evaluation indicators to be updated in a timely manner, providing a more accurate reflection of the latest situation of the planning entities.

Moreover, big data technology can identify potential credit risks of entities in real-time through continuous analysis and monitoring. By monitoring unit data in real time and conducting model analysis, big data technology can timely detect abnormal situations and negative credit behaviors. For example, regarding the progress of projects, the use of funds, and quality issues of urban and rural planning entities, big data technology can conduct real-time tracking and analysis, promptly identifying risks and providing early warnings to management personnel, thereby reducing losses associated with credit risks.

## **4. Modeling of Credit Rating System for Urban and Rural Planning Preparation entities**

### **4.1. Selection of Credit Evaluation Indicators**

Based on the research of relevant credit evaluation systems and indicators in other industries, this study adopts a theoretical analysis approach. It refers to the "Qualification Management Regulations for Urban and Rural Planning entities" issued by the Ministry of Housing and Urban-Rural Development of the People's Republic of China in 2012 [5] and conducts interviews with professionals in the relevant fields. Based on this, the study summarizes three levels: one primary indicator, three secondary indicators, and twelve tertiary indicators. Moreover, through interviews with experts and practitioners in the field, the study assigns weights to different indicators, resulting in the credit system model for urban and rural planning entities in the context of big data based on the current situation in Nanjing [6] (see Table 1).

This approach aims to ensure the accuracy and reliability of the research. By integrating theoretical analysis and field interviews, it can fully consider the actual situation and needs of urban and rural planning entities in terms of qualification management and credit evaluation.

Furthermore, by referencing the experience and standards of relevant industries, the study can guarantee the coherence and comparability of the research results with existing systems.

**Table 1.** Credit System Model For Urban and Rural Planning Preparation entities

Primary Indicators	Secondary Indicators		Tertiary Indicators	
	Element	Weights	Element	Weights
Credit assessment of town and country planning preparation entities (100)	Basic information on the unit	27.03	Amount of registered capital of the unit (in millions of dollars)	6.25
			Area of physical office space of the unit (square meters)	7.78
			Number of persons contributing to social insurance in entities (person)	6.65
			Unit uptime (years)	6.35
	Financial status of the unit	33.87	Average annual operating income per unit (last five years) (in millions of dollars)	7.87
			Average annual unit cost expenditure (last five years) (in millions of dollars)	8.12
			Average annual profitability of entities (last five years) (Percentage)	9.33
			Average annual profit growth rate per unit (last five years) (Percentage)	8.55
	Unit creditworthiness	39.10	Unit credit line of credit (in millions of dollars)	11.22
			Status of legal proceedings in the unit	10.83
			Industry and public reputation of the organization	9.88
			Implementation of unit social responsibility	7.17

By constructing the credit system model for urban and rural planning entities in the context of big data, regulatory authorities will be able to grasp better the credit status and comprehensive capabilities of planning entities. This model allows for a detailed evaluation of specific entities based on their basic information, reputation, credit status, and online evaluations, among other aspects. Additionally, through the application of big data technology, these indicators can be tracked and updated in real-time, providing decision-makers with more timely and accurate credit evaluation information. This promotes the credit management and development of urban and rural planning entities.

## 4.2. Determination of Credit Ratings

By weighting different scores and calculating the credit scores of urban and rural planning entities according to the weights, it can serve as a reference for regulatory authorities in the qualification rating of planning entities. Based on relevant policies and existing research, this study proposes a four-level rating system for urban and rural planning entities:

Level 1: A Grade (score greater than or equal to 90), eligible for granting Class A qualification.

Level 2: B Grade (score greater than or equal to 75), eligible for granting Class B qualification.

Level 3: C Grade (score greater than or equal to 60), eligible for granting Class C qualification.

Level 4: D Grade (score less than 60), not recommended for granting qualification.

These rating criteria are based on strict score divisions and evaluation systems, aiming to accurately assess the credit status and comprehensive capabilities of urban and rural planning entities. By weighing and calculating various indicators, it is possible to determine the qualification rating for different levels objectively, providing a basis for regulatory authorities to make informed decisions.

The establishment of this rating system is of significant importance in further standardizing the evaluation and supervision of urban and rural planning entities by regulatory authorities. It not only accurately measures the credit level of the target entities, helping regulatory authorities gain a better understanding of their qualifications and performance, but also provides clear development directions and goals for the planning entities themselves, urging them to improve their credit levels and comprehensive capabilities continuously.

## 5. Conclusion

This paper focuses on the application of credit system construction in urban and rural planning entities under the backdrop of big data. By analyzing the development and practical application of big data technology in the field of credit evaluation, it reveals its improvements and innovations to traditional credit evaluation indicators. Based on a case study in Nanjing, this study constructs a credit system model suitable for urban and rural planning entities and proposes a three-level rating standard, providing a scientific evaluation basis for regulatory authorities. In conclusion, the application of big data technology in the credit evaluation of urban and rural planning entities has significant research significance. It provides new ideas and methods for credit system construction and evaluation, further emphasizes the accuracy and practicality of indicators, and promotes the enhancement of the development and governance capabilities of urban and rural planning entities.

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