The Construction and Application of a Big Data-Based Enterprise Performance Evaluation System

Ting Xie

School of Management, Northwest Normal University, Lanzhou, Gansu, China

Abstract: In today's era of information explosion, data has become an important basis for enterprise decision-making. With the rapid development of information technology, the concept of big data has gradually gained widespread acceptance, and its applications across various industries have become increasingly widespread. Enterprise performance evaluation, as a crucial component of enterprise management, plays a significant role in enhancing management efficiency, optimizing resource allocation, and strengthening market competitiveness. However, traditional performance evaluation systems are often limited to financial indicators and fail to comprehensively reflect a company's actual performance. Therefore, exploring a big data-based enterprise performance evaluation system has become a hot topic in the field of enterprise management. This paper aims to discuss the application trends of big data in enterprise performance evaluation, construct a big data-based performance evaluation system, and analyze its application effects in enterprise performance evaluation, with the hope of providing new insights and methods for enterprise management.

***Keywords*:** big data; enterprise performance evaluation system; construction; application

1. Introduction

Big data refers to data sets that cannot be captured, managed, and processed using conventional software tools within a certain time frame. It is a massive, rapidly growing, and diverse information asset that requires new processing models to enable stronger decision-making, insight discovery, and process optimization capabilities. Big data has four characteristics: volume, velocity, variety, and value. In this era of explosive data growth, big data has become an important strategic resource for enterprises and is of great significance for improving the accuracy and efficiency of enterprise performance evaluation. [1]

2. Trends in the Application of Big Data in Performance Evaluation

With the rapid development of information technology, the application of big data in performance evaluation has become increasingly prominent. On the one hand, big data has made the sources of performance evaluation data more diversified, no longer limited to traditional financial statements and internal management systems, but expanded to external data sources such as social media, customer feedback, and market trends. This diversified data collection method provides enterprises with a more comprehensive and objective perspective on performance evaluation. On the other hand, the application of big data technology has made performance evaluation more real-time and dynamic. With the help of advanced data analysis tools, companies can monitor changes in various performance indicators in real time, promptly identify potential issues and risks, and take corresponding adjustment measures. This real-time performance evaluation method not only improves the accuracy and efficiency of evaluation but also enhances the company's adaptability and market competitiveness.[2] Additionally, big data has promoted the intelligence and automation of performance evaluation. By constructing intelligent performance evaluation systems, companies can automatically collect, process, and analyze data to generate performance evaluation reports, significantly reducing the burden of manual operations. At the same time, intelligent systems can also automatically adjust evaluation models and parameters based on historical data and business rules to adapt to the ever-changing market environment and business needs.

3. Building a Big Data-Based Performance Evaluation System

3.1 Data Collection and Integration Strategy

In building a big data-based performance evaluation system, the data collection and integration strategy is a critical step. First, companies need to identify data sources, which may include internal systems such as ERP and CRM, as well as external data platforms such as market analysis reports and social media data. The diversity of data requires companies

to have cross-platform and cross-format data integration capabilities to ensure the comprehensiveness and timeliness of data. During data integration, data cleaning and standardization are the foundation for ensuring analysis quality. This step may involve handling missing values, outliers, and unifying naming and measurement standards across different datasets. Additionally, the implementation of data security and privacy protection strategies is an indispensable part of this phase to comply with data protection regulations such as GDPR.

To transform massive amounts of data into actionable insights, companies can use data lake or data warehouse technologies to convert raw data into structured business reports or data models [3]. For example, IBM's Watson Analytics platform provides such functionality, helping companies integrate multi-source data and perform preprocessing to prepare for performance evaluation. In data integration strategies, data modeling and the identification of data relationships are key to enhancing analytical value. By establishing connections between data, new factors or patterns influencing performance can be identified.

3.2 Data Preprocessing and Quality Control

The preprocessing stage involves cleaning the raw data, including removing duplicate values, filling in missing values, and correcting data entry errors to ensure the accuracy of subsequent analyses. For example, in the financial industry, due to the large volume and real-time nature of transaction data, even minor errors in the data can lead to serious biases in performance evaluations. Quality control is more complex, requiring the establishment of strict standards to assess data suitability. This may include data integrity checks, consistency verification, and the identification and handling of outliers. For example, when technology companies conduct product R&D performance evaluations, they may need to integrate internal R&D data with external market feedback data. Data quality control ensures that data from different sources can be effectively merged and provide consistent analysis results.

3.3 Quantification and Weighting of Performance Indicators

In the construction of a big data-based performance evaluation system, the quantification and weighting of performance indicators are core elements. Quantification involves converting abstract performance metrics into measurable and comparable numerical values to more objectively reflect a company's operational status (e.g., through specific metrics such as sales growth or customer satisfaction scores). Weighting involves assessing the importance of different metrics, which directly impacts the accuracy of the final performance score. In practice, methods such as the Analytic Hierarchy Process (AHP) or Fuzzy Comprehensive Evaluation Method can be used to determine weights. For example, expert scoring methods can be employed to collect evaluations of indicators from multiple stakeholders, including senior management and department heads. These feedback inputs are then analyzed using AHP's hierarchical structure to determine the relative weights of each indicator. Additionally, data-driven methods like Principal Component Analysis (PCA) can be used to identify key drivers and reduce the interference of redundant indicators on decision-making.

During the weighting process, changes in internal and external environments should be considered, and weights should be adjusted regularly. For example, when the market environment shifts from growth-oriented to competitive, it may be necessary to increase the weights of indicators such as cost efficiency and customer retention to adapt to the new competitive landscape. At the same time, companies should ensure transparency in the weighting process to enhance employees' acceptance and trust in performance evaluation results [4].

3.4 Selection and Development of Big Data Analysis Models

The selection and development of big data analysis models is a core component in building a performance evaluation system based on big data. At this stage, companies need to select appropriate analysis models based on their business characteristics and data resources to uncover the deeper value of their data. For example, predictive analysis models can be used to forecast future performance trends (such as predicting sales through time series analysis), or association rule learning can be used to uncover hidden relationships between different business metrics. Additionally, machine learning algorithms such as decision trees, random forests, or deep learning networks can be applied to complex performance evaluation scenarios to automatically identify key factors influencing performance (e.g., determining key indicators affecting employee performance through feature importance ranking). During model development, the interpretability, stability, and real-time capabilities of the model should be fully considered to ensure that performance evaluation results provide timely and accurate decision-making basis for management. During model application, data quality and security are critical considerations. During the data preprocessing stage, data cleaning, missing value handling, and outlier detection must be performed to ensure the accuracy of the analysis. Additionally, companies should establish strict data security and privacy protection mechanisms, comply with relevant laws and regulations, and ensure the compliance of big data analysis.

4. Application of Big Data in Enterprise Performance Evaluation Systems

In the field of science and technology, a new paradigm of enterprise performance evaluation driven by big data has been widely applied. For example, technology companies can collect and analyze user behavior data, product R&D data, and market feedback information to more accurately assess key performance indicators such as product innovation, market penetration, and R&D efficiency. For example, Google uses big data to analyze user search behavior, optimize algorithms, and improve advertising effectiveness, thereby achieving continuous performance improvement. Additionally, the application of data analysis models such as data mining and machine learning algorithms enables technology companies to predict market trends, adjust strategies in a timely manner, and enhance market competitiveness [5].

In the financial industry, big data plays a crucial role in risk assessment, customer relationship management, and fraud prevention. For example, banks and fintech companies utilize big data technology to analyze customers' credit histories, transaction behaviors, and social media data to more accurately assess credit risks. For instance, Ant Financial's Sesame Credit uses big data analysis to provide users with credit scores, helping financial institutions make more informed lending decisions. Additionally, big data-driven real-time monitoring systems can promptly detect abnormal transactions, enhance anti-fraud capabilities, and ensure the stable operation of the financial system [6].

In the retail industry, big data is used to optimize supply chain management, enhance customer experience, and promote sales growth. By analyzing sales data, inventory information, and consumer feedback on social media, retailers can more effectively predict demand, reduce inventory backlogs, and launch targeted promotional campaigns. For example, Amazon uses big data to analyze consumer shopping habits, enabling personalized recommendations that improve conversion rates and customer satisfaction. In addition, big data combined with IoT technology, such as smart shelves, can monitor product inventory in real time to ensure the efficient operation of the supply chain.

These industry practices demonstrate that big data has not only changed the way companies evaluate performance, but has also revolutionized strategic decision-making, enhancing market adaptability and competitiveness. However, as data volumes increase, ensuring data privacy, data quality, and data security has become a new challenge. Companies need to continuously explore and refine their data management strategies to maximize the value of big data.

5. Conclusion

In summary, the construction and application of a big data-based enterprise performance evaluation system is a complex but highly promising field. Through carefully designed data collection and integration strategies, rigorous data preprocessing and quality control processes, scientific performance indicator quantification and weighting methods, and the selection and development of efficient big data analysis models, enterprises can construct a comprehensive, objective, and dynamic performance evaluation system. This system not only significantly improves the accuracy and efficiency of performance evaluation but also provides robust data support for corporate decision-making, driving sustained development and innovation. In the future, as big data technology continues to advance and application scenarios expand, a big data-based corporate performance evaluation system will play an increasingly important role, becoming a key driver for enhancing competitiveness and achieving sustainable development.

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Author Bio

Ting Xie (1988-), female, Han ethnicity, from Gangu, Gansu, PhD, Lecturer, Research Direction: fuzzy mathematics, rough set and its application research.