

## *Retraction*

# **Retracted: Modeling and Research on Human Capital Accumulation Complex System of High-Tech Enterprises Based on Big Data**

### **Complexity**

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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] Y. Shen, "Modeling and Research on Human Capital Accumulation Complex System of High-Tech Enterprises Based on Big Data," *Complexity*, vol. 2021, Article ID 6635228, 14 pages, 2021.

## Research Article

# Modeling and Research on Human Capital Accumulation Complex System of High-Tech Enterprises Based on Big Data

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At present, high-tech enterprises are mainly organizations engaged in the production, research, and development and service of high-tech products. The current development of high-tech industries in various countries in the world is of great significance to improving social productivity and overall national strength. This article mainly introduces the modeling and analysis of the complex system of human capital accumulation in high-tech enterprises based on big data. This paper proposes a theoretical analysis of corporate human capital data and proposes regression analysis and analytic hierarchy process to calculate and analyze the process of corporate human capital accumulation and collect and analyze the data using questionnaire surveys and other methods. In addition, complex systems were modeled based on big data, and a cloud computing-based human capital big data analysis platform was established. The experimental results show that complex system modeling based on big data has a positive impact on the human capital accumulation of high-tech enterprises. For high-tech companies at different stages of development, the relationship between various types of human capital and corporate performance is inconsistent with the market economy. In contrast, the current salary system of some high-tech companies still has many drawbacks. The cost of using human resources controlled by the wage system accounts for more than 24%.

## 1. Introduction

With the development and dissemination of information technology and computers, the flow of personnel, capital, goods, and information in the production and living activities of human society gradually tends to be digital. Digital products are not uncommon in life, which in turn activates industry data. Explosive development has promoted the rapid development of big data. However, traditional human resource management often lags behind, even simple manual and subjective personnel management. Even the performance appraisal standards are subjective, which run counter to the development of society.

With the emergence of network and information, especially the widespread popularization of computer and Internet technology, we should make full use of the convenience provided by information technology to make human resource management more scientific, reduce

human capital, and give full play to the role of human resource management [1]. Through the production of a large amount of internal and external data, the processing and analysis of a large amount of human capital accumulation data of high-tech enterprises can bring huge added value to enterprises and adapt to the changing economic environment [2]. Through the analysis of the current situation of human resource information system, we found its shortcomings and further put forward the theory and method of creating a new platform, which provides support for the establishment of analysis platform based on high-tech enterprise data of computing cloud [3].

H. Chen, B. Xuan, P. Yang, and others stated that safety requirements are becoming more and more important for various industrial production processes. Although many facilities have been designed and used to ensure safety, some safety accidents still occur [4]. But he did not come up with a plan on how to prevent brain drain. D. Sledgianowski et al.

responded to the initiative to apply big data technology to accounting courses and used the lens of the accounting education ability integration framework to provide examples of integrating big data and information systems into teaching resources [5]. From the accounting of R&D expenses of enterprises, the expenses in the process of R&D are calculated, and reasonable cost sharing standards are formulated. The main purpose of this paper is to improve the cost control of R&D projects of high-tech enterprises, so as to ensure the economic benefits of high-tech enterprises. However, his research on high-tech enterprises is more invested in enterprise benefits and does not consider how to introduce high-tech talents [6]. Z. Wang, J. Yang and others took high-tech companies listed on the small board from 2007 to 2010 as a sample and used the structural equation model to explore the political connection mechanism of technological innovation in small and medium-sized high-tech companies. They said that politically connected managers can play an active role in the technological innovation of small- and medium-sized high-tech companies. External financing and entry barriers play an indirect role in the transmission of political connections to technological innovation, that is, political connections indirectly affect the technological innovation of enterprises through external financing and entry barriers [7]. This strategy is based on fully realizing that the international competition at present and in the future is mainly scientific and technological competition and also a correct decision based on China's national conditions and the rise and challenge of knowledge economy in the world. The enlightenment of human capital investment theory to us: Talent is capital [8]. This view sees the importance of talent but it does not have a good explanation for big data. To attract talents, we should first know where the talents are and rely on big data technology for precise positioning [9]. Although the theory of human capital has been attached importance to by various disciplines, scholars have been studying it more and more. In recent years, most of the researches at home and abroad have focused on the relationship between human capital and economic growth or enterprise performance, or the impact of the combination of human capital and technological innovation on economic growth [10]. The research on the relationship between human capital and technological innovation is scattered, and most of them only use qualitative analysis to analyze the relationship between human capital and technological innovation ability. The mechanism of human capital on technological innovation capability is ignored [11].

This article mainly introduces the modeling and analysis of the complex system of human capital accumulation in high-tech enterprises based on big data. This article puts forward the theoretical analysis of enterprise human capital data, questionnaire survey, and other methods and proposes regression analysis and analytic hierarchy process to calculate and analyze the process of enterprise human capital accumulation. In addition, complex systems were modeled based on big data, and a cloud computing-based human capital big data analysis platform was established.

## 2. Human Capital Acquisition Method of High-Tech Enterprises Based on Big Data Technology

### 2.1. Method of Analyzing the Data of Human Capital of High and New Enterprises

*2.1.1. Methods of Theoretical Analysis.* This paper expounds the background and content of the theory of enterprise capability in detail and expounds the mechanism of the relationship among human capital investment, enterprise capability, and enterprise performance, so as to provide a reasonable theoretical basis and suitable and meaningful hypothesis to be tested for the empirical research in the following paper. Analyze the connotation and characteristics of core human capital and general human capital and the different characteristics between high-tech enterprises and traditional enterprises and understand the commonness and individuality between them [12]. So we have a deeper understanding of the core human capital and its internal relationship with the competitiveness of high-tech enterprises. In the competition of the enterprise, only know the enemy and the friend can win the victory [13]. The theoretical analysis method can help the enterprise to understand the strengths and weaknesses and can analyze the strengths and weaknesses of the competitors [14].

*2.1.2. Questionnaire Analysis.* In this paper, a questionnaire about the relationship between the optimal allocation of human resources and the performance of high-tech enterprises is developed, and some enterprises of high-tech enterprises are surveyed by questionnaire [15]. It is a kind of survey method to collect research materials indirectly in written form, a method of obtaining materials and information indirectly by sending a concise inquiry form to the investigator and filling in the opinions and suggestions on the relevant issues [16]. In this way, we can clearly know the human resources structure of high-tech enterprises, and the following investigation and analysis can be carried out more smoothly [17].

### 2.2. Base on Human Capital Law of High-Tech Enterprises Based on Big Data

*2.2.1. Visual Research Method.* Visual analysis refers to the mutual analysis of a large amount of data, which is affected by the information dispersion and nonuniform data structure [18]. In addition, manual analysis occupies the core means, and the analysis process lacks structure and stability. This leads to the analysis process and mode cannot be clear, which makes it more difficult for the application system to obtain data, which hinders the subsequent mining and processing analysis [19]. The construction of visual data analysis platform effectively solves this problem and realizes association analysis manually. The essence of data visualization is a research system based on service-oriented guidance, which is comprehensive and unique [20]. This theoretical concept first appeared in the 15th century and has not been well developed before the 20th century. With the emergence and update of electronic computers, this

guiding ideology has been reborn [21]. With the continuous promotion and application of “big data,” the efficient graphic carrier of visual analysis makes the analysis and understanding of nonsimple data more concise and can effectively assist the application, prediction, and decision-making of data information [22].

**2.2.2. Predictive Analysis.** Analysis and prediction are the ultimate goal of big data application, which must be based on effective and reliable data sources [23]. The basic data needed by HR management is mainly divided into two parts, internal and external, including market environment factors [24]. Generally, the internal data has good accuracy, but it lacks conciseness in collection and application. In addition to the support of data sources, professional analysis software and big data professional analysts are more efficient predictive analysis methods [25].

**2.3. Principal Agent Theory Based on Utility Function.** The principal-agent theory is completely based on the hypothesis of “economic man.” For a rational economic man, the choice of his working style and effort is based on the maximum utility. The general utility function is as follows:

$$U = U(w, e). \quad (1)$$

Among them,  $w$  refers to employee’s income or remuneration and  $e$  refers to employee’s effort. Generally speaking, income is directly proportional to utility, and effort is inversely proportional to utility. Thus, the following formula is established:

$$\frac{\partial U}{\partial w} > 0. \quad (2)$$

Obviously, employees choose as much as possible in exchange for more remuneration with less effort so as to have

$$\frac{\partial U}{\partial e} < 0. \quad (3)$$

The output of an enterprise is a function of effort and environmental factors:

$$q = q(e, s). \quad (4)$$

In the formula, the environmental factor  $s$  is a random variable, which has an important impact on the output of enterprises.

**2.4. Regression Analysis of Human Capital Calculation.** In the regression analysis, firstly, the two factors extracted are taken as the explanatory variables and the explanatory variables to establish a linear regression equation to analyze in detail the impact of large technology on the human capital of high-tech enterprises. The formula of the regression model

$$Y = C_1X_1 + C_2X_2 + \text{Control} + e_1. \quad (5)$$

The regression model is as follows:

$$\begin{aligned} M_1 &= C_1X_1 + C_2X_2 + \text{Control} + e_2, \\ M_1 &= A_{11}X_1 + A_{22}X_2 + \text{Control} + e_2. \end{aligned} \quad (6)$$

The human capital investment of high-tech enterprises can mainly positively affect the production efficiency and operation ability of the enterprise, but the influence on the management efficiency of the enterprise is not significant and not positive. It focuses on the mediating role of the two dimensions of the ability of the enterprise’s production efficiency and operation ability in the impact of human capital investment on enterprise performance. The formula of specific regression models is

$$Y = C_1X_1 + C_2X_2 + B_1M_1 + B_2M_2 + \text{Control} + e_3. \quad (7)$$

**2.5. Analytic Hierarchy Process of Human Capital.** The AHP is to solve a decision-making problem, which will be solved as a subsystem, and then solve the decision-making problem by analyzing the influencing factors and divide a complex problem into simple problems related to it. In this subsystem, the decision problem to be solved is taken as the goal, and the factors affecting the target level are taken as the standard and then further decomposed at different levels as the standard.

According to the scale value and the method of pairwise comparison, the formula is as follows:

$$\begin{aligned} a_{ij} &> 0, \\ a_{ij} &= \frac{1}{a_{ji}}, \\ a_{ij} &= 1. \end{aligned} \quad (8)$$

## 2.6. Mode of High-Tech Enterprise Entrepreneurs’ Human Capital Participating in Income Distribution

**2.6.1. Determination of Withdrawal Amount of Virtual Stock Option Award Fund.** Before the implementation of the option incentive plan, the general meeting of shareholders shall discuss and determine a basic withdrawal proportion and withdraw a certain amount from the current year’s EVA value as the company’s first period incentive start-up fund, including  $F_0$ , the initial incentive plan start-up fund,  $z_0$ , the enterprise’s EVA value when implementing the option plan for the first time, and  $F_0$ , the withdrawal proportion of the first incentive fund:

$$F_0 = z_0 * f_0. \quad (9)$$

After that, the incentive fund FN of that year will be extracted from the EVA value created in that year according to a certain proportion, so as to reward the virtual stock option. The reward level is linked with the company’s operating performance level and is calculated according to the company’s operating performance according to the specific calculation formula, where FN is the reward fund of the

company in the  $n$ th year;  $Z_n$  is EVA value of the company in the  $n$ th year;  $F_n$  is the proportion of the bonus fund withdrawn in the  $N-1$  year of the company;  $G_n$  is determined by the excess EVA growth rate of the company in the  $n$ th year:

$$\begin{aligned} F_n &= Z_n F_n - 1(1 + G_n) \quad (Z_n > 0 \text{ and } 1 + G_n > 0), \\ F_n &= 0 \quad (Z_n < 0 \text{ and } 1 + G_n < 0). \end{aligned} \quad (10)$$

The calculation method of the excess EVA growth rate is as follows, where the expected value is recorded as E1:

$$G_n = \frac{(\Delta \text{EVA} - \text{EI})}{\text{EVA}_{N-1}}. \quad (11)$$

Since the values of the source data are both negative numbers, all source data need to be taken as absolute values:

$$\begin{aligned} U &= \{P_1|D, L, f_2, Q, d, l \quad P_2|f_1, \mu \quad P_3|N, M, I\}, \\ \text{IR} &= \sum_{s=1}^U \sum_{d=1}^K f_s, DV_s, d. \end{aligned} \quad (12)$$

Take the first 4 values of the RSRP value of the service station received at time  $t$ , and form the short sequence of the GM (1,1) model with the predicted value obtained at the previous time, denoted as

$$\sigma_{ikjl} = \begin{cases} \frac{n}{\Delta_{ikjl}} \sqrt{\sum_{s=1}^n (x_{ik}(\varepsilon) - x_{jl}(\varepsilon))^2 \Delta_{ikjl}(\varepsilon)}, & \Delta_{ikjl} > 0; \\ 0, & \Delta_{ikjl} < 0, \end{cases}$$

$$X_1 = \{X_1(t - 4\Delta t), X_1(t - 3\Delta t), X_1(t - 2\Delta t), X_1(t - \Delta t)\}. \quad (13)$$

In the same way, remember the short sequence formed by the RSRP value of the target site as

$$X_2 = \{X_2(t - 4\Delta t), X_2(t - 3\Delta t), X_2(t - 2\Delta t), X_2(t - \Delta t)\}$$

$$\text{BMI}(b) = 2n \ln(\sigma) + n \ln(2\pi) + n \left\{ \frac{n + tr(S)}{n - 2 - tr(S)} \right\},$$

$$W(T) = K(y(T-1), u(T-d-1)). \quad (14)$$

Establish a GM(1,1) model based on the short sequence  $X$ , and get a new set of prediction sequences after performing operations:

$$\begin{aligned} Y_1 &= \{Y_{1,1}, Y_{1,2}, Y_{1,3}, Y_{1,4}, Y_{1,5}\}, \\ y_i &= \beta(u_i, v_i) + \sum_{j=1}^p \beta_j(u_i, v_i) x_{ij} + \varepsilon_j \beta_j. \end{aligned} \quad (15)$$

In the same way, a GM(1,1) model is established based on the short sequence  $2X$ , and a new set of prediction sequences are obtained after calculation:

$$\begin{aligned} Y_2 &= \{Y_{2,1}, Y_{2,2}, Y_{2,3}, Y_{2,4}, Y_{2,5}\}, \\ w_G^{A_i A_j} &= \max\left\{0, W_G \cdot \varepsilon \left( f_G^{A_i}, f_G^{A_j} \right)\right\}. \end{aligned} \quad (16)$$

Take the average of the predicted sequence of the service site and the target site obtained after the prediction to obtain the average sequence:

$$\begin{aligned} Y'_1 &= \text{avg}(Y_1), \\ Y'_2 &= \text{avg}(Y_2). \end{aligned} \quad (17)$$

### 3. Human Capital Accumulation System Experiment under Big Data Technology

**3.1. Basic Characteristics of Big Data Machine Learning.** The large system of machine data learning includes many complex technical problems in mechanical learning and big data processing, such as model structure, teaching algorithm, accuracy of mechanical learning model, distributed storage, and parallelism of big data processing. These are closely related to calculations, network communications, local calculations, work plans, system fault tolerance, and other factors. However, data development method is a nonparametric estimation method, which uses mathematical programming to evaluate the relative effectiveness of multiple input and output decision-making units, that is, to judge whether DMU is within the "limit" of total production potential. Since production boundary is the extension of production function in the case of multiple costs in finance, DEA method and model can determine its structure. For production boundary, DEA method can be regarded as a nonparametric statistical method. When you use data envelopment analysis to evaluate the effectiveness of decision-making units, you can not only get the information decision-making of relative performance and scale economy of each receiving unit but also obtain a lot of management information with profound economic significance and background.

**3.2. Analytic Hierarchy Process Test.** Analytic hierarchy process (AHP) is a kind of multiple criteria decision-making process that combines qualitative and quantitative analyses. Its characteristic is to establish a hierarchical structure model by analyzing the essence, influencing factors, and internal relations of complex problems and then determine the decision-making process mathematically with less quantitative information, thus providing a simple decision-making method for the resolution of composite materials and providing quantitative basis for analysis, decision-making, prediction, or mathematical control. The following is how to use it:

- (1) According to different objectives and functions, the system is divided into different levels, such as target level, standard level, and system level.

- (2) In pairwise comparison, the detailed level procedure of decision table (AHP) is mainly for people to evaluate the relative importance of each factor at each level. These decisions are expressed in the form of numbers by introducing appropriate scales, reflecting people's understanding of the relative importance of various factors. Generally, the 1–9 scale method and the reciprocal scale method are used. By pairing and comparing the factors, the values are assigned according to the importance level, thus completing the transformation from qualitative analysis to quantitative analysis.
- (3) Hierarchical single sort. It is to calculate the weight of the elements related to the upper level according to the decision table. Theoretically, the calculation of the single level classification of the problem may be limited to the calculation of eigenvalues and the maximum value of the sector of the crisis matrix.
- (4) In order to determine the relative importance or relative advantages and disadvantages of the lower level elements of the overall goal, the comprehensive weight of each element in each layer is calculated and the general classification is carried out.

#### 4. Human Capital Analysis of High-Tech Enterprises Based on Big Data

**4.1. Item Data Analysis Based on Scale.** As shown in Figure 1, the test of item analysis is to explore the difference of subjects with high and low scores in each item or to test the homogeneity among items. The difference between the first 27% and the last 27% of the total score of the scale is called the comparison of the two extreme groups, and the difference value of the comparison results of the extreme group is called the decision value or critical ratio. Data analysis is shown in Table 1 and Figure 2.

As shown in Table 2, *t*-test of independent samples is to test whether the average of each item in the high score group and the low score group is significant, so as to know whether the average of each item in the scale is different due to the different groups (high group and low group). In terms of the variable C1, the average of the high group was 2.5, the standard deviation was 1.4, the average of the low group was 3.7, and the standard deviation was 1.2. The greater the difference between the two groups was, the more likely the difference would be.

**4.2. Factor Analysis of Human Capital.** KMO and Bartlett's test is the fitting test before factor analysis. KMO is an index for comparing the observed correlation coefficient and partial correlation coefficient. The value of KMO reflects the correlation degree of this factor analysis. In general,  $KMO > 1$  is very suitable for factor analysis;  $1 < KMO < 1.1$  is suitable; above 0.9 is acceptable; 0.7 is poor; below 0.4 is not suitable for factor analysis. The results of KMO and Bartlett's test on 12 variables in human capital measurement table are as follows:  $KMO = 0.8 > 0.7569$ , and the significance probability sig of  $\chi^2$  statistical value of Bartlett's sphericity test is

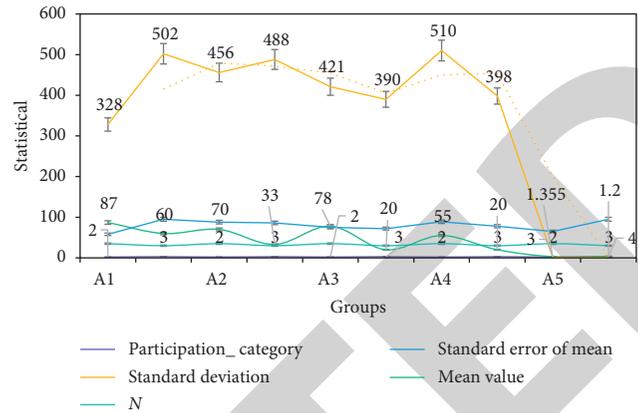


FIGURE 1: Statistical quantity of groups statistical graph.

less than 0.11, indicating that the factors in the questionnaire have certain relevance, as shown in Table 3.

Factor analysis is to study the internal dependence among many variables. The principal component method is used to extract common factors, and the orthogonal rotation method of varimax is used to obtain the load value of each factor. The main purpose is to condense many observation variables into a few factors to achieve the effect of reduction to make the scale more scientific and simplify the later calculation.

**4.3. Data Analysis of Regression Method.** When establishing the regression model of economic problems, it is necessary to consider whether there are conditions inconsistent with the assumptions of the model, such as heteroscedasticity. If the problem of heteroscedasticity exists in the model, the least-square method is still used to estimate the unknown parameters, which will lead to the results that the estimated values are not optimal. The residual graph analysis method of SPSS software is used to test the heteroscedasticity. The test results show that the model does not have heteroscedasticity problem.

As shown in Figure 3, high-tech enterprises' nonexecutive human capital investment and executive human capital investment can positively and significantly affect their performance, and this impact has a certain lag effect. In the control variables, the human capital stock of enterprises can promote the performance of enterprises and is significant, which also confirms that the reasonable human capital structure in high-tech enterprises is the premise to improve the efficiency of human capital investment, and the higher the quality of human capital, the better the performance of enterprises.

As shown in Table 4, when the flow of human capital is more frequent, it will reduce the performance of the enterprise. This may be because when the flow of human capital is more frequent, the recruitment cost that the enterprise needs to invest in the next year will increase, and the newly introduced human capital often has a certain running in period with the enterprise, which will have an adverse impact on the performance of the enterprise.

TABLE 1: Statistical quantity of groups.

Participation_category	N	Mean value	Standard deviation	Standard error of mean
A1	2	35	87	328
A1	3	30	60	502
A2	2	35	70	456
A2	3	30	33	488
A3	2	35	78	421
A3	3	30	20	390
A4	2	35	55	510
A4	3	30	20	398
A5	2	35	3	1.355
A5	3	30	4	1.2

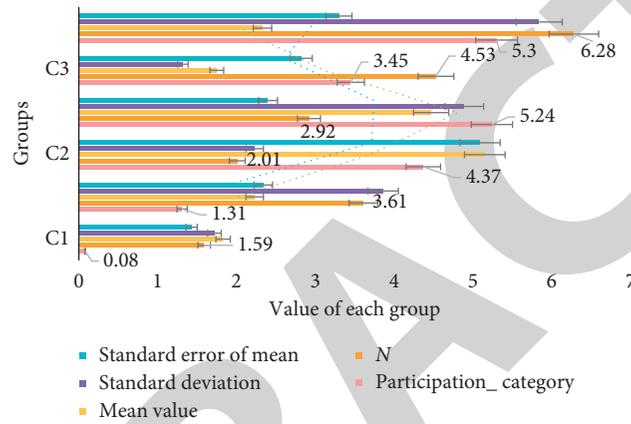


FIGURE 2: The average value of the high and low groups.

TABLE 2: Comparison of the standard deviation of the average value of the high and low groups.

Participation_category	N	Mean value	Standard deviation	Standard error of mean
C1	2	35	3.15	1.366
C1	3	30	4.72	1.35
C2	2	35	2.5	1.225
C2	3	30	3.9	1.088
C3	2	35	1.235	1.365
C3	3	30	1.265	1.965

TABLE 3: KMO and Bartlett's test.

Kaiser-Meyer-Olkin measure of sampling adequacy	800
Approximate chi square	605.29
Bartlett's sphericity test	88
Sig	1

4.4. HR Staff's Views on Big Data. The most important part of human resource planning is to investigate the current human resource situation of the company in the preparatory stage. The quantity and quality of all human resources of the company are the foundation of enterprise development. In general, the number of existing employees, the number of people of all ages, the distribution of employees at all levels of education, and the skills of employees are the contents of the company's thinking.

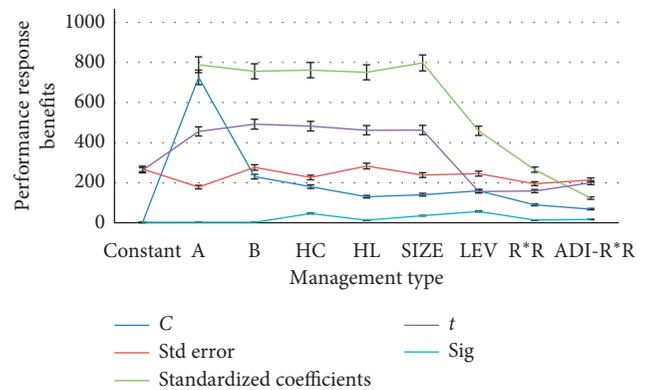


FIGURE 3: Regression analysis of human capital investment and enterprise performance.

TABLE 4: The more frequent flow of human capital.

N	Volatile factor	Pheromone concentration	Information quality	Valid data	Density
10	3.82	1.47	2.28	5.74	2.69
20	3.28	1.42	2.47	1.19	4.07
30	5.17	3.75	5.3	3.31	5.07
40	6.2	1.72	3.13	5.52	4.62
50	1.55	3.87	2.74	2.79	1.84

TABLE 5: Employees' views on big data.

	Big data has a great impact on our lives (%)	Big data has a general impact on our lives (%)	Big data has a little impact on our lives (%)	Big data has a no impact on our lives (%)
Proportion	25	35	19	21

As shown in Table 5, these data and information are multidimensional. Companies need to process and analyze the information of these data to determine the current total number of company advantages in terms of employee composition, so as to distinguish between the company and competitors, especially the company's deficiencies in personnel structure. Prepare human resource planning; second, predict the company's human resource potential in the forecast phase.

The data in Figure 4 show that most people involved in human resource planning, including human resource managers and employees, do not generate much data awareness. Everyone says that they know they are in the era of big data, but they feel that big data is very far away from their life and work. 19% of the respondents think that big data has a general impact on their work and life, and 21% of them think that big data will not affect their work and life.

As shown in Table 6, the reality is that big data has penetrated into life and work, and human resource planning is no exception in all aspects. For the personnel involved in human resource planning, it is very important to cultivate a high degree of data awareness. Only when the relevant staff have a high degree of data awareness can they point out the value and influence of data in human design and make reasonable human resource planning according to the value reflected by big data. In this process, most people are managers and growers of enterprise employees.

As shown in Table 7, only when they take the lead in forming data awareness can they have a direct impact on other employees and promote the development of employee awareness in the whole enterprise. The formation of enterprise's overall consciousness can promote the digitalization process of enterprises and provide digital support for relevant personnel to predict the distribution of labor supply and demand.

**4.5. Market Use of Human Resource e-HR System.** With the development of human resource information software market, a certain scale has been formed. Domestic enterprises have a better understanding of the culture of domestic enterprises, and the user interface is more suitable for domestic enterprises. Especially after China's accession to the WTO, the software industry has sprung up like mushrooms. As shown in Figure 5, UFIDA, Kingdee, Qizheng, Neusoft, Jinyikang, and so forth have been recognized by domestic

enterprises, and they are ahead of foreign manufacturers in terms of cost performance.

As shown in Figure 6 and Table 8, although Microsoft, Oracle as the representative of the company, has been in the software industry for decades, its products are more mature and security is also higher; especially with Oracle database as the representative, open-source, security-incomparable, China's large enterprises generally choose Oracle as their own enterprise database. However, the price of foreign software industry is relatively high, and the maintenance cost is very high, and the interface does not necessarily conform to the norms and habits of Chinese enterprises. Therefore, the choice of information system should be combined with the enterprise itself rather than blindly choosing foreign software enterprises. According to the relevant statistical industry survey, most of China's enterprises have not yet introduced the information system for management. The figure below reflects the general trend of Chinese enterprises in choosing information system.

We can see clearly from Figure 7 and Table 9, where enterprises choose e-HR system, that the first consideration is the development stage of enterprise informatization. If the enterprise is just in the initial stage of informatization, it should choose a simple and easy-to-understand e-HR system for basic information operation. If enterprises do not require high degree of informatization, they only need simple employment data and choose e-HR system, which is easy to operate. If the enterprise develops into a medium-sized enterprise, is cross-regional, and has a large number of basic employees, it should choose e-HR system, which can process important data of the company and has additional functions.

As shown in Figure 8 and Table 10, if the enterprise is a large enterprise or requires a high degree of informatization due to the nature of the industry, it is necessary to select the e-HR system with the highest security level, which can process large data and provide data mining and data analysis. In a word, enterprises should choose e-HR system according to the development stage and scale of the enterprise and choose the e-HR system suitable for themselves.

**4.6. Human Capital Allocation in X Software Company.** As shown in Figure 9 and Table 11, X software company is a high-tech R&D company in the period of rapid

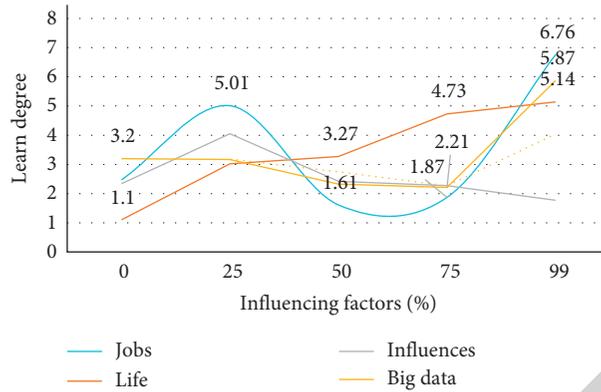


FIGURE 4: Employees' views on big data.

TABLE 6: The reality is that big data has penetrated into life and work.

N	Multicast routing	Convergence speed	Best ant colony	Ant colony member	Growing tree	Basic ant colony
10	1.29	1.86	0.57	1.33	0.61	1.48
20	1.85	1.75	3.03	2.78	3.5	1.49
30	4.15	3	3.42	3.31	3.58	5.82
40	1.47	2.28	5.74	2.69	2.53	5.35
50	5.62	5.28	9.16	6	6.11	11.17

TABLE 7: Association of characteristic parts in complex systems.

Num.	Group optimization	Ant colony optimization	Basic	Node	Effectiveness	The complexity
10	2	1.32	1.45	0.86	0.08	0.57
20	3.19	3.16	3.41	3.99	2.29	1.81
30	4.9	4.95	3.71	2.55	2.71	5.13
40	4.54	2.07	3.52	2.13	1.22	5.15
50	1.55	4.22	2.53	1.42	4.1	1.06

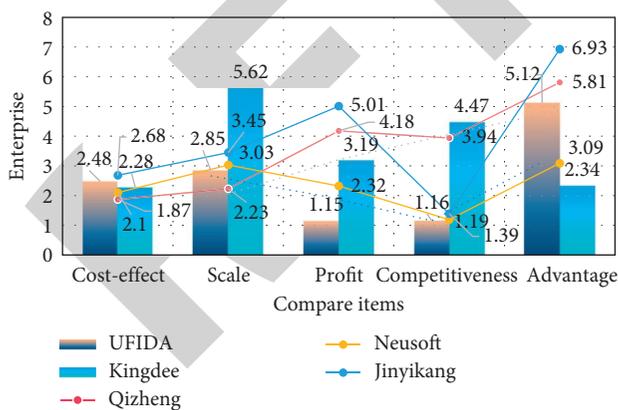


FIGURE 5: Competitive advantages of different companies.

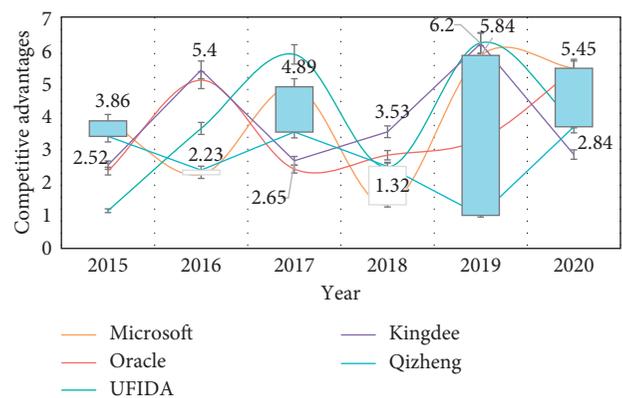


FIGURE 6: Competitive advantages of Microsoft and Oracle.

development. The staff is mainly composed of high-quality students, and the age structure is relatively young. The average age of the company's employees is about 25 years. The company has more than 90% of the total number of employees with certificates. According to the company's

technological innovation strategy, X software company has launched a large-scale recruitment plan.

As shown in Figure 10, the company's large amount of funds is used to attract knowledge-based and technical talents, introduce and improve the quality of employees, and

TABLE 8: Market utilization rate of e-HR system.

Software type	UFIDA (%)	Kingdee (%)	Oracle (%)	Neusoft (%)	Sap (%)	Other (%)
Proportion	5	15	10	9	15	6

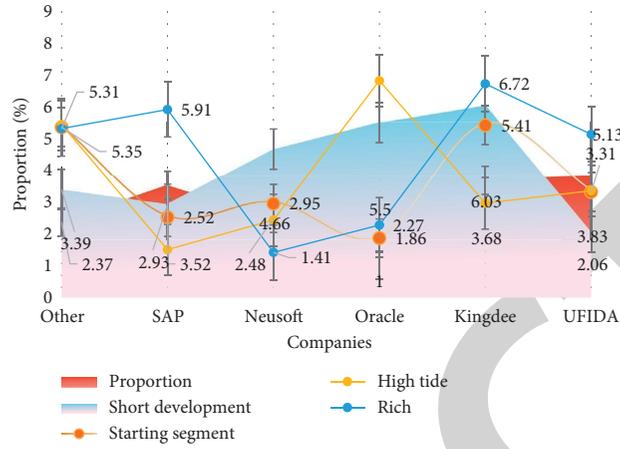


FIGURE 7: Market utilization rate of e-HR system.

TABLE 9: Market utilization rate of e-HR system data.

Item	Proportion	Starting segment	Short development	High tide	Rich
Other	2.37	5.35	3.39	5.43	5.31
SAP	3.52	2.52	2.93	1.5	5.91
Neusoft	2.48	2.95	4.66	2.43	1.41
Oracle	1	1.86	5.5	6.82	2.27
Kingdee	3.68	5.41	6.03	2.96	6.72
UFIDA	3.83	3.31	2.06	3.35	5.13

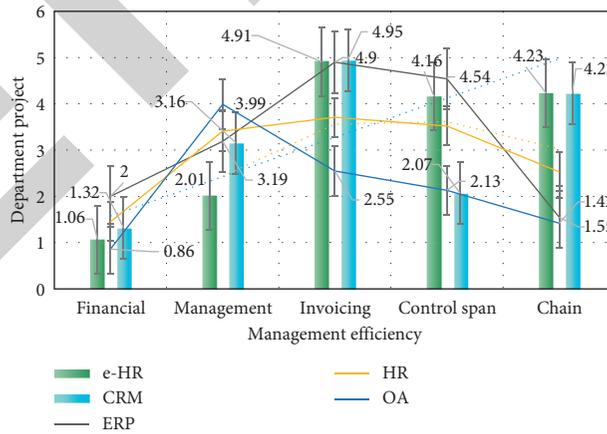


FIGURE 8: The relationship between company management tools and benefits.

TABLE 10: Relationship data between company management tools and benefits.

Item	e-HR	ERP	CRM	HR	OA
Financial	1.06	2	1.32	1.45	0.86
Management	2.01	3.19	3.16	3.41	3.99
Invoicing	4.91	4.9	4.95	3.71	2.55
Control span	4.16	4.54	2.07	3.52	2.13
Chain	4.23	1.55	4.22	2.53	1.42

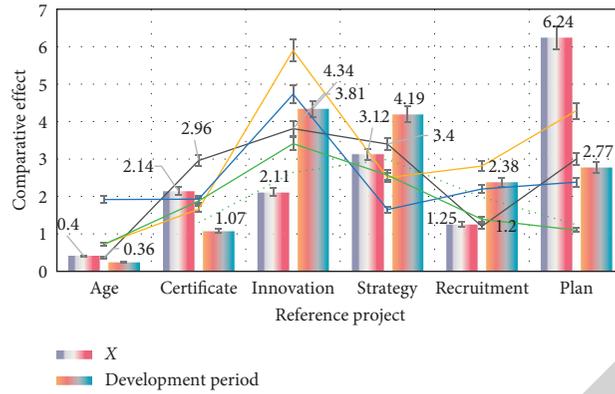


FIGURE 9: The relationship between company management and the quality of members.

TABLE 11: The influence of staff management and member quality on company benefit.

	X	D	Development period	Staff composition	High quality	Software
Age	0.4	0.36	0.25	0.73	1.92	0.72
Certificate	2.14	2.96	1.07	1.66	1.93	1.88
Innovation	2.11	3.81	4.34	5.9	4.73	3.41
Strategy	3.12	3.4	4.19	2.5	1.65	2.57
Recruitment	1.25	1.2	2.38	2.81	2.2	1.39
Plan	6.24	3	2.77	4.29	2.38	1.1

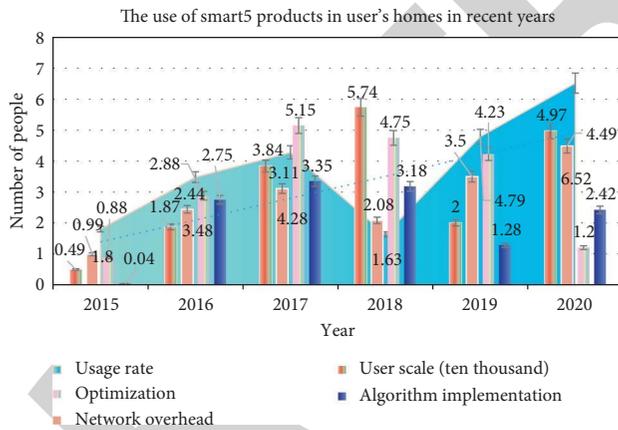


FIGURE 10: The stock of human capital of X software company.

enrich the company's structure. According to the human resource system disclosure, X software company has 2500 employees, of which more than 70% are R&D personnel. While the stock of human capital of X software is increasing rapidly, it should pay attention to maintaining a good structure of human capital. As a high-tech enterprise, the proportion of R&D personnel in the enterprise is about 70%, and the high proportion of R&D personnel ensures the development needs of Jinshan software products.

As shown in Figure 11, X software company attaches great importance to the training of its employees, and it takes one week every year for corporate culture training. The

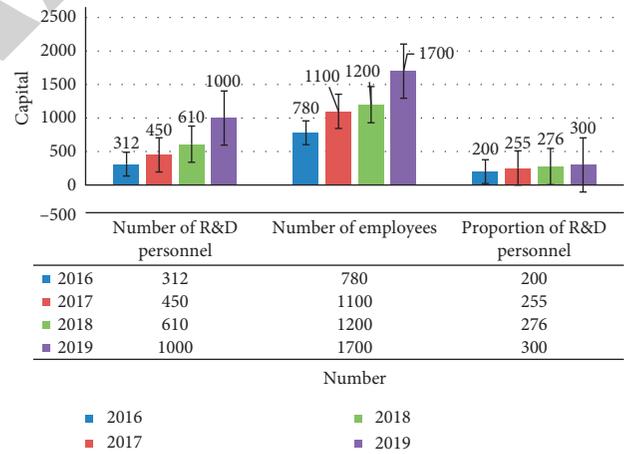


FIGURE 11: Human capital structure of X software company in 2016-2019.

senior management of the company introduces the development history and corporate culture of X software company to the employees.

4.7. Education Framework of Human Capital in High-Tech Enterprises. As shown in Figure 12, we can see that, among the high-tech enterprises, the proportion of high-tech enterprises with high-level education accounts for a large proportion, accounting for 45%, followed by master's degree accounting for 35% and undergraduate education accounting for 20%, which

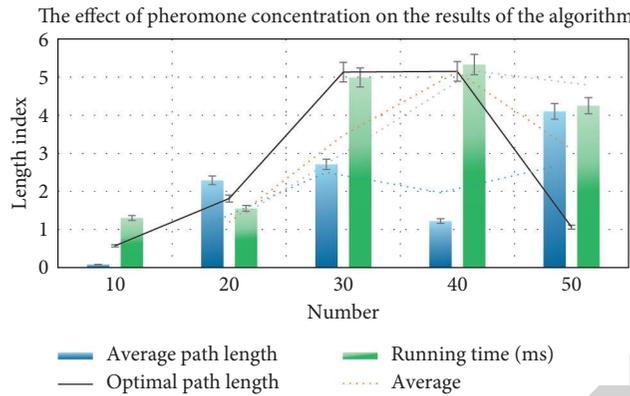


FIGURE 12: High-level education accounts for a large proportion.

TABLE 12: Education structure of human capital in high-tech enterprises.

Education structure	Doctor's degree (%)	Master's degree (%)	Bachelor degree (%)	Other (%)
Tradition	15	25	30	40
Proportion	45	35	19	1

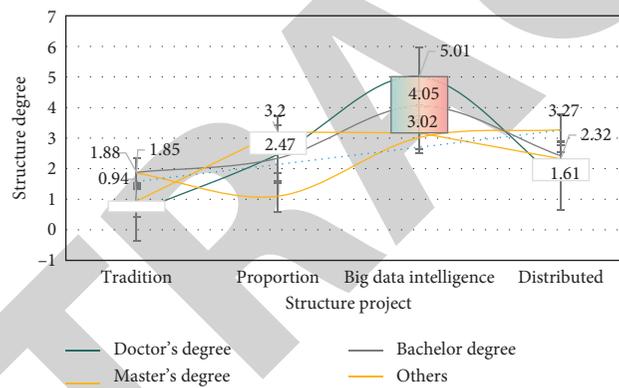


FIGURE 13: Education structure.

shows that the demand of high-tech enterprises for various talents is also increasing. In traditional enterprises, the proportion of high-tech enterprises with high degree is small, accounting for 15%, followed by master's degree accounting for 25% and undergraduate degree accounting for 30%.

As shown in Table 12 and Figure 13, a department takes over the technical training in the company and forms corresponding training programs, such as developing a small toy or small unit. Several people form a team. Many groups will develop at the same time. Finally, each group will produce products to show the comparison. For the training of senior officials, X software company will regularly select employees who have worked for more than two years to study for graduate students. The company will pay them more than half of their study expenses or send them to foreign countries to learn and exchange advanced technologies, so as to better contribute to the company's R&D.

4.8. Problems in Cost Control of Human Resource Use. As shown in Figure 14 and Table 13, from the overall level of the

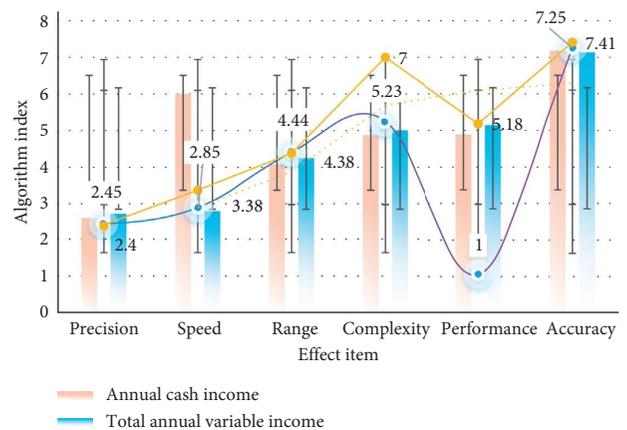


FIGURE 14: The proportion of human resource cost is increasing.

cost expenditure of high-tech enterprises in China, the proportion of human resource cost is increasing. The high-tech enterprises with strong economic strength can still afford it, but, for the small- and medium-sized high-tech

TABLE 13: Salary structure of human capital in high-tech enterprises.

Occupation	Annual cash income (%)	Total annual subsidy (%)	Total annual variable income (%)	Total annual benefits (%)	Total (%)
The basic level	64	7	6	23	100
Executive director	62	9	9	20	100
Management	65	10	13	18	100
High level	68	12	5	15	100

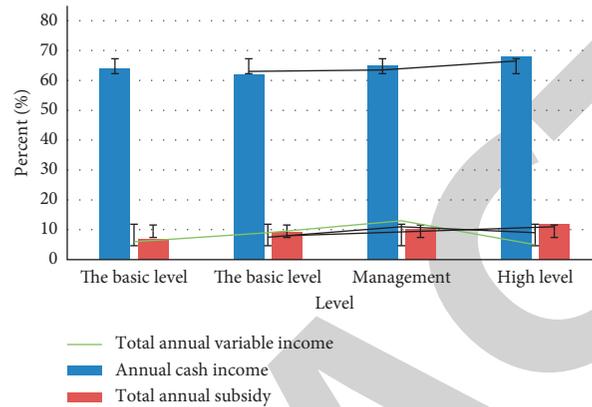


FIGURE 15: Salary structure of human capital in high-tech enterprises.

enterprises that have just started, this expenditure undoubtedly adds a huge economic burden to them.

From Figure 15, we can see that, in high-tech enterprises, whether at the grass roots, middle level, or senior level, the proportion of annual cash income, that is, employees' cash salary, is the highest. Such a large amount of capital investment will inevitably require the enterprise's distribution system to be transparent, open, and fair. However, the reality is that, compared with the market economy, there are still many drawbacks in the current salary system of some high-tech enterprises, and the salary distribution system is directly related to the expenditure of the use cost of human resources, so the salary system also directly affects the control of the use cost of human resources.

## 5. Conclusions

In the economic level, science and technology tell development today, network and intelligent are no longer a strange topic, and this era is a modern era. In the field of human resources, it is no longer an era of tarnishing exploration. Relying on big data technology, the research on human resources of high-tech enterprises has entered a climax. With the in-depth application of cloud computing and other technologies, the construction of high-tech enterprise informatization is accelerated. It is a long-term process to build and implement the big data analysis platform for human resources of high-tech enterprises based on cloud computing. With the development of human resource system to cloud information, more and more enterprises will apply the human resource big data analysis platform based

on cloud computing. Therefore, the human resource big data analysis platform can contain information of many enterprises. Different enterprises can compare their own information with the information publicly disclosed by competitive enterprises in real time and make favorable decisions when they know themselves and their competitors. At the same time, the government can also use the platform to remote audit different enterprises to facilitate government supervision.

Of course, the support based on big data technology is far from enough. Every company should pay attention to the training of employees and spend a lot of time and energy on the allocation of employees among different departments, including job needs, employee abilities, employee wishes, and salary distribution. There are too many factors involved, so allocating employees in human resources will encounter various problems. Moreover, due to the lack of timely and in-place communication, there is a phenomenon of "re-work" in the work. That is, after working for a period of time, the employees reflect that they are not suitable and need to be readjusted. Therefore, this has brought about great trouble to the human resources department and delayed the work progress of the company. The use of big data can greatly avoid such a thing, because, before the allocation of manpower, big data will have human resource assessment, which can adjust the special situation in advance until it is suitable. Therefore, big data can help human resource units to make good use of human resources.

Human resource information management is the trend of future development; it can promote the value-added of human resources, and human resources management has

been raised to a strategic position; the implementation of human resources information management can enhance the core competitiveness of enterprises, which has important strategic significance for the development of enterprises. For high-tech enterprises, the success of informatization depends on staff training to a large extent. In the process of training, training should be carried out at different levels. Senior leaders focus on decision-making ability and strategic management ability, middle-level functional managers focus on communication ability, and grass-roots employees focus on technical ability. To do a good job in training evaluation, information management based on big data technology is a long-term implementation process. Enterprises should continuously improve the system, and information management is also a process of full participation.

### Data Availability

No data were used to support this study.

### Conflicts of Interest

The author declares that there are no conflicts of interest.

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