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Theoretical and Modeling Research on The Valuation of Data Assets

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Abstract: The era of big data has greatly accelerated the process of capitalization of data elements, and enterprises can fully release their intrinsic value and gain a foothold in the increasingly fierce market competition in the future only if they develop and utilize their data assets in a scientific and efficient manner. However, academic research on data assets is relatively small, and a unified and comprehensive theoretical framework has not yet been formed. How to objectively and accurately disclose the status of enterprise data assets and maximize the role of data assets in enterprise production and social development is a problem that enterprises need to solve urgently. Therefore, this paper further defines the concepts and characteristics of data and data assets on the basis of previous research, applies the traditional market method, income method, cost method, and innovatively borrows Chen model and artificial neural network model to measure the value of data assets, summarizes the challenges of data asset management, analyzes the problems of data assets in the process of applying them, and proposes appropriate It summarizes the challenges of data asset management, analyzes the problems of data assets in the process of application and proposes corresponding solutions, trying to provide a little reference for the practical handling of enterprise data assets in the era of digital economy as well as the theory and method of national economic accounting.

Keywords: Data assets, digital economy, valuation.

1. Introduction

1.1. Background to the selection of topics

1.1.1. A thriving digital economy

Entering the 21st century, the digital economy has gradually extended from the consumer Internet to the industrial Internet, and along with the cross-border and integration of industries, the digital economy has entered a fissile development stage. Countries have introduced strategies for the development of the digital economy, taking the digital economy as an important engine for economic growth. Not only that, with the emergence and rapid development of cloud computing, big data and other digital technologies, the rise of the digital economy has provided strong technical support. From the current point of view, digital technology is not only limited to the information industry, but also spills over into traditional sectors, accelerating the informatization process of traditional industries and giving rise to new production factors and business models. E-commerce, sharing economy and other new business models are springing up, further promoting the vigorous development of the digital economy. In China, the development of the digital economy has been elevated to a national strategy, and the government has vigorously promoted the construction of digital infrastructure, strengthened the protection and utilization of data resources, and encouraged digital technology innovation and talent cultivation, thus providing a strong guarantee for the healthy development of the digital economy and injecting new impetus into the prosperous development of the global economy.

1.1.2. Increasing value of data

In the era of digital economy, data is not only the basis for enterprise decision-making, market forecasting and product innovation, but also a key driver for economic development. Data assets can help enterprises understand market demand, optimize production processes, and improve operational efficiency, thus enhancing their competitiveness and innovation, so data has become an important economic resource. With the continuous progress of technology, the processing and analyzing ability of data has also been significantly improved, and the development of big data, artificial intelligence and other technologies enables us to process and analyze massive data more efficiently and accurately, and to tap the commercial and social value contained therein, which further releases and enhances the value of data. In addition, the cross-border integration and sharing of data has also promoted the enhancement of its value. In the economy and society, data from various fields can be interrelated and integrated, thus generating new value. For example, governments, enterprises and social organizations can share data to achieve the optimal allocation of resources and the precise provision of services, and promote the enhancement of social governance capacity and the improvement of public services. Finally, data can also help better understand and respond to the complexity and uncertainty of the economy and society. By analyzing data, we can reveal the inherent laws and trends of economic and social development, predict the future direction of development and challenges, and thus formulate more scientific and reasonable policies and measures to promote sustainable economic and social development. With the deepening development of the digital economy, the value of data will be further explored, injecting new vitality into the economy and society.

1.2. Significance of the selection

1.2.1. Review of existing research

Academic literature reviews on data assets have centered on a number of dimensions such as their definition, characteristics, classification, valuation, and applications.

At present, the rights, measurement, trading and application of data elements are still in their infancy, and there

are still many problems. In terms of the definition of data assets, most studies emphasize their commercial and economic value, considering them to be data resources that can help enterprises make smarter decisions, improve efficiency and create new business opportunities. These resources are non-physical in nature, i.e. they do not have a physical form, but their value can be realized through a tangible medium such as a computer. In terms of value assessment, academics have proposed a variety of valuation methods. The traditional cost method, market method and income method are widely used, but each method has its limitations. For example, the cost approach is difficult to reflect market supply and demand, the market approach is limited by sample size, and the income approach may be affected by subjective forecasting and uncertainty. Therefore, some studies have begun to explore novel valuation methods based on data characteristics, data quality, and data size to more accurately reflect the true value of data assets. In addition, the literature has explored the application scenarios of data assets. With the development of big data, artificial intelligence and other technologies, data assets are increasingly widely used in various fields, such as finance, healthcare, retail and so on. Data assets can not only help enterprises optimize operations and improve market competitiveness, but also promote social progress and innovation. In general, academic research on data assets is deepening and expanding, covering a variety of aspects such as definition, characterization, classification, value assessment, and application. With the continuous progress of digital technology and the wide expansion of applications, the importance and value of data assets will be increasingly emphasized.

1.2.2. Purpose of this paper

For the evaluation of data assets, the process of evaluating their value is relatively complex due to the characteristics of data assets that are different from those of traditional assets. Currently, there are fewer academic studies on data asset value assessment, and the existing studies have not yet formed a unified assertion. Based on this, this paper attempts to explore the value of data assets in the economic society and thus tries to complement and improve the existing national economic system. Therefore, the structure of this paper is arranged as follows, firstly, data and data assets are defined, and their importance as the core assets of enterprises is analyzed. Data assets not only include all kinds of data generated in the process of enterprise operation, but also cover data resources that can bring economic benefits to enterprises, with the rapid development of big data technology, data assets have become the key to the competitive advantage of enterprises. Secondly, this paper thoroughly researches the value assessment system of data assets, and proposes five valuation methods, namely, income method, market method, cost method, and Chen model and artificial neural network model, according to the characteristics of data assets different from traditional assets. Finally, this paper summarizes the challenges and future development trends of data asset management, analyzes the problems of data assets in the process of application and proposes corresponding solutions. With the continuous growth of data volume and technological progress, enterprises need to optimize their data management strategies to make full use of the value of data assets.

2. Data and Data Assets

2.1. Data development process

The concept of data and the definition of its production attributes are the first issues that need to be clarified in subsequent statistical accounting (Xu Xianchun et al., 2022). Nowadays, situated in the era of digital economy, data as an important production factor is gradually receiving more attention from scholars, and at the same time, with the progress of society and the development of science and technology, the concept of data is also evolving (Zhang et al., 2015). According to the definition of the International Organization for Standardization (ISO), data is an embodiment of information in a formal way for the purpose of being suitable for communication, interpretation or processing. The term data first appeared in the field of informatics as a subject-specific term, understood as everything that can be manipulated by a computer, which can be represented by a binary code and exists in the form of an information carrier that records and reflects objective facts (Han Xiulan,Wang Sixian. 2023). Data first came to the forefront as early as 1865 when Devens introduced the concept of business intelligence. Subsequently Farboodi and Veldkamp (2021) explored data in depth, analyzing it from both broad and narrow perspectives. In the broad sense, data refers to information generated by measurement and statistical activities that can be used for exploration and planning, while in the narrow sense, data is a series of "0", "1" characters, information stored in the form of bits that can be computed and analyzed. Cai Yuezhou and Ma Wenjun (2021), on the other hand, argue that data can be regarded as information in both the broad and narrow sense. Li Jingping (2020) defines data as undeveloped information, including data originating from the organization itself and data obtained from external units, and she believes that data is an objective existence, usually accompanied by a series of facts as well as observations that occur in economic and social activities. Luo Mei et al. (2023), in their latest study, based on previous research, categorized data as "binary-based, bit-expressed information with a relatively fixed form". Jinchang Li (2017) refined the structure and presentation of data, suggesting that data refers to structured data in digital form that can be manipulated, as well as unstructured data such as images, symbols, pictures, and videos. Tian Jaitang et al. (2020), on the other hand, argued that data cannot directly participate in production activities, but must first go through a series of steps, such as collection, integration, processing, and analysis, before it can be turned into information with production value. Similar to the study by Jietang Tian et al. and Xianchun Xu et al. (2022) creatively put forward the concept of data value chain on this basis, which explicitly explains how unstructured, low-value-density data can be transformed into structured, high-value-density data that possesses great business value or other greater and multiple uses, and expresses the observation that data can be used to support decision making in a digitized form that can be stored, transmitted or processed Results. In light of previous research and review of related materials, this paper summarizes data as a concentration of structured and unstructured information based on binary representations, and as a manifestation of the results of exploratory descriptions of human beings, from which knowledge and information can be extracted for use in future decision-making.

2.2. Classification of data

By the heterogeneous difference of data users, data in the economy and society can be categorized into three types, namely personal data, enterprise data and government data. Personal data are derivatives generated by individuals participating in social activities as social subjects, which are more fragmented and usually recorded in the network, smart terminals and other devices; enterprise data exist in the daily production and operation activities of enterprises, accompanied by procurement, production, warehousing, logistics, after-sales and other processes; and government data are mainly derived from various public utilities, such as public transportation, health care, education, etc., which have certain Welfare and public welfare. In terms of external form, according to different forms of expression, there are mainly structured data and unstructured data, the former mainly refers to traditional data with fixed formats and rules, while the latter mostly refers to data without fixed formats and specifications, represented by images and videos. From the current point of view, most of the existing data in China are unstructured data, and reflect the 3V characteristics of large volume, variety and velocity.

2.3. Characterization of data

Nowadays, data is not limited to the traditional function of data carriers, but as a production factor that needs to be invested in daily production like traditional production factors such as land, technology, capital and labor, and integrated with specific businesses, so as to drive the improvement of the efficiency of business processes and ultimately bring about economic benefits (He Wei, 2020). People gradually compare the importance of data resources for the era of digital economy with the importance of traditional oil resources for the era of industrialization (Han Xiulan, Wang Sixian, 2023), so that the asset characteristics of data have become more and more obvious, and at the same time, as a brand new factor of production, the data factor presents many different characteristics compared with the traditional factors of production. Combined with the concept and connotation of data mentioned above, this paper further explores its data attributes, so as to more comprehensively and systematically recognize the concept of data and data assets, and we believe that the characteristics of data mainly include six points: non-competitiveness, virtuality, non-depletion, timeliness, uncertainty of value, and relevance to application scenarios.

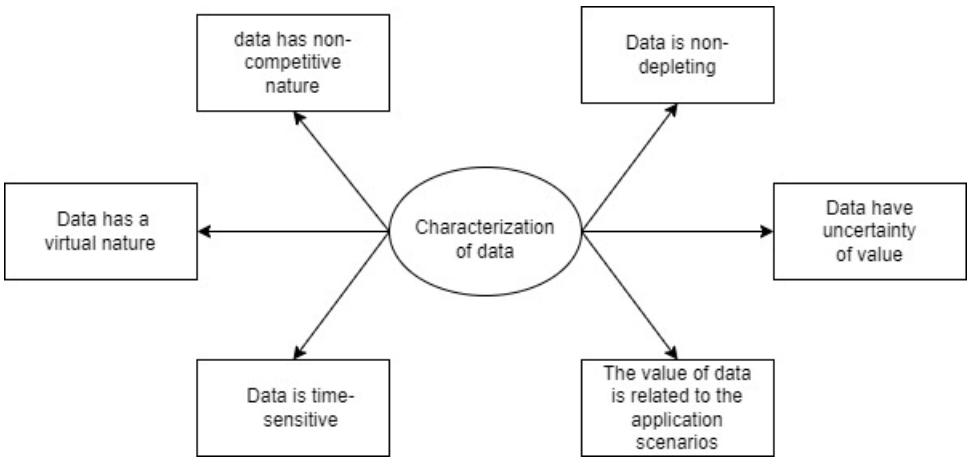

Figure 1. Characterization of data

2.4. Data assets

2.4.1. Research history of data assets

Nowadays, data has become an important strategic resource with an increasing status in economic life, and has been called the "oil mine of the 21st century". In order to better play the enabling role of data assets and maximize the value of data assets, academics have been paying more attention to this issue and fully studying it. From the research history, foreign scholars Richard first put forward the conceptual framework of data assets, Niekerk (2006) exploratory research on data assets on this framework, he believes that data assets are the text or media with the right to use, which are formatted as binary source code. With the development of informatization and digitization,the times are changing and the definition of data assets is also evolving.Toygar et al. (2013) expanded the attributes of data assets based on Niekerk and pointed out that data assets should also be stored in terminal devices such as computers as well as digital media and the cloud.Ribarsky (2019) proposed that in order to be recognized as a data asset, three criteria are to be satisfy three criteria: firstly, the revenue criterion, which means that it can bring economic value to the data owner, secondly, the production attribute, which requires that the data asset needs to be accompanied by the production process of the enterprise, and lastly, the time principle, which means that the data needs to be used for more than one year, and it is necessary to satisfy these three points at the same time in order to be initially determined as a data asset. In recent years, Chinese scholars have also conducted in-depth research in the field of data assets and achieved fruitful results. Liu Xuguang (2020) conceptualized data assets and divided the characteristics of data assets into four parts, which are legally acquired, generated by enterprises or individuals, have the potential to bring economic value, and must be current data resources. Xu Xianchun (2022), on the other hand, defines data assets as data that have application scenarios and have been used repeatedly or continuously for more than one year in the production process, based on two considerations: clear economic ownership and having a beneficial nature. Some accounting and informatics scholars also define data assets based on their specific fields, and Li Jingping (2020) believes that as long as the two conditions of clear economic ownership and bringing benefits to its economic owner are met, it can be accounted for as a data asset. Liu Yu (2014), on the other hand, analyzes the value of data assets and believes that data assets are a collection of data that bring economic

benefits to enterprises through the process of data mining. Liu Qi (2016) evaluates data assets through the market approach and proposes that data assets are multi-source data that are accumulated from user information, difficult to recognize the physical form, and have commercial value.In 2018, the China Academy of Information and Communication Research officially released the White Paper on Data Asset Management Practices (2.0) version and defined data assets as data owned or controlled by an enterprise that can bring the enterprise economic benefits, and are recorded physically or electronically as data resources.

2.4.2. Definition of data assets

Based on the above analysis, based on the definition of "asset" by the Ministry of Finance of China and the conceptual description of "asset" in the 2008 SNA, and combining the views of different scholars at home and abroad, this paper grasps the connotation of data and assets, and makes a comprehensive understanding and definition of data assets from the perspective of four conditions that need to be met by data assets. In this paper, we grasp the connotation of data and assets, and make a comprehensive understanding and definition of data assets from the four conditions that data assets need to fulfill, and define data assets as data resources that are owned or controlled by individuals or enterprises, whose costs can be accurately measured, whose usage period is more than one year, and which are expected to bring economic benefits to the data owners.

3. Measurement of Data Assets

As a new type of asset, data is characterized by virtuality, non-depletion, and value uncertainty, and it is very difficult to measure its value accurately and correctly, so the academic community has not yet formed a unified value assessment system (Yating Zhao, 2022). At present, the value assessment of data assets is largely based on the measurement of intangible assets in accounting, which is mainly based on the market method, income method, and cost method. Based on the above three traditional measurement methods, this paper creatively draws on Chen's valuation model, takes into account the timeliness and accuracy of the dataset, the application scenarios, and the heterogeneity of the users, and constructs a data asset value assessment model based on the data that can be easily measured in practice, trying to accurately reflect the value of data assets. The asset value assessment model attempts to accurately reflect the current value of data assets. Secondly, this paper also constructs a preliminary artificial neural network model to estimate the characteristic function of data assets with a large number of inputs, so as to try to objectively and accurately evaluate the value of data assets, and ultimately help the future development of digitalization of enterprises.

3.1. Market approach

The value of the object should be determined by its market price valuation (SNA 2008). Simply put, the market approach is to estimate the value of the target asset by directly or indirectly comparing the recent transaction prices of data assets with the same or similar characteristics in the current market. Two prerequisites are needed to value data assets using the market approach: firstly, data assets can be traded in the open market, and secondly, they need to be comparable (Li Yonghong et al., 2018). Therefore, the market approach can be used to measure all the data that enterprises obtain from third-party data trading platforms.

The big data industry has been developing rapidly in the past decade. in 2014, the Zhongguancun Digital Sea big data trading platform was officially launched, which opened the precedent of China's big data trading, and in 2015, China's first big data exchange, Guiyang Big Data Exchange, was also officially listed for operation. As the Chinese government attaches more and more importance to the digital industry, the Central China Big Data Exchange, the East China Jiangsu Big Data Exchange Center, and the Harbin Data Exchange Center have been established one after another, and other big data trading platforms and trading systems around the country continue to be planned and constructed, so that in the next few years, data assets can be disclosed and traded more openly and transparently in the market. At the same time, with the increasingly frequent number of transactions, the rapid growth of the transaction volume, and the increasing expansion of the type of transactions, there are more and more cases of the same, similar and comparable data asset transactions available, so it is more and more reasonable to utilize the market approach to assess the value of data assets, and the results of the assessment are more and more objective and real (Liu Qi et al., 2016).

However, at the same time, since the attributes and characteristics of enterprise data assets are not exactly the same as those already available and referenced in the third-party data trading market, it is necessary to make a certain degree of price corrections based on the corresponding indicators and to finalize the value of the data assets.

The basic formula for the market approach is therefore as follows:

$$V=\frac{[\sum_{i=1}^{n}(V_i\times\alpha_i)]}{n} \quad (1)$$

where V is the value of the enterprise data asset, n is the number of similar referenceable data assets selected in the third-party data trading platform, and V_i is the market price of the reference object, and α_i is the finalized adjustment factor for the reference object by combining various factors.

3.2. Income approach

Compared to the market approach, the income approach requires discounting calculations according to the expected income generated by the data asset in the future (SNA 2008), and the value of the data asset can be obtained by discounting and summing up the income that the data asset is expected to earn over its future useful life through the discount rate (Li Yonghong and Li Jinrui, 2017). Using the income approach to measure the value of data assets also needs to meet two conditions: first, the data assets will be continuously used and create value in the future, and second, the value that the data assets bring to the data owner can be accurately measured (Wei Bizhou, 2023). Therefore the income approach is suitable for situations where the data asset category of an enterprise is more specialized and can be easily identified.

The basic formula for the income approach is as follows:

$$V=\sum_{t=1}^{n}\frac{R_t}{(1+i)^t} \quad (2)$$

where V is the value of the data asset being evaluated, n is the expected useful life of the data asset.R_t is the value of the data asset under appraisal,and i is the discount rate.

3.3. Cost method

Significantly different from the above two methods, the cost approach is to sum up the costs incurred in the process of production and application of data assets to obtain the value of data assets (Xu Xianchun et al., 2022). Accounting for the value of data assets using the cost approach mainly includes the following aspects: first, in the early stage of data collection and processing, i.e., the cost of ultimately obtaining the data asset, such as the cost of obtaining the data through external purchases, terminal capture, on-site surveys, manual collection, and the distribution of questionnaires, etc.; and second, in the stage of data storage, which includes the cost of the factors, such as the labor and capital, that are invested in data during the storage stage. . Since data is virtual in nature and needs to be stored in a certain medium, a series of costs invested in the process of storage are also included in the costing in addition to the cost of data storage. Specifically it is divided into the following three aspects, the first is the cost of direct data storage, such as the cost of using database systems, servers or clouds, and the cost of storing data in a suitable format; the second is the cost of intermediate inputs related to data storage, such as the cost of specialized technicians in the process of data storage to regularly update the system as well as the cost of operating and maintenance expenditures; and lastly, the cost of media used in the process of data storage Finally, it is the service cost of the media used in the process of data storage, such as the capital service cost of storage, access, licensing, security monitoring and a series of services provided by computers, industrial Internet and database management systems such as the cloud in the operation of the whole life cycle of the enterprise; thirdly, in the stage of data analysis and application, firstly, it includes the cost of direct inputs on the aspects of data mining, in-depth analysis, validation, and application to modeling analysis of specific scenarios in order to deeply excavate the information in the data. First, it includes the cost of direct investment in data mining, in-depth analysis, validation and application of modeling analysis to specific scenarios in order to deeply explore the information in the data, such as the labor cost of data analysts and the cost of training algorithms through machine learning. At the same time, it also includes intermediate inputs incurred in the data analysis and application phases, such as the cost of software licenses related to data analysis and the cost of software tools used (purchased custom analytics software, software licenses, and open-source R and Python languages, etc.); fourthly, in addition to costs incurred in the process of producing and applying data, the total cost of data assets also includes costs that directly contribute to the data production process, such as the cost of data analyst labor and the cost of training algorithms through machine learning. include the costs that act directly on the data production process, the apportionment of indirect costs, and the capitalized expenditures on self-developed data assets. Specifically, this includes costs directly attributable to the production of data, as well as indirect costs such as finance costs, management costs and manufacturing costs that are indirectly attributable to the production of data and can be accurately apportioned between the production of data and other different production and business activities. In addition, for data assets developed by the enterprise itself, it is necessary to aggregate the costs related to the data production process, such as collection, storage, processing and application, to determine whether they belong to the research stage of the expensed expenditures, or belong to the development stage of the expensed expenditures or capitalized expenditures, and, finally, to uniformly allocate the part that can be capitalized and include it in the cost of data assets.

The basic formula for the cost method is as follows:

$$V=C_0 +\sum_{i=1}^{n} C_i \quad (3)$$

where V is the value of the firm's data assets accounted for using the cost method, and C_0 is the initial data preparation costs incurred by the enterprise in the data collection phase, and C_i is the cost of all intermediate inputs and corresponding expenses incurred by the enterprise in all stages of data production and application.

3.4. Chen model

Chen's data asset value assessment model takes the degree of use and novelty as the two main features affecting the value of data, and this paper argues that the value affecting data assets is affected by the four aspects of timeliness, accuracy, application scenarios, and heterogeneity of users at the same time, and constructs a data asset value assessment model based on the above four influencing factors on the basis of Chen's research results, which is defined as the Chen model.

Borrowing from Chen, the model also divides the evaluation period into equal parts in terms of timeliness, with the part closer to the evaluation period being given more weight, and the accuracy being measured by the value density of the data asset and the joint determination of both the buyer and the supplier. Since the same data asset is often used in different scenarios to generate different values, data with more diverse applications are recognized as having greater value to the buyer of the data asset, and are therefore given greater weight. Similarly, the method of use and the purpose of use varies with the subject of use, and generally speaking, specialized agencies and professionals in specific fields utilize the same data more efficiently, and the more value the data exerts, so the difference in user heterogeneity can be defined by the criterion of whether the user is a specialized agency and professional, and corresponding weights are assigned according to the types of different data users. Therefore the basic formula of Chen's model is as follows:

$$V_t(d)=\sum_{i=1}^{N_t}[n(i) \times f(u_i(d)) \times f(v_i(d)) \times f(w_i(d))] \quad (4)$$

Where N_t is the number of equal-length portions into which it is divided, and $n(i)$ denotes the strength of the timeliness of the data asset in part i, and $f(u_i(d))$, the $f(v_i(d))$ and $f(w_i(d))$ denote the standardized value measures of accuracy, application scenario heterogeneity, and user heterogeneity of data assets in part i, respectively.

3.5. Artificial neural network model

Artificial neural network originates from the basic principle of neural network in biology, simulating a mathematical model of the human brain nervous system on complex information processing mechanism, and now it is widely used in estimating unknown functions with a large number of inputs and outputs, with faster processing speed and stronger fault tolerance, and powerful self-learning ability and self-applicability at the same time. This paper innovatively applies the artificial neural network model to the data asset value assessment system, inputs a series of

indicators affecting the value of data assets, such as data timeliness, completeness, heterogeneity of value density, heterogeneity of scale, heterogeneity of source, heterogeneity of type, accuracy, etc., into the artificial neural network model, and finally inputs the fair value of the data (market value) and historical cost of the data (intrinsic value) to the output, to obtain the most scientific and accurate estimate of the value of the data. Finally, the fair value (market value) and the historical cost (intrinsic value) of the data are output to get the most scientific and accurate data asset valuation results.

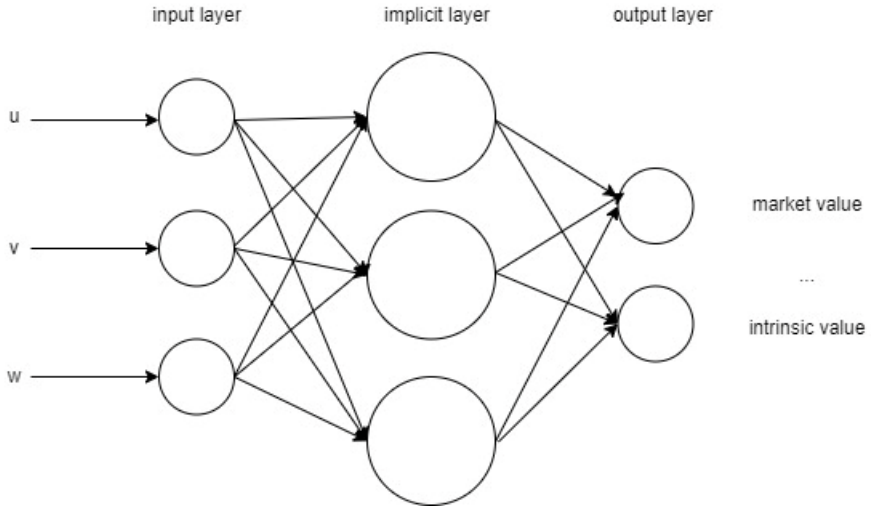

Figure 2. Artificial neural network model

4. Problems That May Exist in The Application of Data Assets

Despite the detailed discussion of the connotation and value assessment methods of data assets in the previous section, data assets may still have many problems in the process of application. First, the security and privacy protection of data assets face serious challenges. With the development of big data technology, the scale and complexity of data assets continue to increase, and the sensitive information involving personal privacy and business secrets is also becoming more and more abundant; however, the current data security protection measures are not yet perfect, and the risks of data leakage, illegal access and misuse are still high, which seriously restricts the safe utilization and full release of the value of data assets.

Secondly, the quality and accuracy of data assets need to be urgently addressed. In practical applications, data assets often suffer from missing, erroneous and duplicated data due to irregularities in data collection, processing and storage. This not only affects the effectiveness of the use of data assets, but also may lead to biased data-based decision-making, which can lead to serious consequences.

Furthermore, there is an urgent need to improve the efficiency and standardization of data asset management and operation. At present, the data asset management system is not yet sound, and there are still many deficiencies in key aspects such as catalog management, classification management and metadata management of data assets. In addition, the operation level of data assets is relatively low, and the lack of effective data sharing and trading mechanisms limits the mobility and utilization of data assets.

Finally, the legal and regulatory constraints on the application of data assets and compliance issues should not be ignored. With the deepening of the application of data assets, the lagging of relevant laws and regulations has gradually come to the fore, and there is a lack of clear legal provisions for the protection of the rights and interests of data assets, such as ownership, use, and income. This, to a certain extent, hinders the compliant application of data assets and increases the risk of data asset application.

In summary, the problems that exist in the application of data assets involve security and privacy, quality and accuracy, management and operation, and laws and regulations. In order to solve these problems, it is necessary to conduct in-depth research on the characteristics and laws of data assets, strengthen technological innovation and institutional construction, and promote the safe, efficient and compliant application of data assets.

5. Enterprise Data Management Strategy

Developing an effective data management strategy is key for organizations to ensure data quality, security, and enable data-driven decision making. First, define business goals and needs. Before formulating a data management strategy, enterprises need to define their business objectives, strategic direction and data management needs, and deeply understand the needs and use of data in various departments to ensure that the data management strategy can support the overall development of the enterprise; second, formulate a data governance framework. Second, formulate the data governance framework to clarify the organizational structure of data management, division of responsibilities and decision-making mechanisms, to ensure that the data governance framework is consistent with the enterprise strategy and business objectives, to provide strong support for data management. Third, data standardization and classification. Formulate data standards, including data formats, naming conventions, quality standards, etc., to ensure data uniformity and comprehensibility, and classify data into different categories according to business needs and data characteristics for easy management and use. Fourth, data quality management. Establish a data quality management system, including data cleaning, validation, integration and

other processes, to ensure the accuracy, completeness and consistency of the data, and conduct regular data quality checks and assessments to identify and solve data quality problems in a timely manner. Fifth, data security management. Develop a data security management system, including data encryption, access control, backup recovery and other measures to ensure data security. Carry out special treatment for sensitive data, such as desensitization and anonymization, to prevent data leakage and abuse. Sixth, data sharing and collaboration. Establish a data sharing mechanism to promote the flow of data and collaboration between departments within the enterprise, and encourage employees to actively use the data to provide strong support for business decision-making. Seventh, technical support and tool selection. According to business needs and technology development trends, select appropriate data management tools and technologies to ensure that technical tools can support the implementation of data management strategies and improve data management efficiency and quality. Eighth, training and culture construction. Strengthen data management training for employees to improve their data awareness and skill level. Create a data-driven corporate culture and encourage employees to actively utilize data for business innovation and development. Ninth, regular assessment and adjustment. Regularly assess the implementation of data management strategies and make adjustments and optimizations based on the assessment results. Pay attention to industry developments and technological changes, and update data management strategies in a timely manner to adapt to new business needs and market environment.

By formulating and executing an effective data management strategy, enterprises can better manage and utilize data resources to provide strong support for business development. At the same time, the formulation and implementation of data management strategies also help to enhance the competitiveness and market position of enterprises.

6. Conclusions and Outlook

6.1. Conclusion

With the development of information technology, data has become a new type of resource necessary in the future economy and society, and the promotion of the circulation and trading of data elements is a major trend in the future development of the industry. In recent years, as the construction of China's big data trading platform and trading market continues to advance, the importance of data assets has become more and more apparent, and data capitalization is a necessary path for the development of the digital economy.

This paper first explores the background characteristics of the digital economy era and proposes the concept of data, based on previous research, as a concentration of structured and unstructured information based on binary expressions that can be collected, stored, analyzed, and applied, and as an embodiment of the results of man's exploratory descriptions of things, from which knowledge and information can be obtained for future decision-making. Next, this paper summarizes the classification and characteristics of data, and defines data assets as data resources owned or controlled by individuals or enterprises, whose costs can be accurately measured, whose useful life is more than one year, and which are expected to bring economic benefits to the data owner, according to the regulations of the Ministry of Finance and the SNA's overview of data assets. After defining the concept, three common data asset valuation methods, namely market method, income method and cost method, are proposed, and Chen model and neural network model are innovatively borrowed to measure the value of data assets, and finally, the problems that may exist in the process of applying data assets are elaborated in detail, as well as the data management strategies that can be adopted by enterprises to cope with such problems.

6.2. Research outlook

As a brand-new production factor, capitalizing data and incorporating it into national economic accounting is an inevitable requirement for the construction of enterprise digital intelligence and the high-quality development of the economy and society in the future. At the same time, data assets are a concrete embodiment of the digital economy era, and the inclusion of data into assets for measurement will have a far-reaching impact on the capital stock of the whole country and region as well as the future accounting of the gross national product. However, from the current point of view, the development of data assets in China is not mature enough, constrained by external resources such as existing data platforms, information technology, diversified talents, and a series of challenges in corporate governance and corporate culture, etc. Meanwhile, the selection and application of some assessment methods have yet to be perfected, and need to be further crossed over from the theoretical world and applied to the practical world. In addition, how to legally and accurately authenticate data, how to formulate scientific rules for transaction pricing, how to supervise and evaluate the process of data transactions, and how to safeguard the privacy rights of data owners ..... These issues still need further research and improvement in the future.

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