Advances in Mobile Security - Security, Privacy, and Digital Forensics for Mobile Systems and Networks

Lead Guest Editor: Chi Lin
Guest Editors: Raja Krishnamoorthi and Chang Wu Yu

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Retraction

Retracted: Study on Deep Learning Technology to Construct E-Commerce Industry Marketing Promotion Model

Security and Communication Networks

This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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[1] P. Gao and L. Zhao, "Study on Deep Learning Technology to Construct E-Commerce Industry Marketing Promotion Model," *Security and Communication Networks*, vol. 2022, Article ID 9958398, 11 pages, 2022.

Retraction

Retracted: Learning Behavior Based on Data Mining Technology

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[1] J. Wang, Q. Zhang, and M. Guan, "Learning Behavior Based on Data Mining Technology," *Security and Communication Networks*, vol. 2022, Article ID 6155704, 10 pages, 2022.

WILEY | Hindawi

Retraction

Retracted: Design and Management of Comprehensive Art Student Information Database from the Perspective of Internet plus Education

Security and Communication Networks

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(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

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[1] W. Liu and S. Wei, "Design and Management of Comprehensive Art Student Information Database from the Perspective of Internet plus Education," *Security and Communication Networks*, vol. 2022, Article ID 6494404, 9 pages, 2022.

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Retraction

Retracted: Method for Controlling Economic Management Cost in Enterprises Based on Coase Theorem

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[1] Z. Li, Q. Hu, and J. Huo, "Method for Controlling Economic Management Cost in Enterprises Based on Coase Theorem," *Security and Communication Networks*, vol. 2022, Article ID 3913087, 12 pages, 2022.

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Research Article

Method for Controlling Economic Management Cost in Enterprises Based on Coase Theorem

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In today's integrated economy, no country's economic development can be outside the international economic environment. After continuous and rapid development, China's economy has surpassed Japan's overall economic level and has become the second largest economic power in the world. But with the advent of the new normal economy in China, the economy has entered a stage of medium- and high-speed development, and business management and cost management of enterprises are also facing the transformation of strategies and systems. Every enterprise and company is trying its best to improve its own cost management system, business model, and cost management strategy. The development of science and technology and the advent of the era of information technology have gradually brought China's economic development into a green development track, which has put forward greater research topics for enterprise cost management. Therefore, the method for controlling economic management cost in enterprises based on the Coase theorem was proposed.

1. Introduction

With the continuous development of China's economy and the vigorous advancement of urbanization, the construction industry has ushered in a great opportunity for development and played a huge role in promoting the development of the national economy. Due to the increasingly fierce market competition environment, coupled with the characteristics of multiprojects, long fronts, and multifaceted construction companies, the profitability of the construction industry is getting lower. In this increasingly severe social environment, the key to the sustainable development of the construction industry is cost control [1]. In order to effectively improve the economic benefits of the construction industry, it is an indispensable means to comprehensively reduce corporate expenditures, improve management, and do a good job of cost control. This thesis mainly studies the cost control and management of engineering projects in the construction industry. Through in-depth analysis of the existing problems, related cost control and management theories are used

to analyze the cost control and management problems existing in the project implementation process, as well as the cost control problems, and propose improvement measures. Planning is the first step in cost control, which is the activity of recognizing and lowering corporate expenditures to boost profitability. Sustaining and profit maximization depend on preserving and reducing costs. Cost control aims to modify an operation via modifications and prediction, whereas cost management entails forecasting the economic operations of a firm or program. Fine and effective cost control and management methods can not only ensure the profit of the project but also control the completion time on the basis of ensuring quality. This is conducive to improving customer satisfaction with construction enterprises and is conducive to improving the overall competitiveness of the construction industry. Since the reform and opening-up, China's economy has developed rapidly, and all walks of life have grown vigorously. Before the reform and opening-up, the economic growth of enterprises was slow due to the planned economic system [2]. The reform and opening-up have revitalized

China's market economy and made the competition between enterprises more brutal. This has led to the disorderly development of many enterprises, the serious duplication of construction, the destruction of the environment, the overcapacity of various industries and the layoff of employees, and increased business risks. How the company develops and how it can mitigate risks and control costs are critical. We need to carry out systematic research and analysis on business management and cost management. Facing the current economic situation, we need to reexamine and recognize the cost control in the market economy and how to use financial analysis methods for cost control. Based on the current problems of enterprise cost management, we carry out targeted system research and propose corresponding solutions. The optimal management and control value of the financial cost of the enterprise is predicted in turn by the corresponding evaluation index system [3].

The rest of the structure is as follows: Section 2 describes the materials and methods; Section 3 shows the results of the enterprise's internal economy; Section 4 depicts the discussion part; Section 5 presents the conclusion.

2. Materials and Methods

Cost management is a key administrative technique for boosting competition and enhancing company outcomes. Cost-effectiveness is the primary goal of budgetary control, which, in reality, involves realizing the ideal balance between the expenses incurred and the outputs attained. Cost management is actually cost control, the purpose of which is to control cost expenditures, and the purpose of cost management is also to manage and control cost expenditures in the case of cost expenditures and to strengthen the supervision of costs [4]. The practice of organizing and regulating a company's operating expenses is known as cost management. In order to plan, anticipate, and manage costs are easier, it also involves gathering, evaluating, and summarizing financial information. The factors included in managing and controlling cost expenditures are cost variance, ROI stands for rate of return, utilizing checkpoints to monitor all expenditures, cost of supplies, employing modification control mechanisms, and cost of labor. Supervision and management are two systems in one process, so the understanding of cost management is that cost management and control need to be combined together, and cost expenditures should be made in accordance with prescribed standard conditions. Cost management is an important condition and implementation basis for cost reduction and profit for enterprises. Cost reduction will make products more affordable for people to purchase. Increased quantity of goods, efficiencies of large-scale manufacturing, increased income due to industrialization, and an overall increase in the standards of standard will result from this. If the costs are not controlled and managed, all business activities of the enterprise will be chaotic, and the use of various costs will greatly exceed the expected cost range, which will cause unnecessary losses to the enterprise [5]. Cost management can effectively reduce the amount of cost used during production or operation. The current market economic conditions are to reduce the cost of products and increase the sales volume of products. The higher the sales volume is, the lower the cost of the product is. As product prices decrease, market competitiveness continues to increase, so cost management is the basis and important condition for an enterprise to conduct business activities.

(1) Cost management can save unnecessary capital waste and reduce cost investment. The purpose of cost management is to reduce the cost investment of enterprises to a certain extent and reduce the use of costs. It is not just to reduce the purchase price of materials but to take the consumption of funds in the entire activity process, mainly in terms of human, material, financial, management costs, technical support, and other aspects of cost reduction. It is an act of saving various resources and an important basis for cost management [6].

(2) Cost management can improve the planning of the company's economic development system and business model and enhance its profitability. If an enterprise's operating model and economic development concepts are not perfect and cannot guide the enterprise to develop and profit, the existence of the enterprise will have no meaning, and cost management can reduce the cost.

(3) The business model and economic development system of the enterprise have been improved and improved. The practice of allocating and administering resources in a way that meets corporate overall design objectives is characterized as resource distribution. Allocating resources requires controlling physical assets like equipment to optimize the usage of delicate resources like intellectual resources. The growth of human resources can provide doors for raising everyone's standard of living in aggregate. This may be accomplished by enhancing the three factors that make up the Human Development Index (HDI), including raising per income levels, advancing in the education field, and lengthening the average lifespan. Only when the organizational structure of an enterprise is perfected, reasonable allocation and use will be made in the process of resource allocation and human resource use to enhance the profitability of the enterprise itself.

As the core element of management content, the construction and improvement of cost management should be strengthened. Cost planning, which computes expenses, has been a classic cost management technique in China. The arrival of modernized enterprises has improved and perfected the cost planning of Chinese enterprises. A series of cost systems, such as cost control, cost accounting, cost planning, and cost supervision, have been added to cost planning management to form the current cost management structure, as shown in Figure 1.
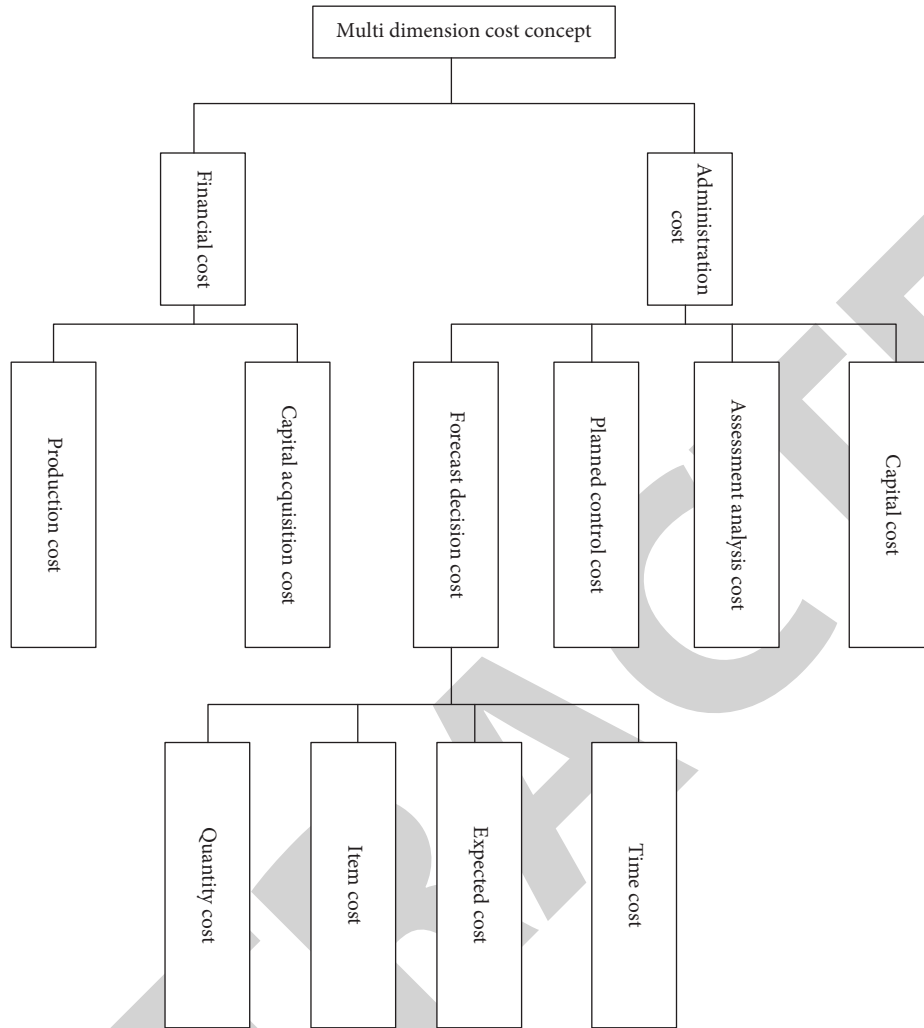
Figure 1: Economic management structure in the enterprise.

Economic management is the control over a group's or an organization's expenditures, supplies, revenue, and outlays. In emerging nations, economic management continues to be a significant issue. In these organizations, it allows for the best possible use of their limited resources and aids in attaining their objectives in the most effective way possible. No matter the research on cost management or the change in the economic system, the theory of cost management in China has made a breakthrough, and the cost management of each enterprise has entered a standardized and comprehensive cost management stage [7]. The research on cost management mainly focuses on the whole process of cost management control. Cost management is divided into several parts, and the index design of cost management is made at the same time. Cost management indicators include cost management objectives, cost budget, cost consumption, cost control plan, cost control measures implementation, cost management evaluation, and cost management report [8]. The purpose and result of cost management and control are reducing the production cost (product) of each project as much as possible and increasing the operating profit of the enterprise. The so-called cost management and control is to

use the minimum cost consumption to obtain the maximum profit, and the implementation of this process requires technical means and a standardized control system to control and support all activities of cost management and control [9].

Although the research of cost management theory has made a breakthrough, compared with foreign research theories, there are still many deficiencies in the research of cost management theory in China. Enterprise management is a concept that refers to contemporary enterprise resource planning (ERP) implementations that enable companies to handle crucial daily operations, including customer satisfaction, finance, inventory control, and human capital (CRM). The concept of enterprise management is relatively weak, which has a negative impact on the development of the whole enterprise and consumes a lot of enterprise costs. Therefore, driven by the new economic situation, the internal environment and market environment of enterprises have changed. Only by constantly improving the cost management theory and management concept and strengthening the construction of cost management system can the business development of Chinese enterprises

develop well and rapidly [10]. Therefore, combined with the theoretical basis of management, economics, finance, informatics, and other disciplines, based on the research results of scholars at home and abroad, we use the literature research method to analyze the current situation of cost management research and summarize the development stage of cost management [11]. Since it enables the investigator to evaluate the viability of inferences in the shape of a hypothesis prior to coming to any conclusions, an actual study is an essential technique for the comprehensive examination. An exploratory investigation is a method of looking into an issue that has not been properly examined or addressed before. It is often done to gain a deeper knowledge of the issue at hand, but it typically does not produce a definitive answer. This article makes a quantitative analysis of the theoretical research on cost management of Chinese enterprises using the empirical analysis method and summarizes the shortcomings of the theoretical research on cost management of Chinese enterprises. The cost management strategy of the enterprise is designed using normative research and exploratory research methods to fundamentally reduce the cost of the company [12].

3. Results

3.1. Prediction Algorithm of Enterprise Internal Economy. The development and application of technology in all aspects of people's life and modern social life have been inseparable from the development and use of information technology. However, in the embodiment of the technological development level of enterprises, the technological development level of various enterprises in China is still in a relatively backward stage, which has been unable to adapt to the current economic development mode. Therefore, the cost management technology of enterprises cannot be updated and improved, which is hindered by certain technological development factors. In order to improve the concept of cost management and strategic measures, cost management and control technology play a decisive role in the innovation of enterprise cost management technology. In order to develop and improve the technical level of cost management, it is necessary to constantly innovate and improve the technical level so that the cost management of the enterprise reflects the technical strategic measures and improves the operating profit of the company [13].

The forecast is made by the Coase theorem and Markowitz's financial system. In accordance with the Coase hypothesis, individual citizens (or businesses) are capable of negotiating a mutualistic, prosocial resolution in the context of market imperfections brought on by defects, provided that there are no costs implicated with the conflict resolution. In order to establish the optimum portfolio, Markowitz devised a method that enables investors to quantitatively balance out their appetite for risk and investment goals. Assuming that consumers are risk-averse, MPT favors a strategy with lesser incidence for a certain amount of return.

The theoretical basis is as follows:

(1) When economic managers consider each economic management choice, it is based on the probability distribution of earnings within a certain position time.

(2) The economic manager estimates the risk according to the expected rate of return.

(3) The economic management decision of the economic manager is only based on the expected income and the expected risk.

(4) At a certain level of risk, economic managers want the most profit, and correspondingly at a certain level of profit, economic managers want the least risk.

According to the above assumptions, Markowitz has established the calculation method and effective boundary theory of financial expected return and risk and established the mean-variance model of asset optimal allocation, which can be used to evaluate the overall performance of enterprise projects. Managers can use a mean-variance analysis as a technique to assist disperse risk throughout their portfolio. In it, the buyer calculates the risk of a commodity, which is represented by the "variance," and then contrasts it with the investment's probable yield. The objective of mean-variance maximization is to increase the return on an investment given its hazard. Consumers have accessibility to all the knowledge about the average return, variations, and conditional variance of shares or other commodities because markets operate effectively. Companies typically steer clear of unneeded chances due to their uncertainty. It can be expressed as follows:

$$\min \delta^2(Rp) = \sum \sum x_i X_j \mathrm{cov}(R_i - R_j), \tag{1}$$

where R_p is the financial portfolio income, R_i is the enterprise project income, X_i and X_j are the economic management proportions, $\delta^2(R_p)$ is the portfolio economic management variance (total portfolio risk), and $\mathrm{Cov}(R_i - R_j)$ is the covariance between the two projects. The model lays a foundation for the theory of modern enterprise economic management.

The model shows that under the limited conditions to solve the return rate of enterprises X_i to minimize the portfolio risk $\delta^2(R_p)$, it can be obtained through the Lagrangian objective function. Its economic significance lies in that the economic manager can determine an expected return in advance. The Lagrange multiplier technique in mathematics is a way to determine the localized maximal and minimal values of a variable that is subjected to equivalence requirements. The fundamental concept is to transform a limited issue into a format that still allows the equivalent analysis of an unrestricted situation to be used. Through the model, we can determine the economic management proportion of economic managers in each economic management project (such as a certain enterprise project or stock) so as to minimize the total economic management risk. Different expected returns have different minimum variance combinations, constituting the minimum variance set [14].

Although the first mock exam model provides a good tool for measuring the project risk and earnings accurately, the model involves calculating the covariance matrix of all assets. In the face of hundreds of optional assets, the complexity of the model restricts the practical application [15]. The establishment and operation of an enterprise are to obtain considerable economic benefits. In the process of creating economic profits, the most important thing for enterprise managers is marketing and cost reduction. Other management services are only to assist in marketing and cost-cutting activities to achieve better management efficiency and activity efficiency. Cost, as the basis and important guarantee of business development, is an essential cost factor for the survival and development of an enterprise. In the process of cost control, we should set up effective cost control indicators and measures and establish a perfect cost control management system. Jensen's alpha, sometimes referred to as Jensen's Performance Measure or ex-post alpha, is a measure of safety's anomalous appearance to its theoretically average return. It is a variation of the traditional alpha that relies on hypothetical outcomes as opposed to market indexes. Therefore, the Jensen index evaluation model is proposed [16]. The calculation formula is as follows:

$$J_i = R_i, t - [Rf, t + \beta_i(Rm, t - Rft)], \quad (2)$$

where J_i is the Jensen's performance index: Rm, t is the rate of return of market economy management portfolio in t period; Ri, t is the rate of return of enterprise i project in t period; Rf, t is the risk-free rate of return in t period; β_i is the system risk of enterprise project economic management portfolio. A portfolio is a combination of capital instruments, such as securities, contracts, assets, monetary, and marketable securities, such as closed-end vehicles and exchange-traded vehicles (ETFs).

Jensen's index is an absolute performance index, which indicates the difference between the economic management portfolio yield of enterprise project and the market economic management portfolio yield under the same system risk level. When the value is greater than zero, it means that the performance of enterprise project is better than that of market economy management portfolio. When comparing enterprise projects A and B, the larger the Jensen index is, the better is [17]. Jensen model lays the theoretical foundation of enterprise project performance evaluation. However, when Jensen's index is used to evaluate the overall performance of enterprise projects, there is an implicit assumption that the unsystematic risks of enterprise projects have been completely dispersed through the economic management portfolio. Therefore, the model only reflects the relationship between return and system risk factors. If the enterprise project does not completely eliminate the nonsystem risk, Jensen's index may give the wrong information. Whereas exponential extrapolation needs several more datasets, the regression model may be conducted with as little as two positions. This is because additional information points are needed for exponential analysis in order to guarantee that the information fits into a U pattern. By calculating the differential among the mean asset returns and the market returns of the uncertainty return through the overall portfolio beta, the Treynor ratio is determined. R_i is a symbol of the market's or asset's real return. Therefore, Treynor and Mazuy introduced the quadratic regression term into the model; Merton and Henriksson also proposed the double β value market model and further studied the stock selection ability of project managers and the time selection ability in the market application using the quadratic regression term and random variable term. The Treynor ratio is essentially a methodical risk-based risk-adjusted indicator of performance. It shows the value for money (ROI) for the level of risk taken by an investor, including individual stocks, investment account, or marketplace finance. Treynor is calculated as follows:

$$T_i = \frac{Ri - Rf}{\beta i}, \quad (3)$$

where T_i is the Treynor performance index, which is the average rate of return of enterprise project i in the sample period, and f is the average risk-free rate of return in the sample period. $Ri - Rf$ is the average risk premium of I enterprise project in the sample period. Treynor index indicates the risk-return relationship of each unit of coefficient risk. The evaluation method is to calculate the Treynor index of various enterprise projects and markets in the sample period and then compare them. The larger Treynor index means better performance [18]. The schematic diagram of $T - M$ model is shown in Figure 2.

In the operation of the above model, because the Treynor index is a relative performance measurement method, Jensen's index is an absolute performance measurement method based on risk adjustment, which indicates the project manager's accurate judgment ability of securities price under the condition of the complete risk level. Treynor index and Jensen index, when evaluating the performance of enterprise projects, measure the risk with β coefficients, only considering the size of excess return. When measuring the performance of enterprise project economic management, the breadth and depth of enterprise project economic management combination must be considered at the same time. Therefore, in terms of the selection of the operation model, Treynor's index model is more objective in evaluating enterprise project performance, and the Jensen index model is better for measuring the difference in enterprise project actual income [19]. The choice of these two models depends on the type of enterprise project being evaluated. If the evaluated enterprise project belongs to the enterprise project with fully decentralized economic management, the U value of the economic management portfolio can better reflect the risk of the enterprise project, so Treynor's index model is a better choice. With the use of software, buyers may transact with one another immediately in a decentralized market as opposed to doing so through a regulated market. Independent platforms include online marketplaces that employ cryptocurrency or other forms of decentralized money. Further, we standardize the internal economic estimation process of the enterprise. The specific process is shown in Figure 3.
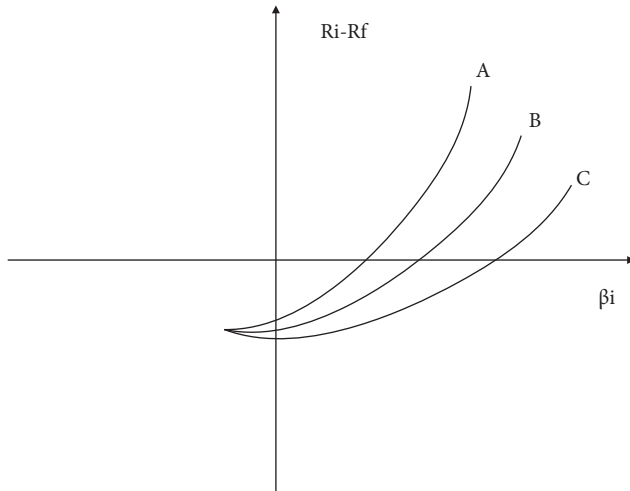
Figure 2: Schematic diagram of enterprise economic $T - M$ model.

Initially, the assessment objective was determined, then the decision unit is used to calculate to get the input and output indicators through the collection of fund data. Next, we choose the Internet of Things model to get the result. Enterprise organization and its structure belong to the structural management elements of enterprises and are the foundation and support system of value chain management. As the functional management elements of value chain management, workflow (including business process and information flow) must be attached to the enterprise organization and its structure through certain means and ways to operate effectively. In addition, strict project audit is an important link to reducing the cost of ships. Some projects need to be investigated on-site and know well about the difficulty of the project and the problems to be solved. The prices of additional items and quoted items are different, sometimes reaching 2-3 times the price. Too large additional items will not only increase the cost but also prolong the repair period or find reasons for the factory to delay the repair period. The effective way to avoid additional items is to make efforts to prepare the repair list and try to be thoughtful and perfect. In the maintenance process, how to arrange all maintenance items scientifically and make quick responses to temporary addition and subtraction items depends on the supervisor's ability. Therefore, it is an important way to save the repair cost to improve the professional quality and work communication ability of the supervisor.

As the main management and control personnel of business activities, enterprise managers play a very important role in the development of enterprises. According to the market survey, most of the managers of enterprises in China have little understanding of the market concept, lack of strategic thinking in the process of making a business strategy, and lack of in-depth understanding of the concept of enterprise cost management. The advantages of enterprise cost management include increased operational effectiveness, modern technologies, lower costs, and acknowledgment of the success of acquisition. In the process of cost
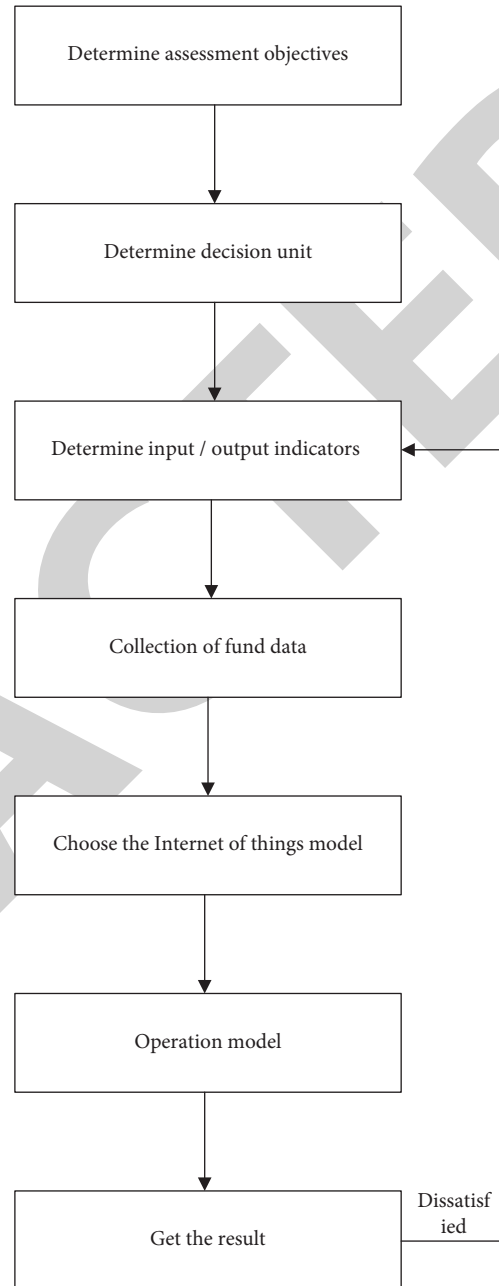
Figure 3: Prediction process of internal economy.

management and control innovation, managers do not have a correct understanding of the concept of cost strategy innovation, which hinders the cost management and control of the company. The company's cost is divided into fixed cost and variable cost. The quantity of merchandise generated determines the fluctuation in overhead expenses. Natural resources, labor, and fees are examples of variable expenses. Despite the level of manufacturing, fixed expenses stay constant. Leasing and property installments, coverage, and interest expense are examples of fixed expenses. Fixed cost is the cost that the company must pay in the process of production and operation, while variable cost generally refers to the increase or decrease of business cost, as well as

the payment of other things. Therefore, in the process of cost management and control innovation, we need to innovate from two aspects, namely, fixed cost management and variable cost management, and establish a perfect cost control innovation system and system construction and effectively reduce the cost of enterprises to achieve the company's cost management and control objectives and the company's overall operating profit objectives. We standardize the sales and management budget values as shown in Table 1.

The cost control information system serves the cost control and management of the whole enterprise. Its design is to establish a strategic cost control framework for the enterprise. The design of the cost control information system should be combined with the configuration of the company's existing electronic computer management system. For enterprises that have realized the internal computer network management, the design of the system can establish a subsystem that is connected with other subsystems and can realize the sharing of relevant cost information resources based on the existing internal network. At the same time, it is an information network composed of several subsystems. Its subsystems are distributed in different levels of management departments, and the terminals of the system are distributed to decision-makers, department heads, and departments with cost control tasks. For enterprises that have not yet formed a computer management system, the design of cost control information system can be considered together with the design of the whole operation management information system. The so-called cost measurement mode is a general concept, which refers to the theoretical expression and abstract generalization of the main characteristics of cost measurement in different cost management environments according to the system point of view. Therefore, the cost measurement model should be a dynamic and developing concept.

3.2. Measurement Algorithm of Enterprise Financial Cost.

Solvency refers to the ability of an enterprise to repay debts (including principal and interest) as they fall due. Solvency analysis includes short-term solvency and long-term solvency.

The current ratio is the ratio of current assets to current liabilities. It shows how many current assets there are for every one yuan of current liabilities of an enterprise as a guarantee of repayment, which reflects the ability of an enterprise to repay current liabilities with current assets that can be converted into cash in a short period of time. If the current ratio of the enterprise is A, the current assets are B and the current liabilities are C; the calculation formula is as follows:

$$A = T_i \sum \left(\frac{B}{C}\right) * 100\%. \tag{4}$$

The quick ratio refers to the ratio of quick assets to current liabilities. It is a measure of the ability of an enterprise's current assets to be immediately realized and used to repay current liabilities. Quick assets Z include monetary

TABLE 1: Cost budget.

Project	Amount of money
Selling expenses	25000
Salary of sales staff	10000
Advertising fee	10000
Freight	25000
Insurance premium	25000
Management expenses:	20000
Salary of management personnel	10000
Office expenses	4000
Business entertainment	1000
Staff training fee	1000
Insurance premium	4000
Expected cash expenditure for the whole year	45000
Quarterly average cash expenditure	1250

funds, short-term economic management, notes receivable, and accounts receivable that can be realized in a short time. The positive correlation of the ability to pay short assets is referred to as short-term investment management. An investment is considered temporary if it can be transferred and transformed into money within a year to cover a company's responsibilities. These resources include goods, debts, and money. If the frozen asset is E, the calculation formula is as follows:

$$Z = A\left(\frac{E}{C}\right) * 100\%. \tag{5}$$

Cash ratio Q refers to the ratio of cash assets to current liabilities. Cash asset R includes monetary capital, fair value measurement, and financial assets with changes included in current profit and loss. If the current liability is C', the calculation formula is as follows:

$$\text{rate}Q = Z\left(\frac{R}{C'}\right) * 100\%. \tag{6}$$

Cash flow liability ratio S is the ratio of net operating cash flow to current liabilities of an enterprise in a certain period of time. It can reflect the ability of an enterprise to repay short-term liabilities in the current period from the perspective of cash flow. If the annual net operating cash flow of the enterprise is T and the year-end current liabilities are D, the specific calculation formula is as follows:

$$(1 - 4)S = \text{rate}Q \sum \frac{T}{D} * 100\%. \tag{7}$$

The equity ratio W, also known as the capital liability ratio, refers to the ratio of the total liabilities G of the enterprise to the total owner's equity H. The calculation formula is as follows:

$$W = \sum \left(\frac{G}{H} - S\right) * 100\%. \tag{8}$$

Operation ability refers to the effect of the allocation of internal human resources and means of production on the realization of financial objectives based on the constraints of the external market environment. The turnover rate of accounts receivable Y reflects the speed of realization of

accounts receivable and the level of management efficiency. Inventory turnover rate L is not only an important index to reflect the liquidity of enterprise assets but also a comprehensive index to measure the efficiency of inventory operation in each link of enterprise production and operation. The turnover rate of current assets K refers to the ratio between the net income of the main business and the average total current assets in a certain period of time. It is an important index to evaluate the asset utilization rate of an enterprise. The turnover rate of fixed assets refers to the number of turnover times of fixed assets or the sales revenue supported by every 1 yuan of fixed assets in an accounting year. Total asset turnover X refers to the ratio of the net business income to the average total assets of an enterprise in a certain period. The calculation formula is as follows:

$$\Delta\alpha = \sum \frac{(Y + X + K + L)}{W - 1}. \tag{9}$$

The research methods of using various statistical comprehensive indicators to reflect and study the general characteristics and quantitative relationship of social and economic phenomena are analyzed. Take the DuPont analysis as an example, which is also called DuPont analysis system. This method of analysis was first used by DuPont company in the United States, hence its name. It is a comprehensive analysis and evaluation method of the financial status and operation status of an enterprise by using the internal relationship between several major financial ratios.

The purpose of enterprise organizational structure reconstruction is to provide system maintenance and guarantee for business process reengineering and to pursue continuous improvement. The transformation of the business process inevitably requires the organizational structure of the company to change from the original straight-line management mode to the process management mode, from focusing on functions to focusing on value-added. Further, the characteristics of the organizational structure of the program are analyzed, and the specific characteristics of management steps are as follows:

(1) The enterprise organization centers on the activity process rather than the functional department, and the cost control unit changes from the functional department to the process team (that is, the team composed of various functional personnel to complete a certain cost control work).

(2) The activities of each department are parallelized rather than operated in sequence and managed in a team way.

(3) The cost control work changes from simple to multifaceted; that is, the work changes from simple and detailed work to multifaceted work responsible for the whole process.

(4) Employees change from controlled to appropriately authorized, and decision points are placed in the process of work and match with the responsibilities of the process team.

(5) The organizational structure has changed from hierarchical to flat, and many responsibilities of managers have been transferred to process teams. There is no need for the middle manager to deliver information, and the responsibility of the senior manager has changed from supervision to guidance and support.

(6) Based on the principle of system thinking, this article emphasizes that management is oriented to business process, and the audit and decision-making points of cost control are located at the place of business process execution so as to realize the transformation from functional management to business process management and improve the response speed to customers and market.

(7) The focus of performance evaluation and compensation changes from activities to results, that is, to evaluate employees according to whether the results of work meet the objectives of the organization and whether the efficiency and quality meet the requirements.

The theory and method of enterprise value evaluation, strategic management, social relationship value, corporate finance, and performance evaluation system constitute the basic content of enterprise value management. The theory and method of enterprise value evaluation is the theoretical basis for the implementation of enterprise value management. It provides the goal and standard for enterprise strategic decision-making and defines the driving factors of enterprise value growth. The most important thing of strategic management is value creation, which has a great and long-term influence on the potential of value creation. There is a clear link between value creation and value promotion, as follows in Figure 4.

The enterprise value is calculated by discounting the free cash flow to investors according to the weighted average capital cost of the enterprise. If the cost of capital decreases, the value of the enterprise will increase, and the minimization of the cost of capital conforms to the strategic goal of maximizing the value of the enterprise. An effective management model generally has a complete performance evaluation system, which can ensure that all business activities are in line with the overall goal of value creation. Further, we establish the supplier evaluation files and related systems, and the specific steps are as follows:

(1) Determine the criteria for supplier network optimization: the most basic indicators for supplier evaluation should include the following: technical level, fuel quality, supply capacity, price, geographical location, reputation assurance, after-sales service, lead time, relationship with port, and rapid response capacity. After the evaluation system is established, the relevant functional departments can regularly assess and count the suppliers.

(2) Establish a strict purchasing system: establish a strict and perfect purchasing system, which can not only standardize the purchasing activities of enterprises,
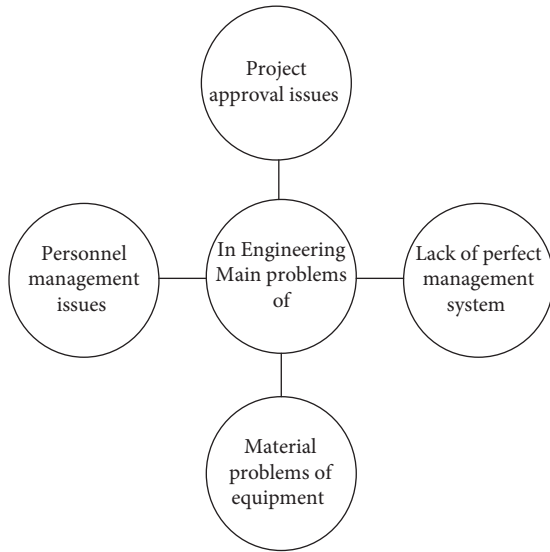
Figure 4: The relationship between value creation and value promotion.

improve efficiency, and put an end to the dispute between departments but also prevent the bad behaviors of purchasing personnel. The procurement system shall stipulate the procurement application, the approval authority of the authorizer, the procurement process, the responsibilities and relations of relevant departments, the provisions and methods of different specifications of procurement, the quotation and price approval, etc. For example, in the purchase system, it can be specified that the fuel to be purchased should be inquired, compared, and negotiated with the supplier, and then the selected supplier and its quotation should be filled in the purchase requisition. It can also be stipulated that more than three written quotations shall be attached to the procurement exceeding a certain amount for audit by the financial department or internal audit department.

(3) Establish a complete supplier file and access system: the formal supplier of the enterprise shall establish a file, which shall include not only the number, contact details, and address but also payment terms, oil supply terms, oil supply period, quality rating, and bank account number. Each supplier's file can only be filed after strict review. The purchase of an enterprise must be selected from the suppliers that have been filed. The supplier files shall be updated regularly or irregularly and managed by a specially assigned person. At the same time, a supplier access system shall be established. Suppliers can only enter after joint assessment. If possible, they should go to the supplier's production site for assessment. Enterprises should establish strict assessment procedures and indicators and grade the assessment questions one by one. Only those who meet or exceed the scoring standards can become filing

suppliers. On the basis of investigation and understanding of suppliers, select a group of suppliers with strong production capacity, high technical level, scientific management, and thoughtful service as the formal suppliers of the enterprise.

(4) Establish a price file and evaluation system: the purchasing department of an enterprise shall establish a price file for all purchased fuels. For the quotation of each batch of purchased raw materials, it shall first compare with the archived fuel prices and analyze the reasons for the price differences. If there is no special reason, in principle, the purchase price cannot exceed the price level in the file; otherwise, a detailed description shall be made. The price evaluation system shall be established and the price evaluation team shall be formed by relevant personnel. Regularly collect relevant supply price information to analyze and evaluate the existing price level, and evaluate and update the archived price file. Such a review may be conducted once a quarter or half a year, as the case may be.

4. Discussion

The above model is a regression model. Under the condition that the data used meet the normal distribution, we need to test the self-correlation of the residual items in the regression. In regression analysis, if the variables used have the nature of time series, there may be self-correlation. When the degree of self-correlation is very high, although the regression coefficient of estimation is more accurate, the standard error of parameter estimation is underestimated (the t-test value is overestimated) because MSE (mean of square error) may seriously underestimate the degree of change of error term. Therefore, it is necessary to test whether there is self-correlation between the error items in the early and later stages. Whether the autocorrelation coefficient P is equal to zero is tested by the Durbin–Watson test. If $P = 0$, the error item has no self-correlation; if $P \neq 0$, the error item has self-correlation. The statistics D can be obtained from the residual value calculated by the general least square linear regression, and two critical values DL and Du can be obtained by referring to the Durbin–Watson table. The inspection method is shown in Table 2.

It is assumed that the risks of the three financing portfolio schemes of the company are the same, and all of them can be accepted by the company. The combined cost of capital for these three funding portfolios can be calculated as follows:

The proportion of financing amount of various financing methods in scheme I is as follows:

Long-term loan: $10000 \div 26000 = 38.46\%$

Enterprise income: $12000 \div 26000 = 46.15\%$

Working capital: $4000 \div 26000 = 15.38\%$

Comprehensive cost of capital: $= 5\% \times 38.46\% + 15\% \times 46.15\% + 10\% \times 15.38\% = 10.37\%$

TABLE 2: Durbin–Watson table.

Assessment factors	Critical value
Positive correlation	0
No conclusion	D1
No self	A2
Negative correlation	D1
Negative correlation	A3
Self	T3

TABLE 3: Performance indicators of project capital control.

Project	Amount of money	Variable revenue as a percentage of sales revenue (%)
Operating revenue (10000 yuan)	230202	
Operating cost (10000 yuan)	157869	69
Business tax and surcharges (10000 yuan)	17600	7
Variable sales and management expenses (10000 yuan)	3816	13
Fixed sales and management expenses (10000 yuan)	25538	
Interest expense (10000 yuan)	241	
Asset impairment loss (10000 yuan)	1130	
Economic management income (10000 yuan)	126	
Operating profit (10000 yuan)	24617	
Nonoperating income (10000 yuan)	1645	
Nonoperating expenditure (10000 yuan)	344	
Loss on disposal of noncurrent assets (10000 yuan)	80	
Total profit (10000 yuan)	25917	
Income tax expense (10000 yuan)	4939	
Net profit (10000 yuan)	20978	

The proportion of financing amount of various financing methods in scheme II is as follows:

Long-term loan: 5000 ÷ 26000 = 19.24%

Enterprise income: 11000 ÷ 26000 = 42.31%

Working capital: 10000 ÷ 26000 = 38.46%

Comprehensive cost of capital: = 6% × 19.24% + 12% × 42.31% + 9% × 38.46% = 9.69%

The proportion of financing amount of various financing methods in scheme III is as follows:

Long-term loan: 8000 ÷ 26000 = 30.77%

Enterprise income: 7000 ÷ 26000 = 26.92%

Working capital: 11000 ÷ 26000 = 42.31%

Comprehensive cost of capital: = 7% × 30.77% + 20% × 26.92% + 12% × 42.31% = 12.62%

Through the comparison of scheme I, scheme II, and scheme III, it can be seen that the comprehensive capital cost of scheme II is the lowest, the financing combination of scheme II is the best financing combination, and scheme II is selected for financing; thus, the capital structure formed is the best capital structure. Based on this comparison of the economic management effect, the Kendall harmony coefficient can be used to test whether the ranking method of performance is reasonable or consistent for the performance of various enterprise projects in different periods and the same research period. After passing the Kendall concordance coefficient test, it can be only known that the ranking method of each enterprise project fund control performance

index is reasonable or consistent. According to this, the economic profit of the enterprise is calculated as shown in Table 3.

5. Conclusion

In today's market operation, the risk of enterprise cost management is ubiquitous and may occur at any time. If the cost management is not handled properly, it will lead to an increase in enterprise costs and the loss of financial operation. Enterprises need to take strategic measures to minimize the risk of operation and cost management. Compared with the western developed countries, the research of cost management and control in our country starts late. Most of the research on cost management and control is aimed at large-scale enterprises or listed companies. The cost management system of small and medium-sized enterprises is not so perfect, and some enterprises do not even have it at all. Therefore, we must attach great importance to this issue. Although the research of enterprise cost management in our country is just in the initial stage, there is a huge research space for the sustainable development of enterprises. It is of far-reaching significance to establish a perfect system of cost management to promote the rapid development of the market economy.

In the fierce market competition, enterprises cannot survive and develop without the development of technology, cost, marketing, internal management, and other aspects. Businesses must deal with the issues in this extremely competitive industry in a bid to expand.

Organizations now face a grow-or-die scenario due to fiercely competitive marketplaces, which has intensified and made the issue more serious. Facing the competition of many enterprises, cost advantage, service advantage, and brand advantage will become the key factors for the growth of enterprises, among which cost advantage is the most influential key link. Cost control is a systematic project, which needs the implementation of the enterprise management to make the concept of cost saving and cost reduction deeply rooted in the hearts of the people, and makes every employee consciously and actively carry out cost control. However, in reality, the cost control of enterprises is in self-management and a weak binding force. The management of business objectives is ineffective, which leads to the decline of corporate culture and cohesion. Many problems, such as insolvency, are mainly due to the lack of understanding of the management, failure to make a correct judgment on market changes, and failure to well position the market and effectively control costs because there is no good marketing model to increase revenue and no better solution for enterprises to get rid of business risks. The future of the enterprise is facing many difficulties, but marketing, cost control, and business innovation will be the cornerstone for the enterprise to rebuild its brilliance. Therefore, strengthening cost control will play an important role in the future operation and management of enterprises.

Procurement can be carried out by electronic information technology. Modern information technology and network technology are the technical basis of the value chain. The value chain should transfer not only the logistics and capital flow but also the information flow of customers. The competition in the modern social economy has been transformed from the competition between a single enterprise and a single enterprise into the competition between a value chain and a value chain. In order to succeed in the competition, the key point of all parties in the value chain is to realize the sharing and integration of information, which must rely on electronic information technology. With the rapid rise of the Internet, many enterprises use the Internet to carry out business activities. Companies can try to purchase fuel online.

Although the development of enterprises is facing many difficulties, we can evaluate the market and determine the development direction of enterprises through the analysis of the internal and external environment of enterprises. After the target is determined, in the cost management control, the internal system of the enterprise shall be supervised, the budget management and the target cost management shall be strengthened, the quota management shall be adopted for the production cost, and the enterprise cost and performance assessment shall be strictly implemented. It needs to fully seize the opportunity for market development, improve the supervision and management system of enterprises, and strengthen the operation of the internal management system. We should adhere to the path of innovation, change our ideas, and strengthen team management and corporate culture construction; only in this way can enterprises get rid of business difficulties as soon as possible and better promote the vigorous development of enterprises in the direction of full of vitality.

Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Retraction
Retracted: Learning Behavior Based on Data Mining Technology

Security and Communication Networks

This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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[1] J. Wang, Q. Zhang, and M. Guan, "Learning Behavior Based on Data Mining Technology," *Security and Communication Networks*, vol. 2022, Article ID 6155704, 10 pages, 2022.

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Research Article
Learning Behavior Based on Data Mining Technology

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With the release of the Education Informatization 2.0 Action Plan and the rapid development of learning analysis technology, educational data mining becomes a new research direction. Data mining can improve teachers' teaching methods and students' learning skills by acquiring information hidden in the educational data. Based on the learning behavior data of college students, this paper uses BP neural network, a data mining method, to predict their comprehensive evaluation results. The results show that there is a close relationship between students' learning behavior and their comprehensive scores. In addition, models of naive Bayes, logistic regression, and decision tree are established for verification and comparison. Compared with other models, BP neural network model has higher prediction accuracy and better performance. It can serve as an important basis to improve students' learning methods and teachers' teaching methods.

1. Introduction

In the "Age of Big Data," data are impacting all walks of life. Big data not only have a great potential in the business field but also change the education field. How to find, understand, and effectively use the information hidden in the massive educational data and analyze students' learning behavior have become a focus of research. Educational data mining (EDM), a technology to extract useful information from large-scale educational data, can not only promote personalized learning but also help teachers in decision-making, intervention, and improvement. The classification and prediction of student performance, graduation rates, and instructor achievement may all be done using educational data mining. Learners may choose programs more effectively and efficiently with its assistance, while instructors can evaluate the progress of students to enhance their instructional techniques.

In recent years, data mining of educational data has gained much attention in the research field. Jia-Jiunn et al. studied the path, browsing order, and study habits of e-learners and found out their learning styles to recommend related learning resources for students [1]. To improve the effectiveness of adaptive learning, Chellatamilan

et al. collected data from a web-based learning management system and predicted students' learning style via data mining [2]. Banu et al. used the social network to discuss various learning tools available online [3]. Their study aimed to increase students' educational awareness and improve their learning habit, knowledge-sharing habit, and academic performance.

With the technology of big data and data mining, teachers can assess students' learning behavior from a new perspective. They can observe students' learning levels, which were difficult to quantify before, and customize courses for students based on their needs. Big data help teachers select the most effective teaching method and thus improve their work efficiency. Although teachers' working method changes, their work will not be replaced by machines. Conversely, big data enable teachers to focus on comprehensive evaluation and improve the overall effectiveness. This paper analyzed 210 groups of data on college students' daily learning behavior. The data were handled with statistical analysis software and analyzed with modeling and data mining technology. Analytical results about students' learning behavior and factors that affected their learning effect were derived [4].

2. Concepts and Technologies

2.1. Definition of Learning Analysis. Learning analysis was first presented by EDUCAUSE in 2010 in the "Next Generation Learning Challenge." The Next Generation Learning Challenges (NGLC) program promotes a technologically assisted instructional approach to significantly raise college preparedness and graduation levels in the United States. By investigating new methods, technology, and avenues for academic achievement, NGLC is aiming to reimagine teaching. It was able to "predict and process students' learning behavioral trajectories with data and models" [5]. Siements, an expert in learning analysis, argued that learning analysis adopts intelligent data, student-generated data, and analysis models to tap the connection between information and the society [6]. It is a good way to predict learning behavior and give suggestions for adaptive learning. Learning analytics is the process of using these connections to improve e-learning settings, whereas educational information mining alludes to finding the correlations buried in massive data. Adding to the body of knowledge about potential tendencies for these ideas is among the objectives of the research [7].

Malcolm Brown held that learning analysis, with learning behavior as the focus, included five elements [8, 9]. They are data collection, data analysis, student learning, feedback, and intervention. Analysis results can be used by an individual student or a learning group and reported back to students, teachers, managers, and researchers. They are good materials for teaching intervention and for individual or institutional decision-making [10].

2.2. Data Mining. Data mining is an analysis step for Knowledge Discovery in Databases (KDD) [11]. Knowledge discovery in databases is to finding true, original, possibly helpful, and eventually intelligible trends or correlations inside a collection in systems is a difficult procedure that helps decision-makers. It describes the general process of finding information in information and places emphasis on the advanced uses of certain data mining methods. To accomplish the necessary information retrieval, several widely employed methods include visual elements, inductive, neural networks, and rule-based algorithms. Data mining, commonly referred to as knowledge discovery in databases, is the labor-intensive process of extracting latent, unknown-before details from datasets that may be beneficial. Data mining aims to uncover patterns and other valuable information by sorting through large data sets [12]. As a discipline of computer science, its techniques include statistics, online analysis processing, intelligence retrieval, machine learning, expert system, and pattern recognition [13, 14]. Typical data mining methods include decision tree, artificial neural network (ANN), support vector machine (SVM), and naive Bayes classifier.

The nonparametric unsupervised teaching method used for prediction and regression applications is the tree structure. It is organized hierarchically as well as has a cluster center, branching, intermediate nodes, and
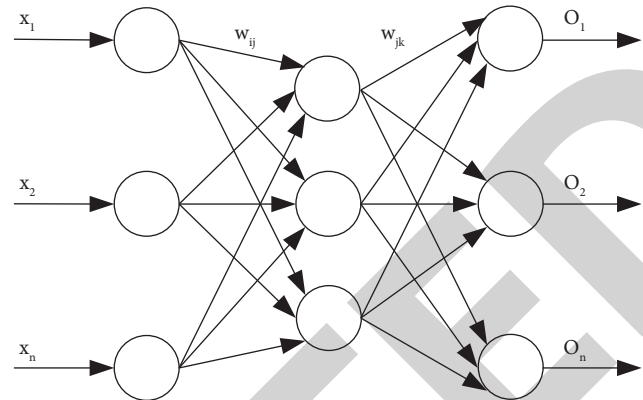
FIGURE 1: BP neural network structure.

connected by edges. A neural system is a combination of techniques that, by mimicking the functioning of the human brain, identify fundamental correlations in a piece of information. The artificial neural network (ANN) handles data similarly to how the human mind does. A controlled approach to machine learning called support vector machine (SVM) is utilized for both categorization as well as prediction. Although we often refer to recurrence concerns, categorization is the most appropriate term. Finding a higher dimensional space in an N-dimensional environment that clearly distinguishes the sets of data is the goal of the SVM method. It is a linear classifier built on the Bayes theorem and predicated on the idea of predicting independent. A naive Bayes classification, to put it simply, believes that the existence of one information in a category has nothing to do with the existence of any additional characteristic [15, 16].

2.3. BP Neural Network. Backpropagation is a gradient descent-based supervision training method for artificial neural networks. The approach determines the slope of the absolute error with regard to the components of the synthetic neural network provided an iterative method as well as a multilayer perceptron. BP neural network is a multilayer feedforward neural network. It is highly capable of data recognition and time series forecasting. BP neural network learning algorithm is trained according to the error back-propagation algorithm. It mainly includes forward propagation of signals and backward propagation of errors. A neuron's activity status is determined by an input signal. By employing easier numerical methods, it will determine the extent to which the neuron's contribution towards the system is significant throughout the probability model. Forward propagation of signals refers to the transmission of input signals to the output layer under various neuronal activation functions, while backward propagation of errors means that errors are propagated backward and are minimized by constant adjustment for connective weights and thresholds.

BP neural networks usually have three or more layers. There is no feedback or connections within a layer. The

FIGURE 2: Flow chart of BP neural network algorithm.

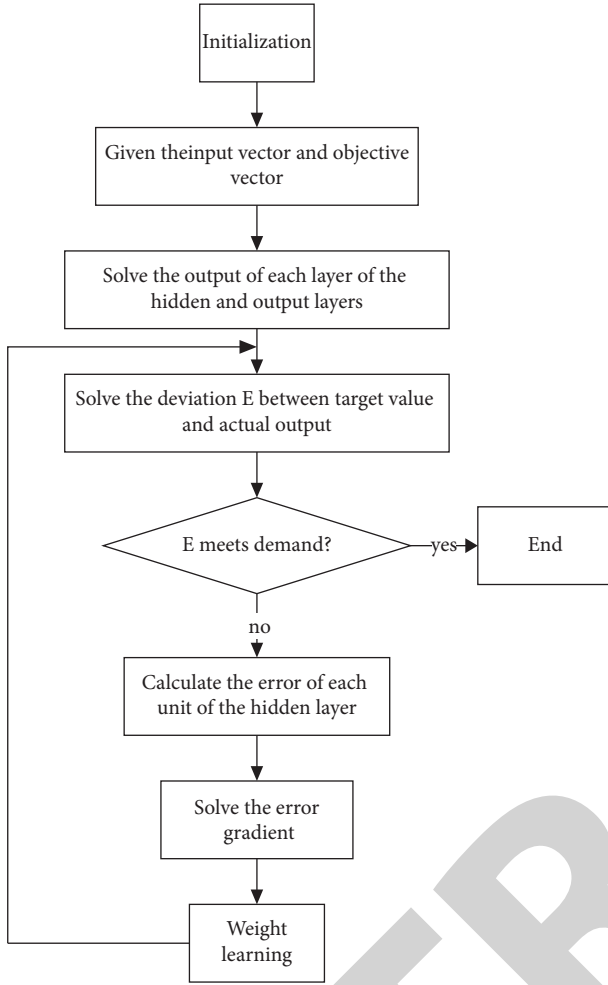structure of a typical BP neural network is shown in Figure 1, where the leftmost layer is the input layer, the rightmost layer is called the output layer, and layers in the middle are named hidden layers. Neurons in adjacent layers of the BP neural network are fully connected, but neurons within the same layer are not connected [17–19]. The three types of layers that make up the neural network are information for the neural system is in the input nodes. Between the input source and outlet levels are hidden layers, which serve as the hub for all computing. Create the desired outcome for the input variables in the output neuron.

2.4. Algorithmic Flow.

The flow chart of BP neural network algorithm is shown in Figure 2.

(1) Initialize the weights and thresholds of the network. Assume that the number of nodes in the input layer, the hidden layer, and the output layer were n, l, and m, respectively. Weights from the input layer to the hidden layer and from the hidden layer to the output layer were wij and wjk, respectively. The bias from the input layer to the hidden layer and from the hidden layer to the output layer was aj and bk, respectively. The learning rate was η. An activation function is applied to a linear combination of sources, and the outcome is

used as a resource for the subsequent stage. The outcome of this component will constantly vary from 0 to 1 whenever the input layer of a synapse is a sigmoid function. The sigmoid function was adopted as the activation function g(x).

(2) Enter the value of training sample xi into the nodes of the input layer and calculate the output of each neuron layer until the output layer was reached. The formulas for deriving the output Hj of the hidden layer and the output Ok of the output layer were

$$H_j = g\left(\sum_{i=1}^{n} w_{ij}x_i + a_j\right),$$
$$O_k = \sum_{j=1}^{l} H_j w_{jk} + b_k. \tag{1}$$

(3) For each unit of the network, errors of each layer were calculated, and the weights were update. The formula for error calculation was

$$E = \frac{1}{2}\sum_{k=1}^{m}(Y_k - O_k)^2. \tag{2}$$

The formula for updating the weight was

$$w_{ij} = w_{ij} + \eta H_j(1 - H_j)x_i \sum_{k=1}^{m} w_{jk}e_k,$$
$$w_{jk} = w_{jk} + \eta H_j e_k. \tag{3}$$

The formula for updating the bias was

$$a_j = a_j + \eta H_j(1 - H_j)\sum_{k=1}^{m} w_{jk}e_k,$$
$$b_k = b_k + \eta e_k, \tag{4}$$

where Yk was the desired output, $i = 1...n$, $j = 1...l$, $k = 1...m$.

(4) Determine whether the requirements were met. If the requirements were not met, the algorithm would return to the second step to recalculate the results until they met the requirements.

3. Model Construction

3.1. Dataset.

When they are learning, college students will produce a huge amount of data, which can be used as a database for the learning analysis model. This paper has collected 210 groups of data in total. They are about the daily learning records and web logs of college students, including their courses, the times of hand-raising in classroom, participation in discussions after class, and looking up online course resources, and their comprehensive evaluation. Precisely identifying a person's abilities and requirements is the goal of a thorough examination as well as a review. In academic contexts, the concept of assessing is employed in a wide range of situations for a number of objectives, comprising individualized and collective, structured and unstructured, and types of assessment. Through the examination of individuals' achievement in both kinds of activities, CCE seeks to lighten the burden of the curriculum

TABLE 1: Some of the datasets.

Courses	Times of raising hands in class	Times of after-class discussions	Times of accessing online course resources	Comprehensive evaluation
C language (C)	22	6	20	C
Data structure (DS)	75	17	62	A
Computer network (CN)	80	68	89	A
Network engineering design (NED)	10	41	0	C
Computer organization principle (COP)	55	40	90	B
Principles and applications of database (PAD)	88	10	81	B
Digital logic and digital circuit (DLDC)	69	75	77	B

TABLE 2: Data preprocessing results.

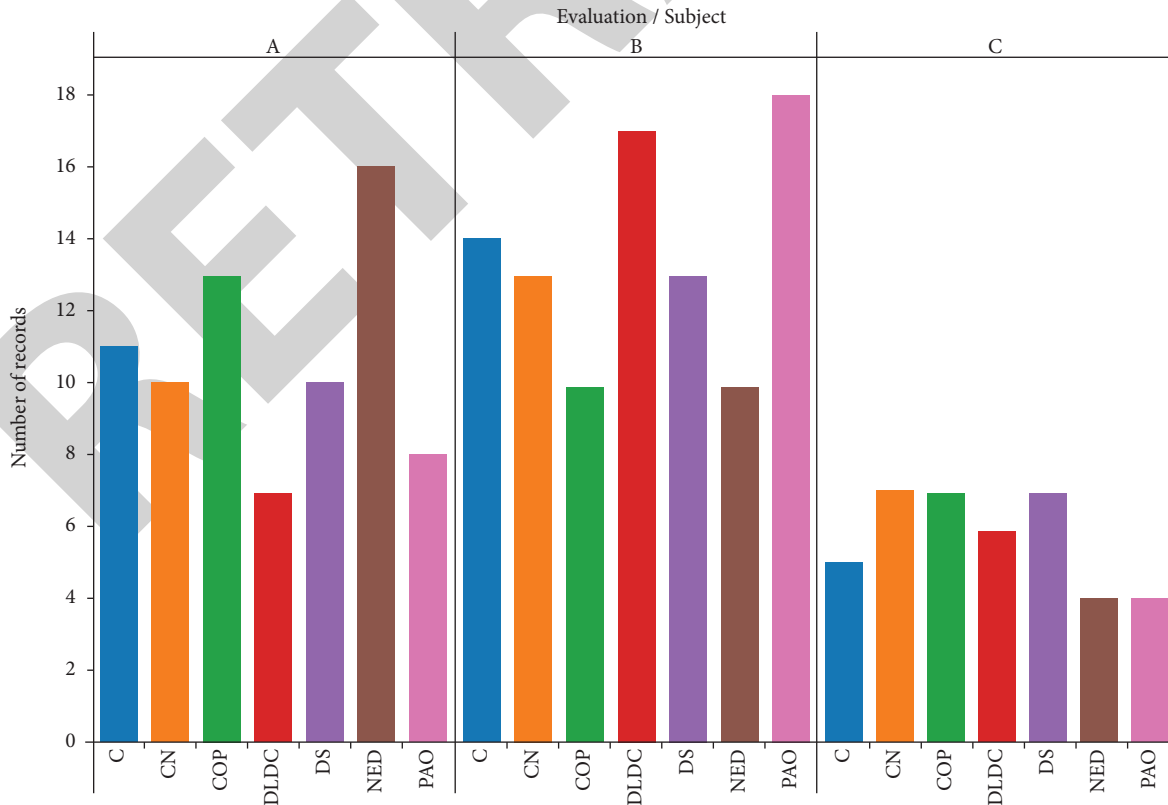|	Time of hand-raising in class	Times of after-class discussions	Number of accessing online course resources	Comprehensive evaluation
Mean	52.50	62.25	56.50	0.25
Std	29.89	24.40	34.35	0.50
Min	12.00	44.00	20.00	0.00
25%	39.75	45.50	32.00	0.00
50%	59.00	61.50	56.00	0.00
75%	71.75	81.25	80.50	0.25
Max	80.00	94.00	94.00	1.00

FIGURE 3: Graphical representation of statistics of the comprehensive evaluations of students in all courses and number of records.

Table 3: Statistics of the comprehensive evaluations of students in all courses.

Comprehensive evaluations	A	B	C
C	10.45	13.19	4.97
CN	9.622	12.39	6.76
COP	12.39	9.58	6.76
DLDC	6.8	16.12	5.85
DS	9.58	12.35	6.76
NED	15.17	9.622	3.98
PAD	7.71	17.00	3.98

on classmates and to enhance their general talents and skills. It can also be used by teachers to evaluate how well their children participate in extracurricular activities. Some of the datasets are shown in Table 1.

3.2. Data Preprocessing.
To ensure the learning analysis model is scientific and useable, it is necessary to collect, integrate, and clean the multisource heterogeneous educational data. Big data fusion has both potential and problems as a result of multisource large datasets. Every information having a significant level of variation in data varieties and formats is considered heterogeneity. As a result of incomplete data, significant data repetition, and deceitfulness, they may be unclear and poor quality. Such educational data contain structural, semistructural, and nonstructural components. The process is to transform them into valid data for effective analysis. Data cleansing, the most important step in data preprocessing, aims to ensure the data are correct, consistent, and useable. The actual process of data cleansing may involve removing possible outliers, uncertain and invalid values, or heterogeneous data. After cleansing, the data quality is improved. The cleaned data were classified into valid datasets for the call of the data analysis module. The results of data preprocessing are shown in Table 2.

Figure 3 and Table 3 show the statistics of the comprehensive evaluations of students in all courses. The evaluations were at middle and upper levels, indicating that the students' academic performances of this class were at middle and upper levels.

3.3. Model Training and Evaluation Indicators.
The datasets were divided into the training set and the test set, which included 140 and 70 groups of data, respectively. Before training the network, the weight was initialized to a small value, and the size of the hidden layer was set as 3 to reflect the training characteristics. The learning rate was put to 0.3. The training would reach the end when the model precision could not be significantly improved anymore.

This paper used accuracy, precision, recall, F1, root mean squared error (RMSE), relative absolute error (RAE), and root relative squared error (RRSE) to evaluate the precision of the model. Among the methods, most frequently utilized to assess the accuracy of forecasts is root mean square deviation, also referred to as root mean square variance. It illustrates the Euclidean distance between observed actual values and forecasts. A decent indicator of
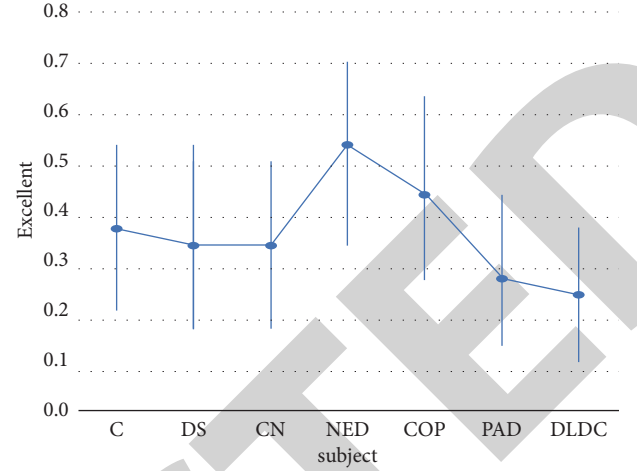
Figure 4: Relationship between course and comprehensive evaluation.

how effectively the system forecasts the reaction is the RMSE. If the primary goal of the modeling is forecasting, then this fit criterion is crucial. The aims of the study will determine the most appropriate model fit measurement, while others might be helpful. A predictive model's effectiveness can be evaluated using the relative absolute error (RAE) metric. It is mostly utilized in operational administration, data gathering, and computer vision. When a simple prediction had been employed, the root relative squared error (RRSE) would have been decreased. This straightforward prediction only represents the median of the measured results.

$$\text{Accuracy} = \frac{\text{TP} + \text{TN}}{\text{TP} + \text{FP} + \text{FN} + \text{TN}},$$

$$\text{Precision} = \frac{\text{TP}}{\text{TP} + \text{FP}},$$

$$\text{Recall} = \frac{\text{TP}}{\text{TP} + \text{FN}},$$

$$F_1 = \frac{2 * \text{Precision} * \text{Recall}}{\text{Precision} + \text{Recall}},$$

$$\text{RMSE} = \sqrt{\frac{1}{n} \sum_{t=1}^{n} (p_t - y_t)^2}, \quad (5)$$

$$\text{MAE} = \frac{1}{n} \sum_{t=1}^{n} |p_t - y_t|,$$

$$\text{RAE} = \frac{\sum_{t=1}^{n} |p_t - y_t|}{\sum_{t=1}^{n} |y_t - \bar{y}|},$$

$$\text{RRSE} = \sqrt{\frac{\sum_{t=1}^{n} (p_t - y_t)^2}{\sum_{t=1}^{n} (y_t - \bar{y})^2}},$$
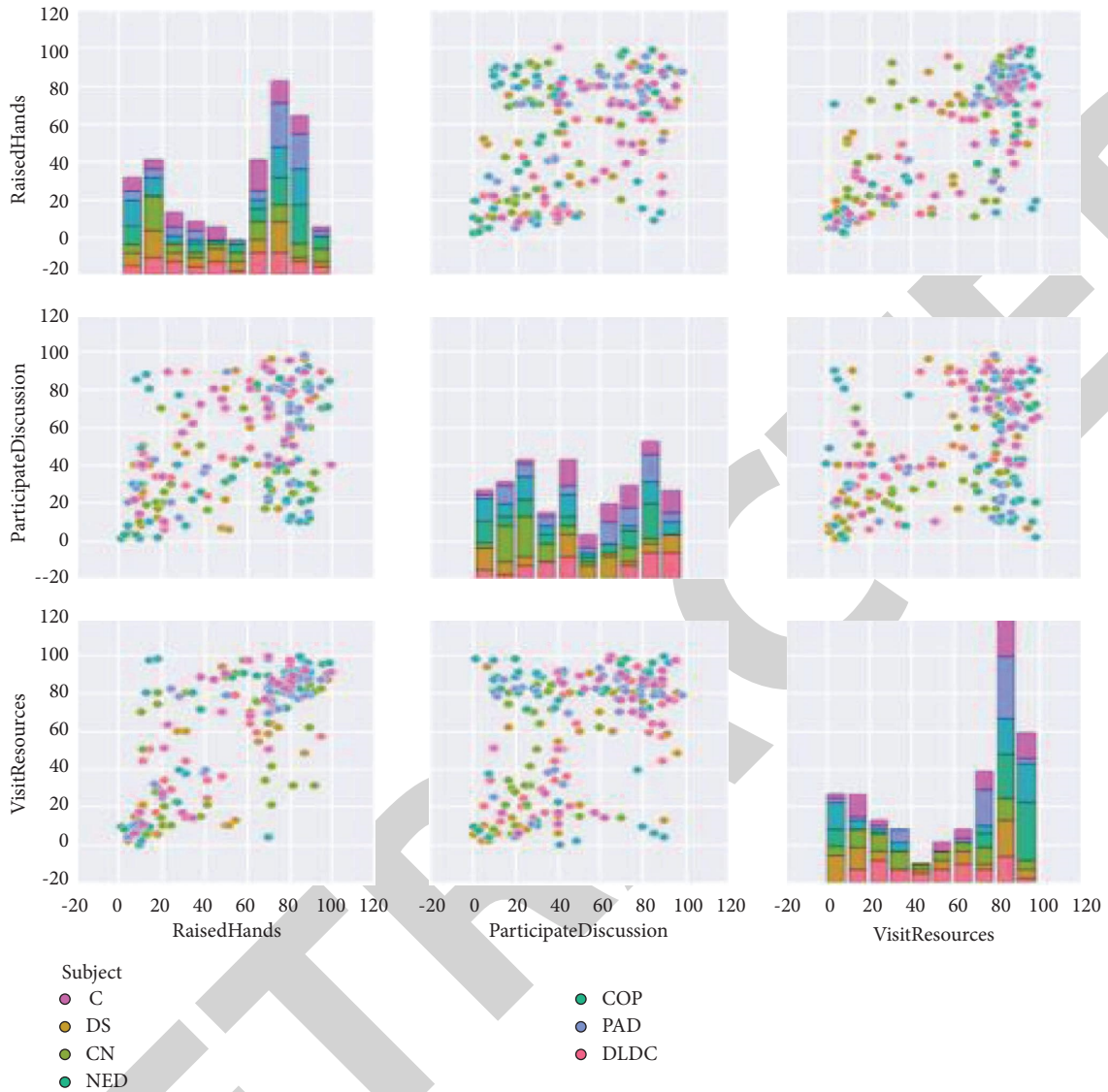
Figure 5: Scatter diagram.

where TP, TN, FP, and FN indicate the number of true positives, true negatives, false positives, and false negatives, respectively. Moreover, pt, yt, and $\overline{y}$ denote the predictive value, the target value, and the mean, respectively, and n represents the number of samples.

4. Result Analysis

4.1. Correlation Analysis. Figure 4 is the relationship between the courses and comprehensive evaluations.

According to Figure 4, the comprehensive evaluation values were high for NED and low for DLDC. The scatter diagram (Figure 5) and correlation diagram of learning behavior (Figure 6) also showed that there were many times of hand-raising in classroom and accessing online course resources, which indicated that students who were active in class kept active after class.

4.2. Visualization Analysis. As an important analysis and processing technology, data visualization uses graphics to represent data. In this way, complex data can be simplified for better understanding. This paper adopted data visualization to present the relationship between students' learning behavior and comprehensive evaluation results. The box plots of the times of hand-raising in classroom, accessing online course resources, and after-class discussions are shown in Figure 7.

According to Figure 7, there was a close relationship between students' learning behavior and the results of comprehensive evaluations. Students who were active in class often participated in discussions and frequently visited online resources after class had higher comprehensive scores. Figures 8–10 revealed the relationships of the times of hand-raising in class, accessing online resources, and after-class discussions to students' comprehensive scores.
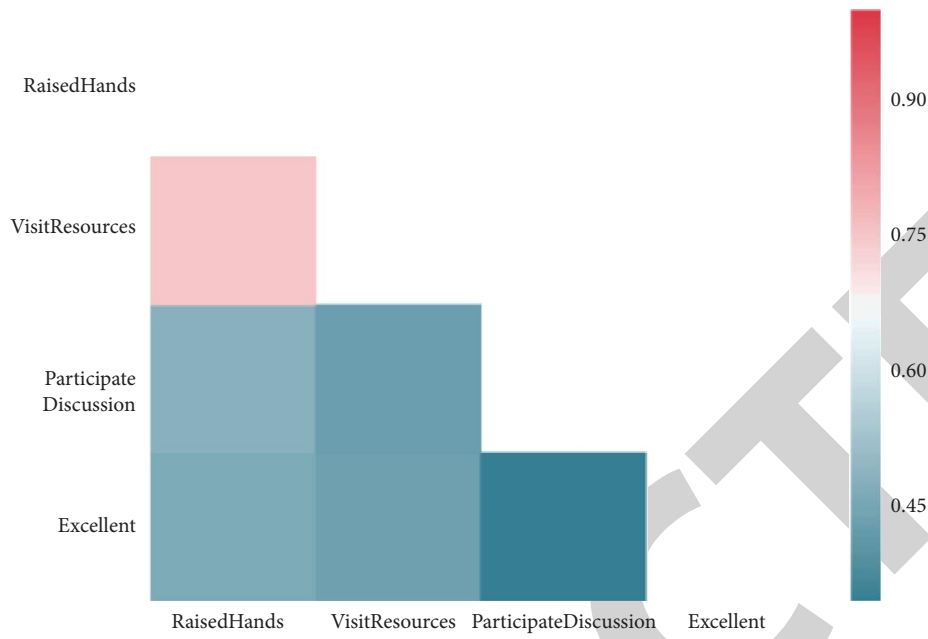
Figure 6: Correlation diagram.
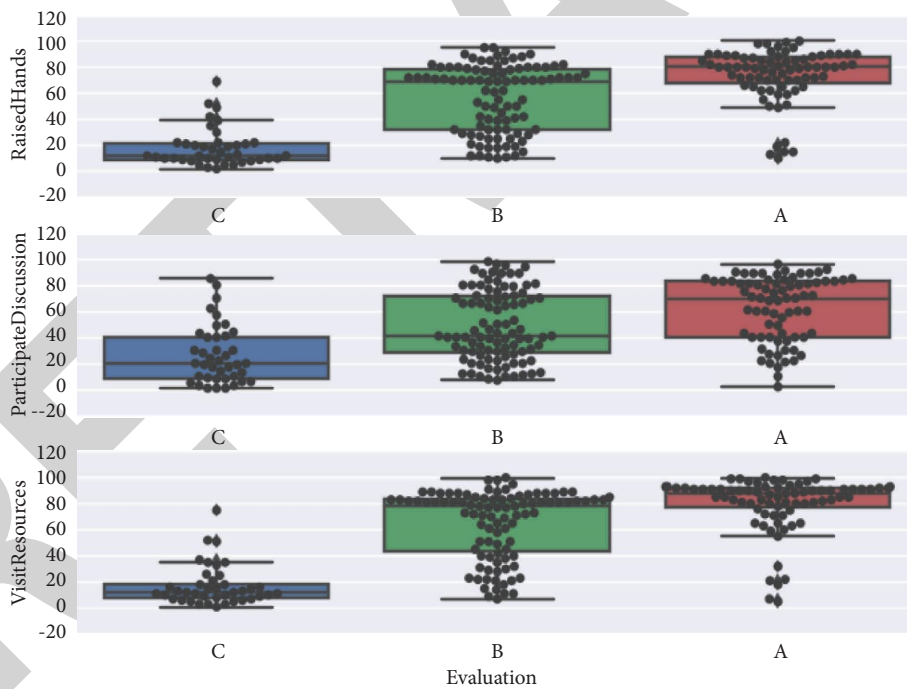
Figure 7: Box plots.

According to the comprehensive scores in Figures 8 and 9, students receiving A were the most active in class, and those receiving C were the least active in class. Students with low comprehensive scores rarely looked up online resources after class. Figure 10 revealed the relationship between the number of students who participated in discussions and their comprehensive scores.

4.3. Predictive Analysis. After setting the parameters of the model, the BP neural network model was launched to obtain evaluation indicators, as shown in Table 4.

According to Table 4 and Figure 11, the precision and F1 were the highest for students who received A in the comprehensive evaluation. The recall was the highest for students who obtained C and was the lowest for students receiving
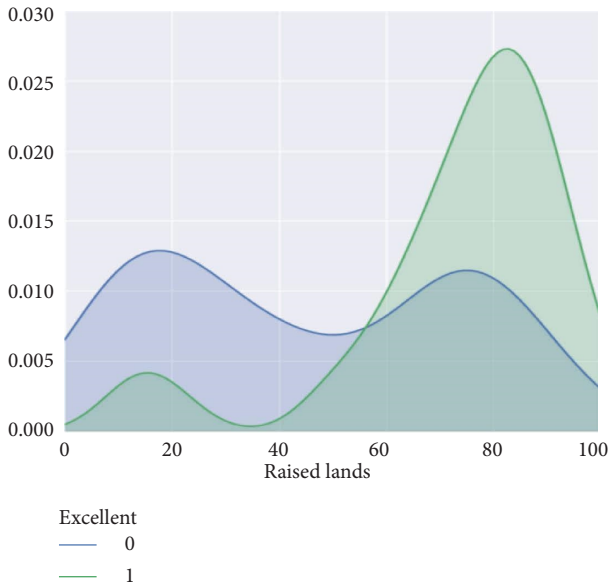
FIGURE 8: Relationship between the times of students raising hands in the classroom and their comprehensive evaluation.

FIGURE 9: Relationship between the times of students accessing online resources and their comprehensive scores.

FIGURE 10: Relationship between the times of students participating in discussions and their comprehensive scores.
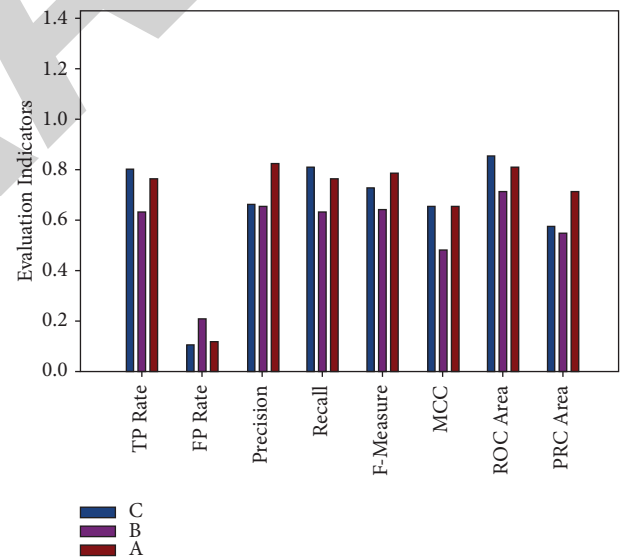
FIGURE 11: Graphical representation of evaluation indicators.

B. The accuracy was high for students at both ends of the comprehensive evaluation.

To evaluate the performance of the model, the models of naive Bayesian, logistic regression, and decision tree were established using the same data samples. The results predicted by the four models were compared and shown in Table 5.

Table 5 and Figure 12 show the performance of the four models. According to the results, the model of the BP neural network yielded the smallest error and had better

TABLE 4: Evaluation indicators.

	C	B	A
TP rate	0.800	0.630	0.759
FP rate	0.107	0.205	0.119
Precision	0.667	0.654	0.815
Recall	0.800	0.630	0.759
F-measure	0.727	0.642	0.786
MCC	0.650	0.428	0.648
ROC area	0.846	0.709	0.817
PRC area	0.576	0.544	0.717

Table 5: Comparison of the results of the four models.

	MAE	RMSE	RAE	RRSE
BP neural network	0.1925	0.3870	0.4502	0.8203
Naive Bayesian	0.2779	0.4208	0.6500	0.8959
Logistic regression	0.3123	0.4052	0.7305	0.8626
Decision tree	0.2631	0.4123	0.6153	0.8239
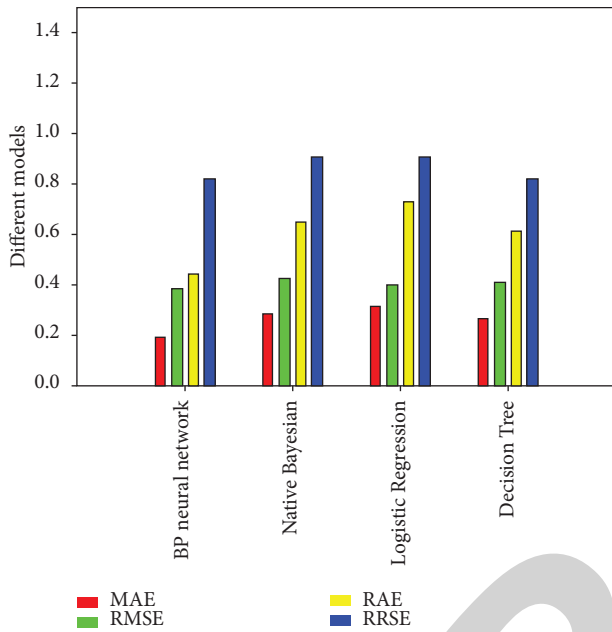
Figure 12: Graphical representation of results of four models.

performance. Therefore, it was the most suitable classification model for the learning-behavior-based evaluation.

5. Conclusion

Learning behavior analysis is a "bridge" to connect students with teachers and improve the learning efficiency. It is also a baton to coordinate students, teachers, and managers. This paper used technologies of data mining and data visualization to model students' learning behavior and predicts their comprehensive evaluation results. It aims to provide teachers with targeted teaching guidance for better intervention and serve as a scientific basis for the enhancement of teaching quality.

When there are a large number of students, it is beyond a teacher's individual capability to know all students' learning levels within a short period of time. Learning analysis technology can help them find out students' learning style and timely adjust teaching strategies according to students' types. Such technology also provides students with suitable resources and helps them learn about their strengths and shortcomings, so that students can adjust their learning plans and strategies accordingly.

Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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WILEY | Hindawi

Retraction

Retracted: Study on Deep Learning Technology to Construct E-Commerce Industry Marketing Promotion Model

Security and Communication Networks

This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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[1] P. Gao and L. Zhao, "Study on Deep Learning Technology to Construct E-Commerce Industry Marketing Promotion Model," *Security and Communication Networks*, vol. 2022, Article ID 9958398, 11 pages, 2022.

WILEY | Hindawi

Research Article

Study on Deep Learning Technology to Construct E-Commerce Industry Marketing Promotion Model

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In recent years, with the development of Internet, Internet technology has swept the world and become a new round of scientific and technological revolution in the world economy. Network marketing has become the "darling" of marketing, with a multidimensional and multilevel marketing layout, which provides a carrier platform for the promotion of enterprise marketing strategy. The traditional network marketing mode is mainly in the form of advertising push, with pop-ups, screen overlays, top search rankings, loading videos, texts, and pictures. Nowadays, Internet technology and social media have promoted the development of community e-commerce models. Live delivery is a new sales model, which has promoted economic development. It has many advantages, such as interactivity, real-time, and transparency. Compared with the traditional e-commerce model, it is more suitable for the development requirements of the new era. Live delivery is a new sales model, which promotes economic development. This paper starts with the AdaBoost algorithm and marketing mode of STP and 4P marketing theory, in order to reduce the execution cost of marketing. In this way, it proves that using online marketing can not only reduce the cost but also improve the marketing effect. Through the new network marketing promotion mode and algorithm described in this paper, the cost can be reduced by 17%, and the promotion effect is remarkable.

1. Introduction

In recent years, with the development of Internet, Internet technology has swept the world and become a new round of scientific and technological revolution in the world economy. Since the introduction of Internet technology, more and more industries have been involved in Internet technology and have made great achievements. Especially, the rise and rapid development of e-commerce have completely changed people's lifestyles, and at the same time, it has brought about the diversification of marketing methods. Traditional marketing methods can no longer meet the needs of the industry [1–3]. The importance of network marketing in enterprise marketing activities is gradually increasing, and enterprises and network marketers have a certain understanding of it. The relationship between network marketing and traditional marketing, how to make systematic use of the advantages of network marketing, and what methods to adopt under what circumstances have all become practical problems faced by enterprises. E-commerce has created a new marketing model, and many e-commerce platforms have gradually laid out live broadcast ports. With the continuous innovation of Internet technology, e-commerce + live broadcast has also ushered in a dividend outlet. On the mobile terminal of a mobile phone, the function of live broadcast is embedded into the platform interface and becomes a unique section. After recent years of development, the advantages of live broadcast are highlighted, and more and more e-commerce companies are empowering new modes of live broadcast marketing, which not only brings about the innovation of retail mode but also drives the economic development of related fields. Internet technology eliminates the asymmetry of information, establishes a dominant position centered on users and individuals have an unprecedented right to speak [4, 5].

The traditional network marketing mode is mainly in the form of advertising push, with pop-ups, screen overlays, top search ranking, loading video, text, and pictures. However, major listed companies have successively used festivals to realize new-type network marketing, which focuses on sharing red envelopes. The marketing promotion cost is reduced, but the effect is improved. Live delivery of goods is a new service mode, which uses the Internet platform and live broadcast technology to communicate with consumers face-to-face. In this process, online celebrity-based live broadcasters display goods to help consumers answer their questions and make them shop successfully. These studio owners themselves have a certain influence, and with the support of fans, the volume of commodity transactions is relatively stable [6, 7]. Before live delivery, TV shopping was the mainstream of e-commerce, and the sales model of live delivery in online celebrity was similar to that of TV presenters, which infected consumers through exciting words, resulting in numerous orders. Network marketing is based on the open Internet environment, which is a "shotgun" marketing layout for different consumer groups. Therefore, in terms of marketing objects, the group of online marketing is more extensive, while the marketing layout of direct sales is relatively narrow. This paper starts from the network marketing mode, in order to reduce the execution cost of marketing and proves that using network marketing can not only reduce the cost but also improve the marketing effect [8, 9].

Precision marketing, as the most effective and low-cost marketing method to find target customers and gain profits, should be used in various fields and industries. As the earliest precedent of precision marketing, there are abundant research results in the world. With the rise of e-commerce, there are more and more theoretical studies on the application of precision marketing in e-commerce by international scholars. However, the e-commerce of agricultural products has only gradually entered people's field of vision in recent years, and the research on the combination of precise marketing and products, especially e-commerce of characteristic products, is still in its deepening stage. This article adopts the following innovations:

(1) This paper highlights the advantages of online marketing by comparing traditional marketing with online marketing and analyzing emotions with the AdaBoost algorithm.

(2) In this paper, by comparing the new live delivery mode with the traditional e-commerce mode with the Internet as the carrier, a new delivery network marketing mode is constructed.

2. Related Work

Live delivery is a new sales model, which promotes economic development. It has many advantages, such as interactivity, real-time, and transparency. Compared with the traditional e-commerce model, it is more suitable for the development requirements of the new era. Live delivery is a new sales model, which promotes the economic development. It has

many advantages, such as interactivity, real-time, and transparency. Compared with the traditional e-commerce mode, it is more suitable for the development of the new era, which requires the live broadcast of stars to become a common mode and promotes the development of e-commerce [10]. On this basis, the live broadcast market has been expanded, and e-commerce direct broadcast has achieved great success. What followed was the problems of product quality and weak supervision, and the healthy development of e-commerce industry was widely concerned by the society. How to make use of data analysis technology to give enterprises a deeper and more accurate insight into the market behavior, how to fully understand the target customers, carry out targeted marketing activities according to their preferences or spending habits, and make an e-commerce precise marketing strategy that is consistent with the attributes and characteristics of agricultural products of this enterprise and the current production and marketing situation is extremely urgent [11].

Ture believes that concepts such as community that focus on individual strength have been invented and constantly upgraded, and business models based on the relationship between users are emerging [12]. Coleman believes that the community economy, as a new business model, is being valued by enterprises. Building community has become an important link for major enterprises to get through the service and consumption chain, and the business chain can be reconstructed under the empowerment of community [13]. Boye believes that there are five main types of tools that users can operate: filters, music, stickers, labels, and clips, which can quickly edit a shared note. Adding labels to the notes can not only accurately locate the content but also allow novices to browse other users' content and refer to their styles when creating [14]. Ture believes that e-commerce live broadcast, as a new marketing model, has experienced several years of rapid development and has gradually established its core position in the new retail and new consumption scenario [15]. Constantinides believes that the e-commerce live broadcast platform is a comprehensive platform, which has developed from the initial one-way transaction to supply chain, products, payment, transportation, and other sectors [16]. Yu believes that in the early stages of the development of live webcast, production, and broadcasting were mostly separated, and the production and broadcasting of content were not carried out simultaneously [17]. Constantinides believes that online celebrities have gradually replaced the TV shopping host and have become popular "product spokespersons" [18]. Hamidizadeh believes that along with the policy dividend of e-commerce in agriculture-related fields, and the comprehensive promotion and gradual improvement of information infrastructure and logistics infrastructure, it has laid a solid foundation for the development of an e-commerce market for agricultural products [19]. Wei believes that to get rich and get rid of poverty, it is necessary to achieve precise marketing [13]. Li believes that after the technological change from 4G to 5G, the form of live webcast has changed in various ways, with more emphasis on the synchronization of production and broadcasting, and the innovation of content has also been greatly improved [20].

With the continuous development of the market economy, the development mode of diversified marketing coexists, which provides diversified channels for enterprise market development layout. In the era of electronic information, with the development of Internet technology, network marketing has become more diversified and technical, and has become an important operation mode in the marketing layout of many enterprises. Therefore, under the influence and impact of network marketing, traditional direct selling is also facing new development challenges and opportunities. Especially in recent years, with the rapid development of e-commerce, major manufacturers have turned to the field of e-commerce, and the "cold" situation of traditional direct sales continues to be exacerbated. However, both traditional direct marketing and online marketing have their own marketing advantages, and the effective integration of online marketing and traditional direct marketing has become an important field of marketing research. Network marketing and traditional direct selling have different promotion methods and different marketing carriers, and they can be integrated through beneficial supplements, which can build market competitive advantage in online and offline multidimensional marketing layouts. Therefore, how to make use of online marketing to carry out interactive marketing operations and integrate them with traditional direct sales has become the primary problem that most traditional enterprises need to face in recent times [21].

The third chapter is about the analysis of network marketing and traditional marketing so as to better understand the two marketing models. The fourth chapter is an analysis of the AdaBoost algorithm. The fifth chapter is the development of live broadcast and marketing models, so as to better understand these marketing models.

3. Comparative Analysis of Network Marketing and Traditional Marketing

At present, network marketing and traditional direct selling have become important means of enterprise marketing layout. However, from the perspective of marketing promotion methods, there are significant differences in promotion methods. First, the online marketing relies on the online platform to realize the marketing promotion of "Internet plus," which to a great extent breaks through the limitations of time, region, and other elements and greatly improves the timeliness and universality of marketing promotion; second, the traditional direct selling focuses on the introduction of offline products. Through offline marketing layout, the contact experience between products and consumers is built, and the marketing construction of "face-to-face" and "point-to-point" is strengthened. Network marketing refers to activities such as publicity and promotion through various means of the Internet. Broadly speaking, enterprises are involved in network promotion activities from the beginning of applying for domain names, renting space, filing websites, and setting up websites to the official launch of websites. Therefore, from the perspective of marketing methods, there are essential differences between them. In the layout of marketing, they are promoted from

online and offline space, respectively. At present, with the rapid development of e-commerce, the market layout based on network marketing is more competitive in the market. It can refine the marketing strategy in the diversified network market space and achieve multilevel and multifield coverage of marketing promotion according to different groups and needs. This is also the different promotion effects formed by different marketing promotion methods, and it is a concentrated expression of their remarkable characteristics as shown in Figure 1.

The second differentiating factor of marketing promotion is that it is different from reality. In the construction of marketing strategy, online marketing takes the Internet as the carrier platform, while traditional marketing takes people's marketing activities as the carrier. There are differences between them. First of all, network marketing is based on the marketing layout under the Internet platform, such as the marketing form of a self-operated e-commerce platform and the network as the carrier of communication, which is consistent with the current marketing development trend of Internet plus. Secondly, in traditional marketing, "people" marketing activities are particularly important, which is an important foundation to realize the introduction of product and consumer experience. When traditional marketing users open the web page to search or browse for information, pop-up advertisements usually appear, and most users close the pop-up windows at the first time. To ensure the advertising effect, websites will set up pop-up windows to force users to watch for a certain period of time and then close them. There are many methods of network marketing promotion, usually the more common ones are display advertising, e-mail promotion, community marketing, website promotion, and search engine promotion; among them, search engine promotion refers to a kind of promotion method in which enterprises pay to display the promotion information on the search results page [22, 23]. Among these promotion methods, the advantages of search engine promotion, such as accuracy, pay-by-effect, and controllable effect, are more effective than other methods for enterprises. Therefore, traditional marketing has higher requirements for personal quality and image, while network marketing is a systematic marketing layout, which emphasizes Internet technology, network marketing strategy construction, and other elements, and is a marketing service based on virtual space. That is to say, the difference in marketing carriers determines that the two companies have different marketing points and marketing content e-commerce modes in the implementation of marketing strategies, as shown in Figure 2.

At present, with the rapid development of e-commerce, network marketing is more effective in the segmented market environment. Under the increasingly fierce market environment of the seller's market, facing the segmented market, how to introduce more accurate marketing requires more accurate positioning of marketing promotion objects. With network marketing, based on big data analysis, consumer groups can be subdivided, and with the introduction of subdivided marketing strategies, products can be better connected with the consumer market. However, traditional
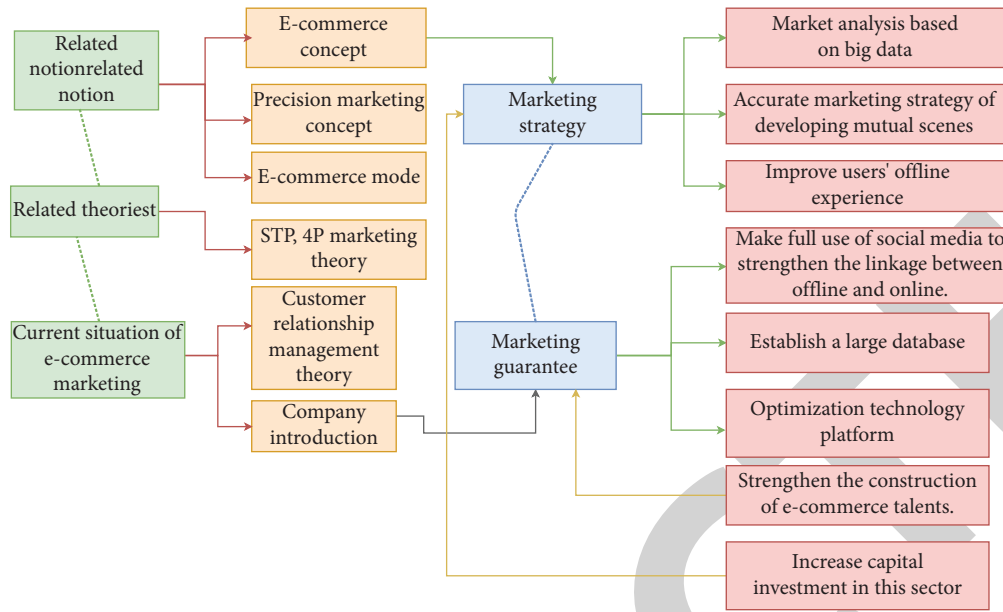
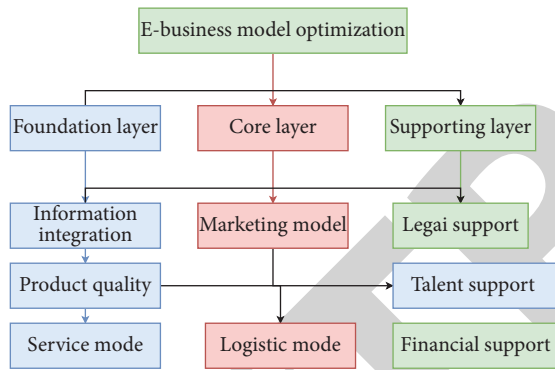FIGURE 1: Characteristics of marketing promotion.

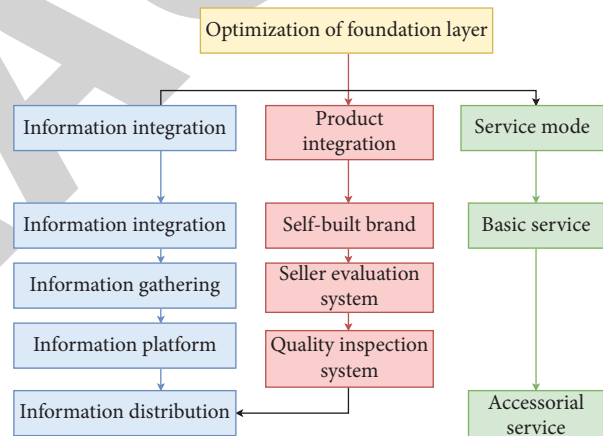

FIGURE 2: E-commerce mode optimization.

FIGURE 3: Optimization of base layer.

marketing is based on marketing promotion in a fixed place, and its audience is relatively narrow, which is not suitable for the current increasingly diversified market development. It is also a problem exposed by traditional marketing. The basic layer of the e-commerce mode mainly includes information integration, product quality, and service mode, among which the quality of traditional marketing products is the most important. The establishment of a basic layer plays a fundamental role in the development of the e-commerce mode of horticultural products, and to some extent, traditional marketing plays a decisive role in the development of the e-commerce mode of horticultural products [24]. Traditional marketing foundation optimization is shown in Figure 3.

3.1. Live Delivery and Community Marketing. Live delivery of goods by an online celebrity has become a trend, and the success of this e-commerce mode is due to the online celebrity's shaping of its own reputation, showing its charm, and building trust with its fans [25–27]. Because of the large

audience and small profits but quick turnover of products, many products seem to be cheap and have guaranteed quality, which has been recognized by fans. At present, "fan economy" has become a new term in the new era, which refers to the brand-new sales relationship formed by traditional marketing followers and fans, resulting in the revenue-generating behavior of traditional marketing. The concerned person should improve the user's stickiness, build his traditional marketing reputation, and gain economic benefits with a unique marketing model. The most traditional marketing of consumers pays attention to commodity value first, and then expands to traditional marketing of users and brands and user value, which reflects the importance of personal design. The traditional marketing of live e-commerce in online celebrity needs to establish personal IP first and continuously increase the number of fans. "Internet plus" can be understood as "various traditional fields in Internet plus," but instead of simply adding the two, it makes use of information technology and Internet

platform to deeply integrate traditional industries with the Internet, create a new ecology and seek new development. Government departments at all levels responded quickly and issued relevant local policies to protect local enterprises to better adapt to "Internet plus." People who are watched through live Internet plus often attract fans' attention by virtue of their talent or face value and interact with fans regularly. Over time, a trust relationship will be formed. Every IP from an online celebrity has a wealth of work, and fans are their core assets. Therefore, online celebrity needs to establish a trust relationship with fans when bringing goods. Compared with traditional selling of goods, the profit of live selling of goods increased by 15% year-on-year, as shown in Figure 4.

Live broadcasts first appeared in domestic entertainment talent shows, electronic game competitions, and other scenes, and the audience was relatively small. With the innovation of network technology, the popularity of smart phones, the wide use of 5G mobile networks, the improvement of network speed and the reduction of traffic cost, various live broadcast platform software are constantly emerging in such a big environment. With the continuous progress of mobile Internet technology, people are no longer limited by time, place, and space, so they can broadcast live or watch live content anytime and anywhere. A large amount of entertainment content fills the audience's free time and meets their spiritual entertainment needs, so live broadcast shows an explosive development. The "live broadcast platform" can be understood as an information release platform that produces and releases information synchronously with the occurrence and development of events on the spot and has a two-way circulation process. Some characteristics of live broadcast can be summarized from the actual live broadcast activities: the live broadcast subject and the audience are synchronized online; the information is transmitted synchronously; and the live broadcast can interact in real time. Joining the live broadcast function in the e-commerce platform is a content marketing method in which the e-commerce platform conducts live broadcast business, and the anchor accurately transmits product information to customers through on-site display and interaction, so as to increase customers' shopping experience and realize product sales. The advantage of this model is that the e-commerce platform itself has a strong traffic base, and customers who watch this kind of live broadcast have specific consumption purposes. Through the gathering popularity and shopping guide function of anchors, customers' purchasing channels can be shortened and products can be realized quickly. This e-commerce platform takes live broadcast as the main content construction mode and attracts customers' attention through content sharing, such as the professional knowledge of live broadcast by anchors. It is a marketing mode in which content guides sales. For example, Little Red Lip is a typical content e-commerce platform. Publish live beauty tutorials on the platform of the anchor and share related beauty products. When customers watch the live broadcast to learn about beauty knowledge, they also accept the anchor's recommendation on beauty products. This content-oriented live marketing model will

make customers more willing to accept it and make it easier to achieve sales. When watching that live broadcast, consumers can choose to place an order on the third-party e-commerce platform according to their own needs. The disadvantage of this mode is that the traffic from the live broadcast platform can easily flow back to the third-party e-commerce platform. Figure 5 shows the statistics of the online number of live broadcasts of platform e-commerce at the same time.

The word "community" has the same origin as the word "community." In the past, communities and communities were more inclined to use common physical space as a prerequisite for the coexistence of their members. With the advent and rapid development of the mobile Internet era, it is relatively easier to form a community by relying on a certain platform, so today's community meaning is more inclined to a virtual community than a real one. The evolution is shown in Table 1.

"Community" refers to the aggregation of members with the same or similar interests and hobbies, such as members of a certain brand or clubs with the same interests and hobbies. Through a social platform, consumers and brands can build a closer relationship. According to Tang Xingtong's 4C theory, community marketing is an online marketing promotion activity based on social networking, aiming at specific communities, selecting suitable scenes, outputting content and topics, and managing relationships among community members. Community marketing has the advantage of high efficiency and low cost, which is different from the traditional marketing model. It is a new marketing model, which fully combines various marketing models such as content marketing, precision marketing, integrated marketing, and emotional marketing. Stimulate the communication power of community users. People are the core of the community era, and everyone has a need for social interaction, self-display, and recognition by others. Each note generated by the user will generate a sharing map or copy link for the user to share with friends in the station, WeChat friends, or friends circle. The user's homepage can be set with top notes, which can show the daily and personality charm of the sharer.

3.2. STP, 4P Marketing Theory. STP marketing theory is considered the core of modern marketing management theory. It is composed of three elements: market segmentation, target market, and market positioning, also known as "target marketing." "Market segmentation" means that an enterprise divides a market into several or more parts that can be accurately defined, and each part is composed of a group of customers with similar demand tendencies, but there are differences among the parts. Market segmentation can help marketers differentiate markets and select target customers, develop marketable products and reasonable pricing, and put them into different channels to meet different market needs, so as to win customers and occupy market share. "Target market" means that an enterprise selects and determines its own market segment, that is, the target market, based on the advantages of the enterprise and
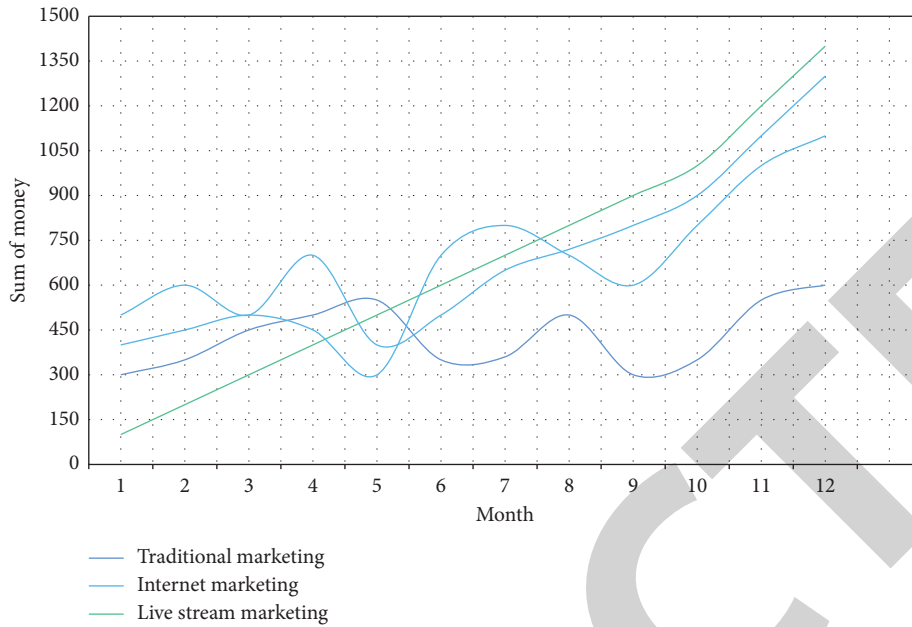
Figure 4: Profit comparison.
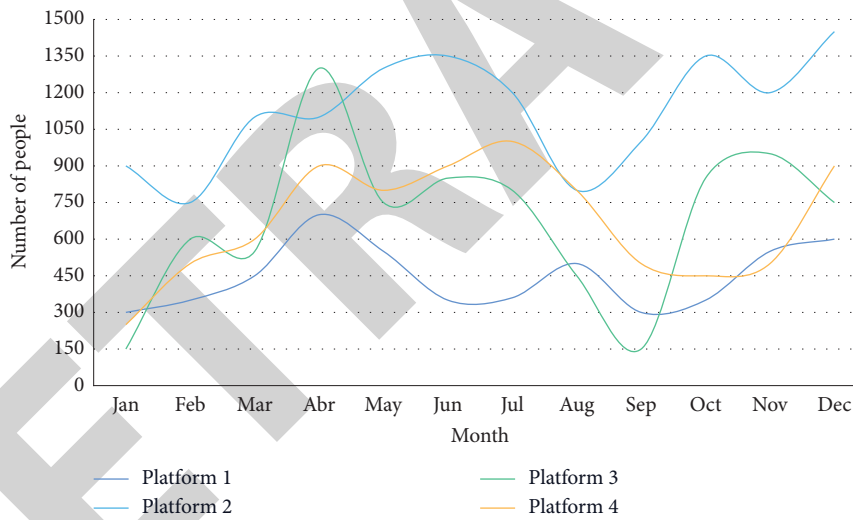
Figure 5: Simultaneous online statistics.

Table 1: Evolution of community.

Community 1.0	Community 2.0	Community 3.0
Only with the gathering of people, the management of people in the community is loose, and the common values and goals are not clear. The first group chat function is the representative, and mutual message transmission is the core of group chat.	In addition to acquaintances socializing, strangers form circles different from other community cultures based on the same or similar interests. Community members have a sense of belonging, and brands realize that they should design different strategies for different communities.	Everything is connected, and getting through the chain between people, things and things, and people and things becomes the ultimate goal, including online and offline connection, and the connection of people, goods, information, and services.

on the premise of completing market segmentation, so as to focus its work on the target market that is most likely to generate benefits and carry out targeted marketing activities. "Market positioning" refers to the research and analysis of customers' consumption behavior on the basis of defining

the target market, gaining insight into unsatisfied consumer demand, combining it with the present situation of competing products, targeting the target customers, targeting development of new products which are different from competing products and have a distinctive personality, and

then accurately spreading them to consumers' minds, so as to gain consumers' recognition, create competitive advantages for enterprises, and win more customers.

"4P" is four elements: product, price, channel, and promotion; the abbreviation of English initials. The 4P marketing theory was born in the 1960s. This theory was first put forward by an American scholar in many speeches. The 4P marketing theory is improved on the basis of its theory. A "product" is anything that can be provided to meet market desires and needs, both tangible and intangible. "Price" is the only factor that can bring profit among many marketing mix elements. According to the expected product value positioning, customer's psychological pricing, brand value, competing products, marketing environment, and other comprehensive factors, the enterprise formulates the price of the products put into the target market and adjusts the price in line with time and market changes, such as cash transaction price, discount and profit-making, promotional pricing, differential pricing, and so on. "Channel" is the sum total of a series of ways that an enterprise's products or services go through from the production link to the end user's purchase. The channel selection is based on the STP marketing strategy of the enterprise because the channel will directly affect other marketing decisions of the enterprise, and the enterprise can choose the channel scheme that is in line with the development of the enterprise from the perspective of the whole process of production-supply-sales and service. "Promotion" is the combination of a series of marketing actions for an enterprise to promote its products, which requires the enterprise to examine the advantages and costs of various publicity tools and methods (such as advertising, promotion, online and social media promotion, direct sales and database promotion, and personnel promotion), and select a marketing combination suitable for the enterprise in combination with factors such as product type, target market type, and acceptance degree of target customers.

4. AdaBoost Algorithm for Deep Learning

With the rapid development of international e-commerce, the competition for e-commerce platforms is becoming increasingly fierce. For store managers, it is necessary to improve not only the quality of goods but also the level of digital operation. Taking commodity reviews as an example, store managers can mine the review data and analyze the problems of commodity quality, service, and logistics. On the other hand, for some unknown products, in order to obtain product information, users will focus on observing other customers' comments on this product, and take this as an important basis for decision-making. For customers, they can learn from other people's purchase history and comments to better assist them in making their own purchase decisions.

The AdaBoost algorithm is used to solve the emotional classification problem of e-commerce comments. In calling this algorithm, a naive Bayes multiclassifier is adopted, and the implementation modes of SAMME and SAMME. R are compared and analyzed in the experimental process. The experimental results show that the multinomial NB _ AdaBoost algorithm based on SAMME. R can effectively classify e-commerce comments with high accuracy. SAMME uses the effect of sample set classification as the weak learner weight (SAMME in principle), while SAMME. R uses the prediction probability of sample set classification as the weak learner weight. SAMME. R is faster in training [28–30]. The pseudo-code of the AdaBoost algorithm implemented by SAMME. R is shown in Table 2.

This model uses the AdaBoost algorithm to improve the performance of naive Bayes. During iterative training, the model parameters are dynamically adjusted according to the training results. When the training samples are classified incorrectly, the weight will increase, otherwise it will decrease. When processing text data, the spatial vector is used to represent the sample, and for each sample data to be classified, the feature vector is used to represent the sample, which is extracted from the text. Sikthe weight of P. When using the AdaBoost classification, it is necessary to determine the prior probability. $P(cj)$ and conditional probability P The formula is as follows:

$$P(C_1 \cdot X_1) = \frac{P_{(CJ)}}{\sum_R^L 1},$$

$$P_{(CJ)} = \frac{\sum 1}{N+1}, \tag{1}$$

$$P(SIK) = \frac{1 + \sum_I^N = 1}{V + \sum_B = 1}.$$

Among them, $\delta(sik, xi)$ is characteristic sik. The number of occurrences when classifying test data, we need to calculate the posterior probability corresponding to each category of samples according to the above formula, and then take the category with the highest posterior probability as the output label of test data. The formula is as follows:

$$H(X) = \text{arg} mpxP = (C_j). \tag{2}$$

When Ada performs iterative training, the weight assigned to each training sample is, and then it is introduced into the parameters. $P(sik|cj)$. The formula is:

$$H(X_1) = \log \sum 1,$$

$$P(sik|cj) = \frac{1 + \sum I = 1}{V + \sum_{B=1}^V 1}. \tag{3}$$

The function of the convolution layer is to extract features through convolution operation, and its specific operation is to slide the convolution kernel window and store the calculation results after each slide. For the convolution layer, it is first necessary to know the concept of convolution kernel and the parameters when the window slides. Convolution kernel, also known as filter, is a small-sized matrix. Commonly used convolution kernels are generally 3×3 and 1×1 in size. In convolution operation, stride is called step distance, which refers to the distance that convolution kernel slides each time. Padding refers to the number of layers to fill

Table 2: AdaBoost is based on SAMME.R pseudo code.

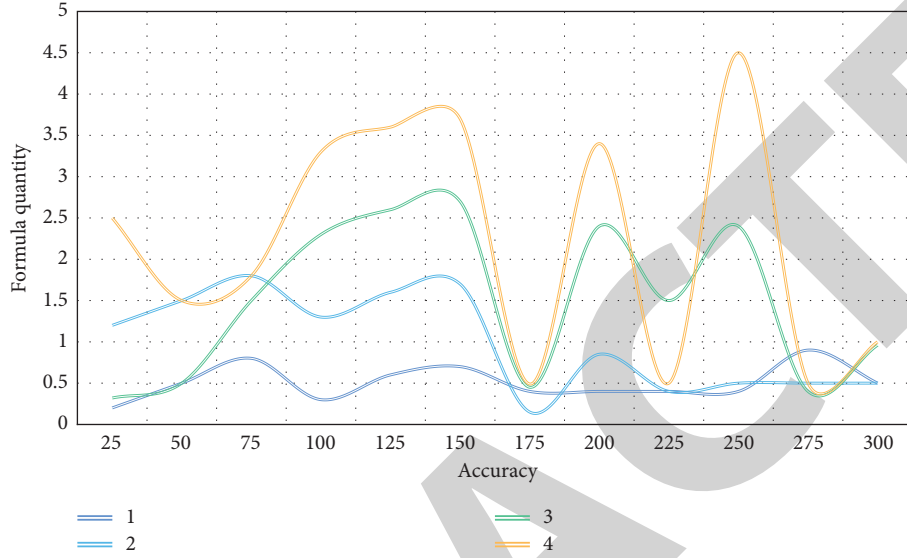| Ada boost is based on samme R	Implementation mode
Input: Known: m Sample sequences: $\{(x1, Y1), (X2, Y2) \ldots (XM, YM)\}$, where yi is a category, and yi $\in y = \{1, 2, \ldots, K\}$	Judge whether the sum of the correct sample weights of each category is greater than that of other categories, the weight sum of the samples.Different algorithms have different accuracy

Figure 6: Formula accuracy.

the outer layer of the input matrix before starting convolution. Here, we will introduce the convolution process by taking single-channel convolution as an example. The formula is as follows:

$$O = \frac{W - K + 2P}{S},$$
$$\tanh(x)\frac{e^x - e^{-x}}{e^x + e^{-x}}. \tag{4}$$

The introduction of convolution layer enables the neural network to continuously map the features of large-size images to small-size feature maps through multilayer convolution, thus, greatly reducing the required parameters and being more conducive to feature extraction. As can be seen from the above table, the accuracy of different algorithms is different, and the specific accuracy is shown in Figure 6.

$$ReLU = \max(o, x),$$
$$S_k = \frac{S_{max} + S_{min}}{m - 1}(k - 1), k \in [1, m]. \tag{5}$$

5. Live Broadcast Development and Marketing Model

In order to enrich the e-commerce content platform, the e-commerce platform constantly innovates and researches new marketing models to attract more users to stay on the platform to browse and shop and has done a lot of planning

and layout in the construction of content ecology. In the initial stage, on the mobile interface of the shopping APP, there are content sections such as "recommended by everyone," "shopping," and "sharing good things." With the rise of live broadcast of short video content, the ecological chain layout of e-commerce platform has been accelerated, and a new live broadcast port has been added to the mobile interface of shopping APP. The operation of a live broadcast platform has become an important means of content marketing for e-commerce platforms. Together with short video services, it forms the key marketing mode of an e-commerce platform, closely focusing on the marketing strategy of attracting traffic and settling users, so that users can stay on the platform for a long time to browse and shop. Not only that, the live broadcast of e-commerce platform also adopts the drainage mode of live webcast, actively introduces stars into the live broadcast platform, and makes online live broadcast of microvariety to improve the exposure rate of the platform. With the rapid promotion of the e-commerce live broadcast platform, a group of e-commerce platform talents and merchants have risen with the help of the platform. Compared with ordinary anchors without a fan base, the advantages of stars will quickly gather popularity, and some of them have high exposure and are well known by the public. Some works have both commercial value and spiritual value or are spokesmen for brands, and they already have many fans. While fans like stars, based on their personal worship, they have an emotional connection with their appearance, personality, and other factors. This connection can quickly establish a trust in stars, and this trust is fully
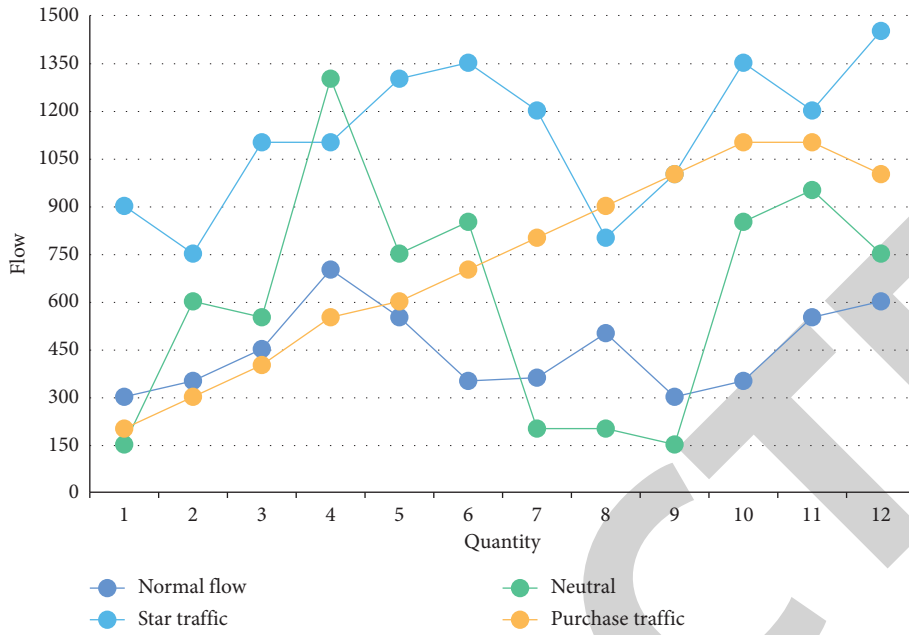
Figure 7: Traffic advantage.
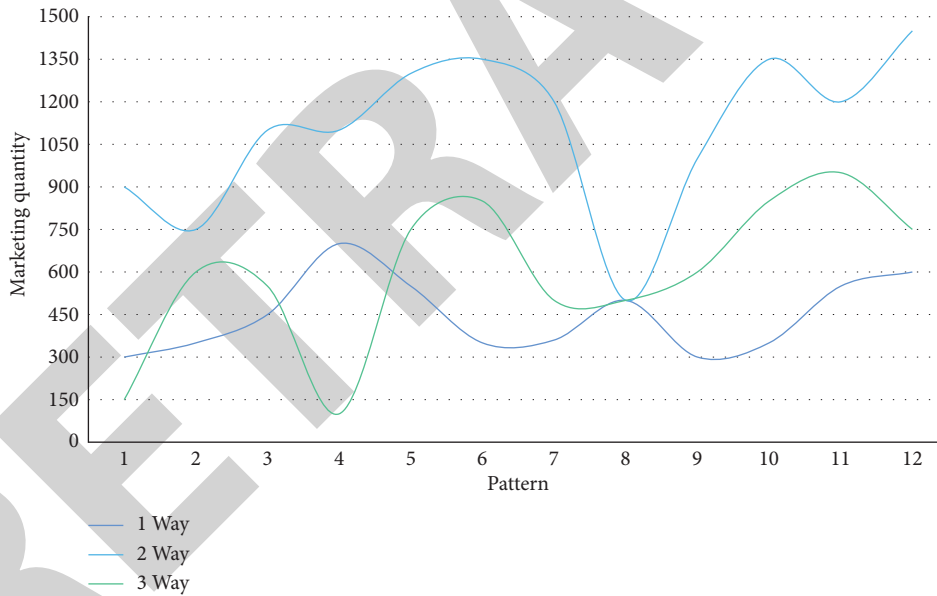
Figure 8: Marketing statistical analysis.

reflected in the commodity sales in the live broadcast. The products sold by their favorite stars will be madly "planted" by fans and even spread all over the network. Brand merchants seize the attention and recognition of fans for stars, and make use of the flow advantages of stars to enhance brand value and increase product sales. As shown in Figure 7, star traffic advantage is compared with no star traffic.

5.1. Network Marketing Model. From traditional to innovative to interactive, network marketing has gradually changed the mandatory viewing in the traditional marketing mode, but it pays attention to the process and ignores the

effect and acceptance. Evolution mechanism: advertising information promotion changes from obtaining revenue from enterprises to sharing revenue with users, and users change from bystanders who do not get any money to participants, indirectly improving the influence of information promotion and precision marketing promotion mode. DSP in precision marketing refers to the demand-side platform composed of multiple enterprises, mainly the advertiser service platform, on which advertisers can set their target audience, delivery area, and delivery price. An SSP refers to the supply and demand platform composed of various online media, which is a media service platform. An Internet advertising trading platform, like a stock trading

platform, connects the buyers and sellers of advertising transactions. This transaction process adopts real-time bidding or nonreal-time bidding mode. In addition, there is a new trading mode, that is, the privatization trading market. In the bidding process, the general rule is that the highest bidder wins, and the same bidder comes first served. The complicated delivery process of traditional media is simplified on these platforms, which greatly saves the time cost. The scientific analysis and application of consumer data has also greatly improved the accuracy and efficiency of advertising. With the help of the network mode of the third-party platform, the third-party platform means that the platform operation team does not produce and sell goods by itself but uses scientific and technological means to build a virtual online mall. In this virtual mall, there is an efficient and high-quality e-commerce environment (hardware and software environment). For example, the platform not only has a fast network speed and a good and easy-to-use operation interface but also has very useful marketing and statistical analysis tools. Figure 8 shows marketing statistical analysis.

6. Conclusion

In the Internet age, network marketing has become the "darling" of marketing, providing a carrier platform for the promotion of enterprise marketing strategy with multidimensional and multilevel marketing layout. As a traditional marketing method, direct marketing has been criticized in its development and evolution due to its characteristics of "pyramid selling." Especially in the era of online marketing, the development space of direct marketing is becoming increasingly narrow, and it also faces many challenges. However, it is more in line with the focus of new 4C theory research that community marketing adopts differentiated strategies for specific communities to gain popularity. Xiaohongshu's social e-commerce model can be said to have achieved certain success, but Xiaohongshu focuses on social interaction and faces young people. Realizing the organic integration of online marketing and direct sales is an important guarantee to promote the symbiosis of marketing resources and enhance the ability of marketing strategic layout, which reflects the importance and necessity of the integration of both. This paper concludes that in the integration of online marketing and direct sales, marketing symbiosis can be realized from the dimensions of resources and channels, which provides a feasible basis for the integration of the two and is also a strong support for the online and offline integrated marketing layout in the new era. In the marketing layout of three squirrels, we can see that online marketing can enhance consumers' stickiness to brands. From the two cases, we can see that any single marketing mode can hardly achieve sustainable and healthy development in the changeable market. Only by constantly following the pace of the development of the times can traditional direct selling and online marketing develop together through the means of resource integration, so as to stand firm in the fierce market competition. In addition, the new network marketing promotion model and algorithm

described in this paper can reduce the cost by 17% and improve the effect.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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Retraction

Retracted: Design and Management of Comprehensive Art Student Information Database from the Perspective of Internet plus Education

Security and Communication Networks

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] W. Liu and S. Wei, "Design and Management of Comprehensive Art Student Information Database from the Perspective of Internet plus Education," *Security and Communication Networks*, vol. 2022, Article ID 6494404, 9 pages, 2022.

WILEY | Hindawi

Research Article

Design and Management of Comprehensive Art Student Information Database from the Perspective of Internet plus Education

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With the rapid development of information technology and network technology, all kinds of data increase exponentially, and the traditional relational databases cannot handle these data well, which is also reflected in the sharp increase in the number of college students. The amount of students' information is increasing exponentially and the simple management method in the past can no longer meet the needs of the new situation. This paper adopts B/S mode and three-tier architecture and relies on network technology and ASP.NET technology to design and implement the student information management system. The system is divided into eight functional modules: comprehensive information inquiry for students, scholarship evaluation, evaluation and award, economic recognition, student loan management, student violation, communication and feedback, and system management. Different operation interfaces are designed according to four users with different permissions: students, class tutors, college administrators, and student affairs offices. This paper describes the system analysis, design, and implementation in detail. The practice results show that the initial use of the student information database management reflects well and achieves the expected goal. The system is easy to maintain and extensible and has good application value. The operation of the system has greatly improved the management efficiency of student affairs and enabled the student affairs administrators to complete various student affairs more efficiently. Campus information construction is becoming an important part of the overall construction of colleges and universities, and it is also a basic and continuous work. Accelerating the establishment of a set of comprehensive, perfect, and efficient student comprehensive management information systems is an urgent need to promote the modernization of college student management. The modernization, informatization, and standardization of college student management are a complex systematic project. Only by relying on modern information technology can we cope with the base pressure brought by the continuous enrollment expansion of college students, promote the flat and intensive utilization of college management information, and improve the efficiency and quality of service.

1. Introduction

As the core feature of the current informatization development, the Internet is being completely integrated with various industries to activate the inherent development potential of various industries. In the integration with education, this is not a simple superposition. The power of one plus one will be far greater than two. The new form of the Internet is being developed under innovation 2.0, and

innovation will make this superposition play a more obvious role. When traditional education encounters Innovation 2.0, education will be forced to change. The change is first reflected in the educational concept. The educational concept should pay more attention to people-oriented, based on the application of knowledge, and make the whole educational process natural and comfortable. The Internet and various industries have achieved integrated development, so a large amount of data has been generated. Therefore, the design

and management of the database can improve the efficiency of the work. In recent years, network security cases have occurred frequently, further improving database security management. Taking the campus network security incident as an example, the economic loss exceeded 700000 yuan because the campus database security prevention work was not in place. It can be seen that carrying out database security protection work can effectively ensure the property safety of the public and make social production and life go smoothly [1].

In order to solve the problem of the increase in data volume and the insufficiency of relational databases in dealing with complex structures, this paper introduces a No SQL database and adopts the technical route of C/S or B/S according to the actual situation for development. C/S is mainly used for students' terminals and management personnel mainly use mobile phones as carriers, conduct corresponding communication, and interaction through Internet technology, and use mobile terminal browsers to operate. The B/S architecture is applied to all participants of the platform, mainly for PC terminals, using the SSH framework for operation. For development, the server uses the Centos7 system, the platform construction uses Nginx + Tomcat for dynamic and static separation, the database uses the MariaDB database, the front-end development uses the Bootstrap framework for rapid development and provides a web page compatibility mode to adapt to different types of browsers. The design and establishment steps of the student information database, the logical structure of the database and its constituent elements, the development strategy of the management and analysis system, the system function, and its realization principle are introduced [2]. The development and application of the system realizes the integrated spatial management and in-depth analysis and utilization of multisource student information such as student sources, attendance, grades, awards, honors, postgraduate entrance exams, and employment at the basic teaching organization side, providing scientific planning, implementation, management, and evaluation. The grass-roots teaching work provides accurate and detailed information reference and visual and intuitive tool support, which effectively promotes the comprehensive, coordinated, and sustainable development of all work.

As a grass-roots organization for teaching management and implementation, both departments and teaching and research offices are responsible for the formulation of student training programs, the construction of curriculum systems, the revision of syllabus, the optimization of teaching content, the reform of teaching methods, the teaching of theoretical knowledge, the guidance of experiment and practice, the evaluation of teaching quality, the construction of a good style of study, the organization of scientific and technological activities, the evaluation of professional construction, and other work directly facing or serving students. The success of these works depends on the understanding and understanding of students [3]. Only by comprehensively collecting and making full use of a variety of student information, such as hobbies, advantages and specialties, academic performance, awards and honors,

employment and further study, can we ensure the overall planning, scientific coordination, and healthy and sustainable development of all work, so as to truly achieve student-centered, respect for personality, teach students in accordance with their aptitude, and promote excellence. The innovation of the research method used in this system lies in the following points:

First, through the specification and standardization of the responsibilities of administrators, student managers, and students, these students also take responsibility and supervision to a limited extent, so as to ensure the accuracy and effectiveness of data collections.

Second, the administrator teacher can formulate policies suitable for the situation of the class by extracting the overall data of the class. At the same time, according to the data statistics of the relevant performance of a certain classmate in a certain time period, more targeted measures can be adopted for the students' communication and guidance.

Third, students can use the system to check their performance in the specified time period, so as to make accurate judgments for themselves and at the same time, based on their actual situation, formulate a targeted personal improvement plan, and achieve correction with the assistance of the system The purpose of improving their own quality is to reduce the pressure of students' self-management from another aspect, improve their autonomy, and improve the management effect [4].

This paper is divided into six chapters based on the organizational structure.

The first chapter is the introduction, which analyzes the application status of student information database design and management under the background of Internet + education, summarizes the causes of problems, and compares new technologies, aiming at improving the management efficiency of university work. The second chapter is a summary of relevant literature, summarizing its advantages and disadvantages and putting forward the research ideas of this paper. The third chapter details the specific composition of the Internet + education model. The fourth chapter introduces the analysis and design of a student information management database from the point of logical design and completion design of the database. The fifth chapter expounds on the analysis and application of database courses on Internet Plus. The sixth chapter is the conclusion, which summarizes the research results.

2. Related Work

Wan et al. believe that databases have gradually entered people's sight, and their security has become more and more important to society with the in-depth development of the Internet and various industries [5]. Therefore, Zhang and Qin analyzes from the perspective of database security in order to provide a theoretical basis for related protection work. Among them, confidentiality is one of the main characteristics of computer databases [6]. Zhang and Yang analyzed that all data in the database is kept secret from the user when no security authorization is obtained [7]. On the basis of confidentiality, integrity is also the main feature of

the database. Integrity mainly refers to the complete protection of data resources of the database. Noraziah A pointed out that with the rapid development of informatization and networking, the system model of affairs management of a single functional department cannot fully meet the actual requirements of the current development of colleges and universities [8]. He-Ping relies on network technology and ASP.NET technology, applies B/S mode, and uses ADO.NET database access technology to realize the real meaning of student information database management [9]. Student management is an important part of the work of colleges and universities, and the establishment of a comprehensive, complete and efficient student-integrated management information system is gradually being included in the agendas of colleges and universities. The development of higher education needs the support of timely, accurate and well-functioning information systems. Sun X has long put forward the construction goals of campus modernization, informatization, and internationalization. According to this goal, it has refined several specific goals, including: realizing the digitization, informatization, and network of teaching, research and services on the campus of the University of Finance and Economics Realize the rational planning, distribution, and effective utilization of information resources and information services [10]. In view of this, Peng and Xu also designed and developed a comprehensive educational administration system with relatively complete functions under the premise of basically satisfying the school's implementation of the credit system for educational administration management. Its functions mainly include teaching, student status, course selection, institutional documents, and study guidance, etc. [11]. The system designed by Chaudhry et al. , etc., its student status management function can realize the query and analysis of schools (training units), professional information, and student information. An authoritative student status information query system [12]. Zhou and others implement credit system management, focusing on the educational thought and concept of "student development-oriented" in the process of student education and teaching. This system provides comprehensive technical support for school teaching management [13]. The online information query system of the Ministry of Education and Industry, which Zhou assisted in designing, includes functions such as the functions and responsibilities of the Ministry of Education and Industry, internal institutions, system management, communication, and inquiry of related information. This system has reached the advanced level of similar educational affairs software [14].

3. Internet + Education

"Internet + education" is a hot topic and hot word in the current education reform and practice. In the field of educational informatization technology, almost all plans and speeches must be discussed, and special attention is paid to them. "Internet + education" is not the network of existing education; it is a new stage of the development of education informatization technology, and it is the basis for technology

to promote revolutionary changes in education [15]. Although "Internet + education" is just beginning to emerge, it is unstoppable. The development of the teaching mode under the background of "Internet + education" in the 5G era is divided into the following aspects, as shown in Figure 1:

(1) *Integrating Teaching Resources.* Colleges and universities should organize teachers to effectively integrate traditional and online learning resources; rebuild the database of teaching resources; collect information resources related to professional teaching extensively; provide rich materials for teachers' teaching design; and provide sufficient learning resources for students' autonomous learning and inquiry.

(2) *Construct Diversified Teaching Mode.* Vigorously develop online and offline mixed teaching and learning modes, and organically combine face-to-face classroom learning with online learning, which not only retains the advantages of classroom teachers in guiding students' learning direction and imparting students' professional knowledge, but also retains the advantages of online learning in stimulating students' autonomy and creativity, and gives full play to teachers' leading role in teaching activities and teaching management [16].

(3) *Improve the Learning Evaluation Mechanism.* In the new teaching mode, the school should pay attention to learning evaluation so as to restrain students' learning behavior and ensure their participation in classroom and online teaching. At the same time, the evaluation results should be taken as the basis for improving teaching quality, and the construction of the educational resource banks should be improved, educational equipment should be updated, teaching methods should be improved, and teaching content should be innovated.

4. Analysis and Design of Student Information Management Database

4.1. Logical Design of the Database. Since the data analysis of the system has been completed, the most important work in the demand analysis stage is to convert the results of the previous stage into a specific database. According to the various relations obtained earlier, they are now converted into data tables. The system mainly includes student information tables, class information tables, grade information tables, course information tables, and professional information tables [17]. Database design mainly includes the logical design and physical design of the database. Usually, the logical design is carried out first, and then the physical design is carried out. The database of the student information management system in this study is designed with the Oracle database, and a total of 7 data tables are created, and their structures are shown in Table 1:

After the establishment of the student information database, the data can be browsed, queried, edited, counted,

FIGURE 1: Analysis of Internet + education model.

TABLE 1: Structure of student information sheet.

Field name	Type of data	Field length and format	Keywords
Student ID	VARCHAR	15	YES
Name	VARCHAR	20	NO
Gender	CHAR	2	NO
Political status	VARCHAR	12	NO
Date of birth	DATE	YYYY-MM-DD	NO
Specialized	VARCHAR	20	NO
Class	VARCHAR	20	NO
Contact number	VARCHAR	15	NO

analyzed, mapped and other operations through the ArcGIS desktop system. As tool GIS platform software, the ArcGIS desktop system is designed for a variety of users, with basic, universal, professional, and other characteristics. Although the desktop system has rich and powerful functions, it is still difficult to meet the specific application needs in terms of flexibility, convenience, practicality, and so on. Therefore, it is necessary to extend and customize the design and develop an applied GIS system for student information management and analysis business [18].

Arcengine supports a variety of development languages such as.Net, Java, VB, VC, Delphi, c++. Different languages have their own advantages and disadvantages, and there is no strict distinction between good and bad. Considering the proficiency, execution efficiency, ease of use, mainstream trends, and other aspects, this paper selects c# in visual.net2010 as the integrated development language [19]. In addition, in order to obtain a more beautiful and friendly interface effect, in addition to the common windows interface controls, the system development also uses the RibbonBar, Panelex, SuperGrid, and other controls in the dot net bar for windows forms control set product of the devcomponents company [20]. The system development strategy and basic architecture are shown in Figure 2:

The database is the core and foundation of the information system, and the design and establishment of the database is an important part of the development of the information system. The database of the student information management system can be established by using Geodatabase technology. The Geodatabase is a new generation of data model and software system that uses a standard relational databases and object-oriented technology to represent, store, and manage geospatial information. The

integrated management of spatial data, as shown in Figure 3, describes the specific connection between these elements, and implicit indirect connections are established between feature classes through spatial relationships.

Aiming at the basic functions of the above databases, the data tables are described one by one, and the detailed content of each data table is planned through the tables. The management personnel information is shown in Table 2, mainly, for the storage of management personnel information.

4.2. Integrity Design.
After analyzing the types of connections among data entities, it is also necessary to analyze the integrity constraints among entities. There are three kinds of table integrity constraints: the first is an entity integrity rule; the second is a referential integrity rule; and the third is a user-defined integrity rule. In this system, there are three kinds of integrality between entities, so as to ensure the integrality of each table. A primary key can be established on the user name in the login table, which ensures that there are no duplicate tuples in the table, thus, realizing the entity integrity. The primary key is established on the student ID in the student table to ensure that no duplicate tuples appear in the table, so that the entity integrity can be realized. Second, although the department number in the student table is not the primary key of this table, it is the primary key of the department table, so the department number can be used as the foreign key of the student table. Therefore, the department number in the student table cannot be taken casually, but can only be taken by reference to the value of the department number in the system table, thus, realizing referential integrity through the foreign key of the department number. Also, the gender field in the student table can only be "male" or "female." This type of constraint is the so called domain integrity rule, and the domain integrity constraint is a kind of user-defined integrity. The primary key is established on the work number in the teacher's table, which ensures that there are no duplicate tuples in the table. In this way, entity integrity can be realized through the work number.

4.3. Key Algorithm Design of Distributed Database.
Different from centralized database management systems, distributed databases involve issues such as data distribution and joint query of multiple data sets. In order to improve the performance of the student file management information system in data processing, it is necessary to improve the existing related data algorithms. Data distribution is a critical step in distributed databases. The mathematical description of data distribution can be defined as follows: let the data site included in the system be S, then,

$$S = (S_1, S_2, S_3, \ldots, S_m). \tag{1}$$

The sites are connected to each other through the network. The set of program transactions running on this network is set to T, then,
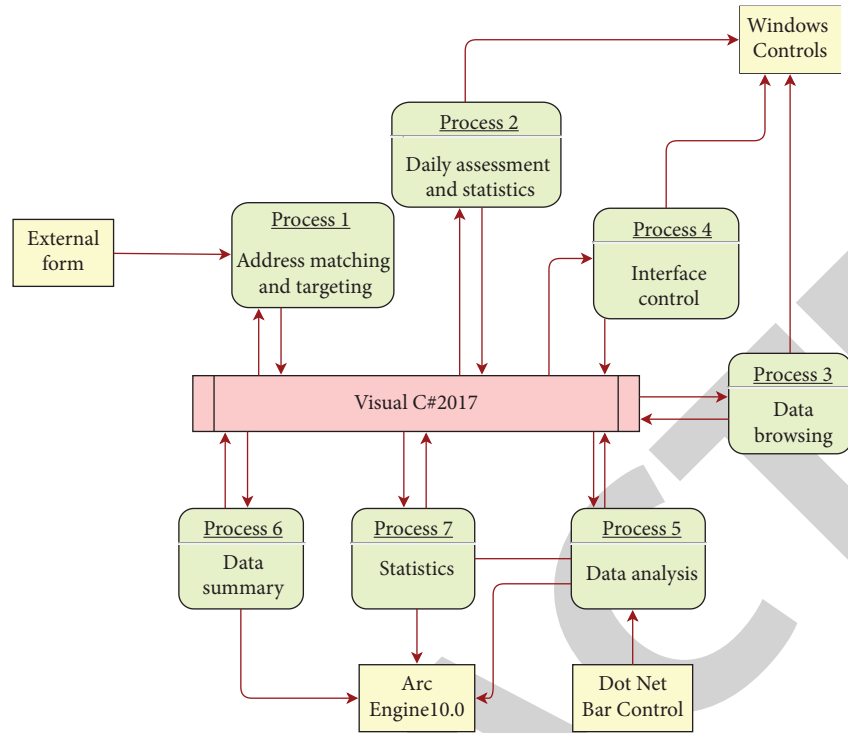
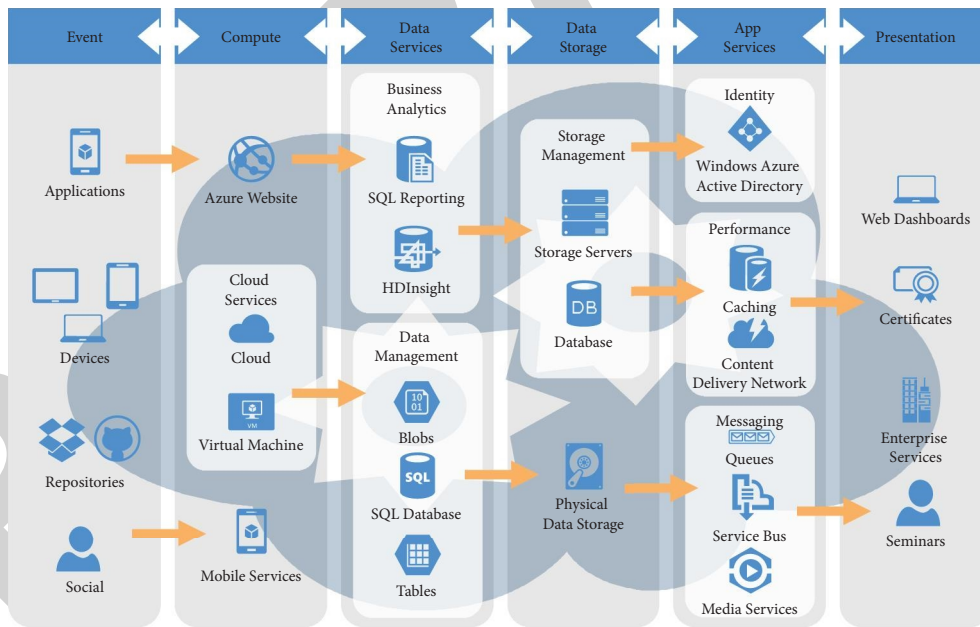Figure 2: System development strategy and basic architecture.

Figure 3: Elements and relationships of databases based on Internet+.

Table 2: Management information sheet.

Field name	Illustrate	Data type/length	Nonempty	Defaults
User name	Manager	VARCHAR (11)	YES	0
Password	Password	VARCHAR (4)	YES	0
Question	Security question	VARCHAR (10)	YES	1

$$T = (T_1, T_2, \ldots T_n). \tag{2}$$

As the basis for the operation of the program transaction, let the data set on the network be D, then,

$$D = (D_1, D_2, \ldots, D_p). \tag{3}$$

Then, the problem that the data allocation algorithm needs to deal with is: design an algorithm to reasonably configure the replicas of D_i in different sites S, so that the total performance of the entire system can be maximized, and the total cost can be minimized. The plan is denoted as $C(D_i, S_j, T_k)$.

For the research on optimal data allocation algorithms, the current algorithms mainly include grouping local optimization algorithms aiming at the minimum cost of data fragmentation storage, clustering optimization algorithms implemented by calculating the minimum average value and attribute correlation-based algorithms. Vertical sharding and clustering, is an algorithm that combines clustering and allocation.

Allocating data units to different clusters have better performance than direct allocation to sites, which can effectively improve communication efficiency between sites and reduce communication costs. After completing the clustering operation of the site, it is also necessary to define and clarify the communication costs between different clusters and the communication cost within each cluster.

(1) If a single cluster C_i includes multiple sites S, the average communication cost within it can be defined as follows:

$$AvgC_i = \frac{\sum_{i=1}^{n} CC(S_i, S_j)}{n * (n-1)}. \tag{4}$$

(2) The communication cost between different clusters can be defined as follows:

$$AvgCC(C_i, C_j) = \frac{\sum_{i=1}^{m} CC(S_i, S_j)}{m * n}. \tag{5}$$

(3) The total communication cost of all clusters in the system can be defined as follows:

$$All\,ACC = \frac{\sum_{i=1}^{n} \sum_{j=1}^{m} ACC(C_i, C_j)}{n * m}. \tag{6}$$

The abovementioned definition and analysis of the communication cost within the cluster and the communication cost between the clusters is the basis for the next step to optimize the distribution of data based on the genetic algorithm.

4.4. Improvement of Distributed Database Query Algorithm. To improve and optimize the distributed query algorithm, we must first determine the cost and cost calculation model of the query algorithm. Based on the research of the query process, this paper constructs a new cost model, which takes into account the factors of data copy selection, site selection,

connection sequence, data transmission, and so on, and gives a mathematical model of query cost. The query cost model mainly considers the network transmission process and the total query time, and the total query cost is the sum of the query costs of all involved nodes. Consider it step by step. First, the transmission cost of data between networks can be expressed as $com(i, j, m)$, which means that there are m bytes of data in stations i and j. Second, the internal processing cost of the site, mainly the operation time cost of the local relational database tables.

The determination of the most important fitness functions in a genetic algorithm, which is the basis for screening chromosomes. At present, for the distributed database query algorithm it is to find a selection scheme of sites, data copy, connection relationship, and transmission relationship, and generate a query tree to minimize the sum of costs in all aspects. The fitness function is constructed according to the cost model of distributed database queries established above. It should be noted here that genetic algorithm is implemented according to the principle of maximum fitness, the higher the probability of selection, and the cost function in the process of distributed database query should be the smaller the value, the better, so it also needs to be processed by taking the reciprocal. Therefore, the fitness function of the chromosome is

$$fitness(gen_i(tree)) = \frac{1}{cos\,t(gen_i(tree))}. \tag{7}$$

The training dataset is divided into several subdatasets according to the value of attribute A. The "SplitInformation" of attribute A is:

$$Split\,Info_A(S) = -\sum_{j=1}^{m} \left|\frac{S_j}{S}\right| \log_2 \left|\frac{S_j}{S}\right|. \tag{8}$$

In the formula: S is the training data set; m is the number of subdata sets; $|S_j|$ is the number of samples in the j-th subdata set; $|S|$ is the total number of samples in the data set before division.

After the attribute a splitting step, the information gain of the sample set can be expressed as follows:

$$Info\,Gain(S, A) = E(S) - E_A(S). \tag{9}$$

In the formula: $E(S)$ is the information entropy; $E_A(S)$ is the information entropy with attribute A as the root classification.

After the attribute A splitting step, the information gain rate of the sample set can be expressed as follows:

$$Info\,Gain\,Ration(S, A) = \frac{Info\,Gain(S, A)}{SplitInfo_A(S)}. \tag{10}$$

5. The Application of Database Course Analysis of Internet +

Taking the physical education course scores of students in 20 classes in the art department of a university as an example, to conduct data mining analysis, and apply the C4.5 algorithm

in the physical education course analysis system, the training set data of 735 students in 20 classes is shown in Figure 4 shown:

Through the training set data shown in Figure 4, the C4.5 algorithm is used to generate a decision tree. Part of the code implemented by the program is as follows:

```
print('Start training...')
tree = train    (train_features,    train_labels,    list
(range(feature_len)))
time_3 = time.time()
print('training cost %f seconds' %(time_3 - time_2))
print('Start predicting...')
test_predict = predict(test_features, tree)
time_4 = time.time()
print('predicting cost %f seconds' %(time_4 - time_3))
```

The student quality management module is mainly composed of three submodules: student daily assessment management, student self-improvement management, and student feedback management. The operations of all modules are completed by the students themselves. For daily assessment information, students can perform advanced query operations and display corresponding content, add and update the promotion status for self-improvement information, and add and view feedback information. The effect of students performing advanced query operations is shown in Figure 5:

After the above clustering algorithm is used to calculate, the academic performance and learning information of each student can be obtained, and a data set cluster with a certain similarities can be formed according to the association rules. Students' different learning information is stored in the curriculum reform information table of the personalized network teaching system. Whether individual students or students in similar clusters with the same learning information will have an impact on the data in the curriculum reform information table when they are learning other subjects, selecting courses, and other activities, forming a dynamic information update mechanism. Each individual in the curriculum information reform table will be assigned a separate information code, and this information code (ID) will be used to form a complete record of learning information. The similarity cluster is a set of learning information with similarity formed by more than 7 IDS, as shown in Figure 6. If there are new learners, the information cluster closest to the new individual can be found in some similar student clusters through their basic information, learning information, course selection, course information, etc. Then the learning system and students complete the interaction in the process of interaction, and the system extracts the data in the curriculum reform information table and sends it to new students to form recommendations.

According to the above information collection mode, the information data accumulated over the past five years is collected and processed by the business platform operated by the data center of a certain school, and various results of the
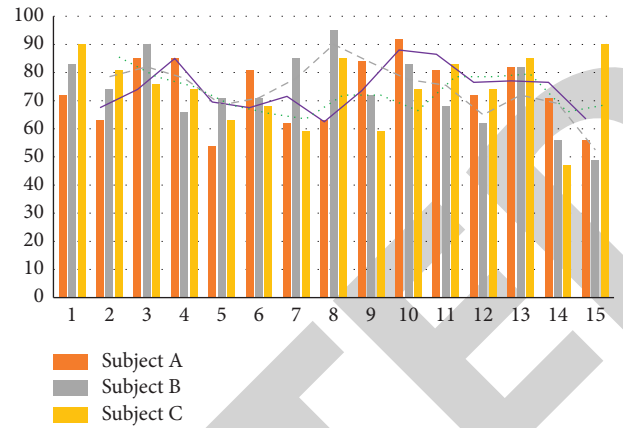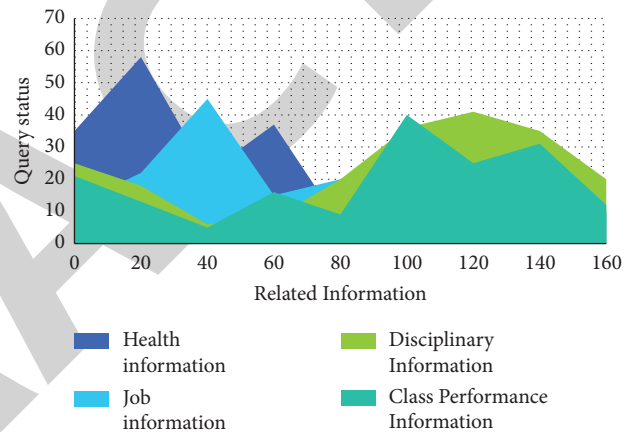

Figure 4: Training set data.

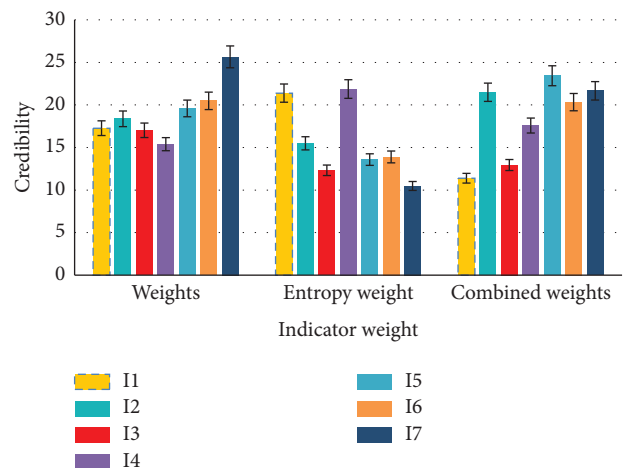Figure 5: Rendering of advanced query operations.

Figure 6: Weights of college teaching scoring indicators.

teaching evaluation project are obtained through compound algorithms (see Figure 7).

The student academic quality analysis system makes full use of web technology to visually process the data so that different roles can dynamically, intuitively, and accurately
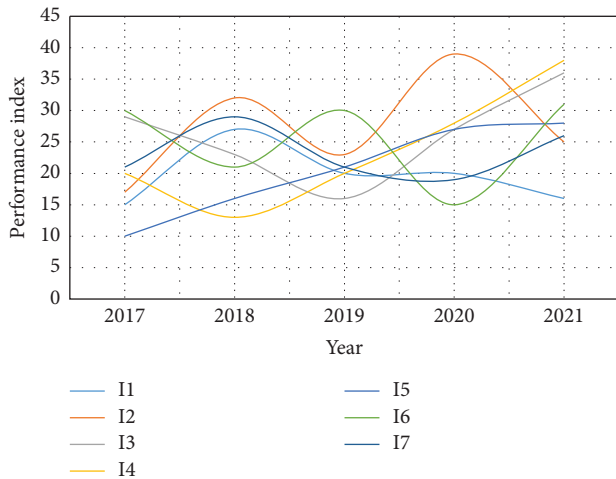
Figure 7: Information data analysis.

Figure 8: Functional use case diagram of the data analysis system.

understand and master the academic status of students, classes, schools, and regions. Gradually change the diagnosis and evaluation of the existing teaching process from fuzzy, qualitative and empirical to accurate, quantitative, and empirical, make a scientific basis for improving and improving the current classroom teaching, promote and improve the teaching work of the school, and promote the improvement of regional teaching quality and efficiency. The functional use case diagram of the data analyses system is shown in Figure 8.

In addition, the database design should also be closely integrated with the application system design and be carried out synchronously. The two refer to and complement each other. The specific steps are as follows:

(1) *Establish a User Data View.* Within a certain domain, determine and describe the user's business functions; clarify the data types and flow processing procedures required to perform the functions; determine the data usage requirements; and various constraints, and logically group the data.

(2) *Define Objects and Connections.* To further classify, aggregate, and summarize the business, function and data that users are concerned about, form a series of identifiable objects (or entities) and their characteristics, determine and describe the relationship between objects, and use graphics (such as ER, UML diagrams) to further classify, aggregate, and summarize. etc.,) are visually expressed.

(3) *Select the Geographic Expression.* For objects that have geometric characteristics or need to be visualized in the form of a map, further choose to determine their spatial representation types, such as points, lines, polygons, surfaces, and grids, etc.

(4) *Convert to Geodatabase.* According to certain rules, the entities, relationships, and characteristics determined in the above steps are transformed into corresponding Geodatabase expression elements, such as tables, feature classes, relationship classes, and fields, attribute fields, subtypes and feature
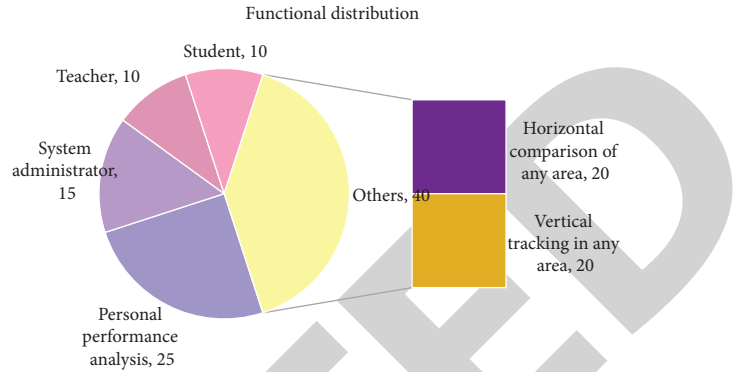
datasets. Among them, the table is mainly used to store the attribute information of nonspatial objects; the feature class is a special table with a "shape" field, which is used to store the geometry and attribute information of spatial objects (features); the relation class is used to establish the relationship between tables to realize the association query and use of object information.

(5) *Geodatabase Structure Adjustment and Optimization.* On the basis of considering the actual use in the future, according to the relational database standardization theory, the database structure is adjusted and optimized through decomposition, consolidation, combination, reconstruction, and other operations so as to reduce data redundancy, avoid abnormal operations, achieve the balance between storage space and access efficiency, and the overall structure is clear.

6. Conclusions

Driven by the Internet + education, the education industry has realized the integrated development of online and offline and obtained more practical benefits. In the process of integration and development of the two, it is not a simple overlapping development, but the Internet is used as a supporting platform and information technology is used to deepen the integration and development of interconnection and education. The reasonable design of the database of the student information management system can greatly improve the work efficiency of student management and related management personnel, and it is of great significance to improve the existing management level. This paper adopts B/S mode and three-tier system architecture, relying on network technology and ASP.NET technology, to design and implement a student information management system, which also improves the management level of the school. There are still many shortcomings in this paper that need to be improved. For example, the construction process of a knowledge graph is developed to be automated, and on this basis, functions such as course recommendation system and question-and-answer system are added to the course selection process of students, which need to be continuously enriched and improved in the later stage.