Exploration and Research on the New Mode of Enterprise Innovation and Development Based on Big Data Analysis Technology

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Abstract. The power mechanism of continuous innovation is one of the main mechanisms constituting the continuous innovation mechanism of an enterprise, and it is also an important magic weapon for the enduring of the enterprise. It is the guarantee for innovative enterprises to acquire lasting core competitiveness and carry out continuous innovation. For enterprises to achieve innovation continuously over a longer period of time, the most important thing is to have a continuous innovation drive. Therefore, according to the characteristics of continuous innovation, exploring the power mechanism of innovative enterprises and establishing a model of the power mechanism of continuous innovation of innovative enterprises play an important role in further improving the power of continuous innovation and lasting core competitiveness of innovative enterprises. This paper analyses and researches the new development of enterprise innovation mode based on the development background of big data technology, and builds a new enterprise development mode using computer algorithms, which provides new development ideas for the development of enterprises.

Keywords: Big Data Context; Sustainable development; Innovative models; linear development

1 INTRODUCTION

Digital technology represented by cloud computing, big data, edge computing, artificial intelligence, digital twins, etc. is the key driving force for the iterative upgrading of new industries and new models, promoting data integration, resource flow and value sharing, and realising configuration optimisation, efficiency enhancement and social synergy [1] [2]. Big data enables the deep mining of massive data and promotes the transformation of data resources into valuable information, and a large number of application services have been carried out in the optimisation of production, reduction of energy consumption and precision marketing. Edge computing enables data to be processed locally, reduces cloud transmission mileage, enables faster data processing and analysis, and improves the efficiency of application services. [3].

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2 SUPPORT VECTOR MACHINE FUNDAMENTALS

2.1 Linear support vector machines

Figure 1 shows the classification problem in two dimensions, the red and green points represent the positive and negative class samples respectively, L0 and L1 in the figure can directly separate the two classes of samples, in higher dimensions that split the different classes of samples are known as linear classification hyperplanes, which are collectively referred to as being linearly divisible in this case [4][5].

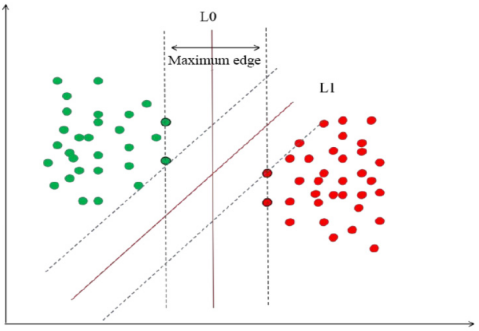

Fig. 1. Schematic diagram of the linear hyperplane.

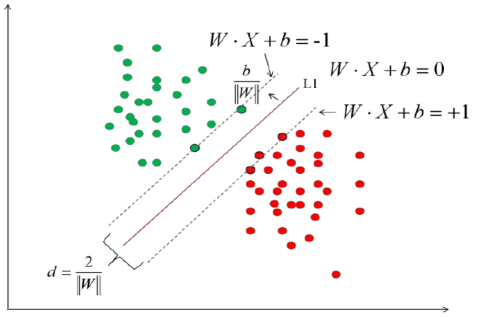

Fig. 2.. SVM optimal hyperplane

As shown in Fig. 2, assuming the existence of two linearly separable data classes, +1 and -1, and the sample points are represented by a vector X, theX consists of n eigenvalues, and the SVM classification hyperplane can be represented by equation (1):

$$f(X) = W \cdot X + b \tag{1}$$

where W is the normal vector that determines the direction of the optimal hyperplane, b is the bias value, and W and b together determine the location of the optimal classification hyperplane.

When Eq. 1 is equal to 0, it indicates the best classified hyperplane; the red dots can be represented by $f(x) \geq 1$ and the green dots can be represented by $f(x) \geq 1$.

2.2 Nonlinear support vector machines

SVM solves nonlinear problems by introducing kernel function $K(x_i, x_j)$. As shown in Fig. 3, when the sample points cannot be directly segmented linearly, they can be mapped to a higher dimensional space by means of a kernel function to obtain hyperplanes that space the samples apart [6].

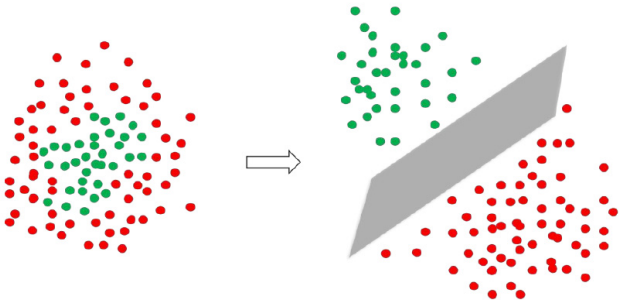

Fig. 3. Schematic of the samples after kernel function mapping

After kernel function mapping equation (2) is expressed as:

$$\begin{cases} max \sum_{i=1}^{n} \alpha_i - \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \alpha_i \alpha_j y_i y_j K(X_i, X_j) \\ st. \sum_{i=1}^{n} \alpha_i y_i = 0, \alpha_i \geq 0, i = 1,2,\cdots,n \end{cases} \tag{2}$$

The above equation (2) is common for several kernel functions $K(x_i, x_j)$.

The BTSVM algorithm is a multi-classification model based on binary tree SVM. Each node in a binary tree uses a binary SVM classifier for decision making [7]. It recursively divides the dataset into two classes at each node until it reaches the leaf node. This method requires a total of C-1 SVM classifiers to be constructed, it does not need to go through C-1 classifiers each time to decide on the unknown samples as the DAG-SVM algorithm does, which greatly speeds up its classification speed and the BTSVM algorithm is able to classify all samples [8].

2.3 A brief introduction to the importance of business model research

Business model research refers to the analysis and study of an enterprise's business model, exploring how the enterprise creates and captures value through multiple aspects such as products, services and customer groups. Business model research is one of the keys to enterprise development and competition, and its importance is mainly expressed in the following aspects:

Helping enterprises identify strengths and weaknesses. Business model research can help enterprises understand their own strengths and weaknesses, find differentiation

points with competitors, formulate corresponding development strategies, and improve the competitiveness of enterprises.

Provide enterprises with effective development strategies. Business model research can help enterprises understand the market demand and competitive environment, predict market trends and changes, so as to formulate corresponding development strategies and improve the enterprise's market share and profitability.

Improve user experience and loyalty. Business model research can help enterprises understand user needs and behaviours, optimize product design and service processes, improve user experience and satisfaction, and thus increase user loyalty and reputation.

Promote enterprise transformation and innovation. Business model research can help enterprises understand industry trends and development direction, explore new business models and business opportunities, promote enterprise transformation and innovation, and promote the sustainable development of enterprises.

In today's globalised economy and rapidly changing market environment, the study of business models has become increasingly important. With the development of digital technology and the Internet, traditional industries are facing unprecedented challenges and opportunities, and enterprises need to constantly innovate and adjust their business models in order to survive and develop in the fierce competition.

Therefore, business model research is not only about the development and competition of enterprises, but also a profound reflection and exploration of the economy and society, which is of great significance in promoting economic development and improving social welfare.

2.4 Evaluation indicators

(1) Acceleration ratio

The speedup ratio is used to indicate the improvement in the efficiency of the algorithm after it is parallelised, assuming that T_α denotes the running time of the algorithm in a standalone environment and T_β denotes the running time of the algorithm in a clustered environment, then the speedup ratio is calculated as follows:

$$S_{spectup} = \frac{T_\alpha}{T_\beta} \tag{3}$$

where a larger $S_{speedup}$ indicates a better parallelism of the algorithm.

(2) Classification accuracy F-measure

Classification precision,F-measure results are determined by the accuracy precision and recall recall of the algorithm, itcan accurately reflect the classification effect of the algorithm, the higher the value of F-measure, the better the classification performance of the algorithm. The calculations are shown below:

$$F - measure = \frac{(\delta^2+1)precision*recall}{\delta^2(precision+recall)} \tag{4}$$

Where the accuracy precision and recall recall are calculated based on the confusion matrix in Table 1 as follows:

$$precisin\ n = \frac{TP}{TP+FP} \tag{5}$$

$$recall = \frac{TP}{TP+FN} \tag{6}$$

Table 1. Confusion matrix

Predicted true value	Positive	Negative
Positive	true positive (TP)	false negative (FN)
Negative	false positive (FP)	true negative (TN)

3 BASIC FRAMEWORK FOR INCENTIVES FOR CONTINUOUS INNOVATION IN INNOVATIVE FIRMS

The enterprise system is the incentive to the internal enterprise, the main body of the incentive is the enterprise, the object is all the enterprise employees, the incentive focus on entrepreneurs and innovative research and development personnel: scientific and technological progress, the market, the government's incentives to the enterprise is the incentive external to the enterprise, the main body of the incentive is the market and the government, the object is the enterprise[9] [10].The basic architecture is shown in Figure 4.

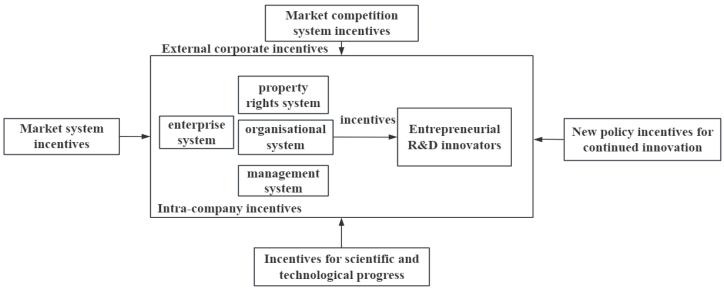

Fig. 4. Basic structure of continuous innovation incentive mechanism for innovative enterprises

4 CONCLUSION

A perfect enterprise management system not only ensures that the enterprise can select entrepreneurs with the spirit of continuous innovation and excellent R&D and innovation personnel, which provides a strong guarantee for the enterprise to carry out continuous innovation. And it also creates a favourable innovation environment for the company's R&D innovators, thus enabling them to innovate in a sustained manner. The improvement of the sustained innovation drive of innovative enterprises requires not only the improvement of the internal institutional structure of the enterprise, but also the support of the government's innovation policy. Improving the innovative enterprise

system and government policy system to create a favourable environment for sustained innovation is the only way to increase its motivation for sustained innovation.

REFERENCE

1. Ravat L ,Goujot H A ,Haudebert H S . Exploring how to develop data-driven innovation capability of marketing within B2B firms: towards a capability model and process-oriented approach [J] . Industrial Marketing Management, 2024, 118 110-125.
2. Wang, Xiaolu. Research on the transformation and development of corporate accounting and practice innovation model under the background of big data [J]. Business Watch, 2024, 10 (04): 65-68.
3. ZHOU Zhao,HUANG Bingbing. Analysis of innovation and development of enterprise management mode in the context of big data era [J]. Modern Business, 2023, (24): 83-86. DOI:10.14097/j.cnki.5392/2023.24.021.
4. Li Xiangyu, Zhong Hongwei. Research on the innovative development mode of enterprise accounting information quality under the background of big data [J]. China Collective Economy, 2023, (31): 137-140.
5. YANG Ling, LI Juqiang, JIA Meizhu. Business Model Innovation of Green Food Enterprises Helps High-Quality Development of Enterprise Economy--Review of Research on Business Model Innovation of Green Food Enterprises Based on Big Data [J]. Journal of Food Safety and Quality Inspection, 2023, 14 (10): 310. DOI:10.19812/j.cnki.jfsq11-5956/ts.2023.10.013.
6. Yan G ,Ma R . The Mechanism of the Role of Big Data Knowledge Management in the Development of Enterprise Innovation [J]. International Journal of Advanced Computer Science and Applications (IJACSA), 2023, 14 (6).
7. Qingyuan Y ,Shaorong X . The Relationship between the Political Connections and Green Innovation Development of Chinese Enterprises-Empirical Analysis Based on Panel Data of Chinese A-Share Enterprises. on Panel Data of Chinese A-Share Listed Companies [J]. Sustainability, 2022, 14 (20): 13543-13543.
8. Guy de Maupassant. Research on Human Resource Management in the Development of Green Food Enterprises--Review of Research on Business Model Innovation of Green Food Enterprises Based on Big Data [J]. Journal of Food Safety and Quality Inspection, 2022, 13 (10): 3397-3398. DOI:10.19812/j.cnki.jfsq11-5956/ts.2022.10.056.
9. Francisco Franco. Exploration of innovative development mode of enterprise human resource performance management in the era of big data [J]. Investment and Entrepreneurship, 2021, 32 (15): 144-146.
10. John Wilson. Innovation and development of enterprise management mode under the perspective of big data [J]. Rural Economy and Science and Technology