Research on the Mechanism of Cultivating Scientific and Technological Talents in High-tech Enterprises——Based on a Survey in Guangdong Province

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Abstract. Talents serve as the crucial driving force for the sustainable development of high-tech enterprises. In this research, centered around the management and scientific-technological personnel of 17 renowned high-tech enterprises in Guangdong Province, the questionnaire survey approach was adopted to comprehensively explore the mechanism of cultivating scientific and technological talents within enterprises. The survey findings revealed that the overall recognition of enterprise technological talent training policies among respondents was relatively low. Moreover, significant discrepancies in satisfaction with such policies were observed among individuals with diverse genders, educational backgrounds, ages, marital statuses, and housing conditions. This study will further dissect the underlying reasons for these differences, analyze both the unique and universal aspects of Guangdong Province's policies regarding scientific and technological talent cultivation, aiming to offer valuable references for the government and enterprises in formulating pertinent policies.

Keywords: High-tech enterprises, Scientific and technological talents, Talent training mechanisms, Guangdong Province

1 Introduction

The report of the 20th National Congress of the Communist Party of China pointed out that we must "adhere to the core position of innovation in the overall modernization construction of our country.". China's economy is entering a stage of high-quality development, and innovation capability has become an important force determining China's scientific and technological progress. As early as 2012, in the "Opinions on Deepening the Reform of the Science and Technology System and Accelerating the Construction of the National Innovation System" issued by the government, it was proposed to "accelerate the establishment of a technology innovation system that is enterprise oriented, market-oriented, and closely integrated with industry, academia, research and application.". Under the guidance and support of policies, high-tech enterprises in China have developed rapidly in recent years, becoming a dynamic

M. Zhang et al. (eds.), *Proceedings of the 2025 5th International Conference on Informatization Economic Development and Management (IEDM 2025)*, Advances in Economics, Business and Management Research 330,
https://doi.org/10.2991/978-94-6463-724-3_16

growth point that promotes technological innovation, economic growth, industrial structure optimization and upgrading, and achieves high-quality development of the Chinese economy.

The core of technological innovation lies in talent. As a core force in the national strategic talent layout, scientific and technological talents play a crucial role in carrying out original and leading scientific and technological breakthroughs and key core technology battles. High tech enterprises are important entities and birthplaces of innovation, and their dominant position in building an innovative country in China will become increasingly prominent[1]. Guangdong Province is one of the most developed regions in China's economy. Studying its mechanism for cultivating scientific and technological talents in high-tech enterprises can provide useful references for the cultivation of scientific and technological talents in high-tech enterprises and even the entire society nationwide.

2 Literature Review

In recent years, scholars have conducted extensive research on the role and characteristics of high-tech enterprises. Wang Jiancheng et al. (2015) emphasized the importance of enterprises in innovation, it is believed that China's innovation driven development strategy is a complex system engineering, driven by the national innovation system, which is essentially technological innovation, and the implementation subject is enterprises[2]. Tang Min et al. (2023) proposed that high-tech enterprises play a leading role in innovation and are important entities in promoting national industrial transformation and technological innovation[3]. In the United States, industries that technology personnel account for more than 10% of the total workforce or R&D expenses account for more than 10% of total profits are referred to high-tech industries[4].

Scholars have conducted research from different perspectives on how high-tech enterprises can cultivate scientific and technological talents. Liu Rongmei (2019) formulated a strategy for cultivating high-level scientific and technological innovation talents in enterprises, including formulating talent cultivation strategies, improving talent incentive systems, cultivating a talent inheritance environment, providing practical opportunities for talents, and strengthening talent training[5]. Song Fang (2020) proposed that high-tech enterprises have the characteristics of knowledge intensity, technology intensity, and talent aggregation, and studied incentive mechanisms on the knowledge sharing behavior of employees within high-tech enterprises [6].

From the above analysis, it can be seen that technological talents are an important driving force for the sustainable development of high-tech enterprises. Scholars have studied the role and internal operational mechanisms of high-tech enterprises from different perspectives, as well as the strategies and methods for cultivating scientific and technological talents in high-tech enterprises. However, there is relatively little research literature on the current situation and existing problems of scientific and technological talent cultivation in high-tech enterprises. This article conducts an in-depth investigation and research on the cultivation of scientific and technological

talents in representative high-tech enterprises in Guangdong Province, identifying the regularity of scientific and technological talent cultivation. Based on this, a mechanism for cultivating young scientific and technological talents in high-tech enterprises is established, striving to promote high-quality economic and social development through the cultivation of young scientific and technological talents, and achieve a positive interaction between scientific and technological talents driving industrial development and attracting scientific and technological talents through industrial development.

3 Research Design

3.1 Research Methods and Sample Situation

In order to conduct a more in-depth study on the cultivation of scientific and technological talents in high-tech enterprises and grasp the current situation of scientific and technological talent cultivation in various innovative enterprises, this article uses a questionnaire survey method to investigate the cultivation of scientific and technological talents in 17 representative high-tech enterprises in Guangdong Province. This survey adopts a combination of stratified sampling and convenience sampling methods. First of all, according to the industrial distribution, scale, geographical location and other factors of high-tech enterprises in Guangdong Province, ensure that the sample covers communication, home appliance manufacturing, Internet, automobile manufacturing, high-performance new materials, daily chemical products and other industries, and includes enterprises of different scale levels (large, medium-sized, small) and different regions (Guangzhou, Shenzhen, Zhuhai, Foshan, etc.). Secondly,Select well-known and representative enterprises within each level as survey subjects, such as Huawei, Lenovo, GAC Toyota, Blue Moon, Gree Electric, etc. These enterprises have high influence in the industry, and their talent cultivation models and policies have certain typicality, which can provide rich and valuable data for research.

3.2 Questionnaire Design

The questionnaire content is mainly divided into two parts. The first part is a basic information survey, covering aspects such as gender, education level, age, job type, marital status, housing situation, etc., aiming to collect personal characteristic information of the survey subjects and provide a basis for subsequent differential analysis. The second part consists of 36 Likert scale questions, involving 8 variables such as "talent recognition and evaluation", "talent importance", "talent training and cultivation", "talent utilization", "talent motivation", "talent guarantee", "working conditions", "innovation atmosphere", etc. Each question contains 5 dimensions, with scores ranging from 1-5 points from "strongly disagree" to "strongly agree".

To ensure the validity and reliability of the questionnaire, the following measures were taken in the questionnaire design process: firstly, a large amount of relevant literature was referenced to ensure that the questionnaire content closely revolves around the key elements of cultivating scientific and technological talents in high-tech

enterprises, and has high validity; Secondly, a small-scale pre survey was conducted, inviting experts and scholars in relevant fields, enterprise human resources management personnel, and some scientific and technological talents to review and evaluate the questionnaire. Based on feedback, the questionnaire was modified and improved to further enhance its effectiveness; The third is to test the reliability of the questionnaire, using Cronbach's alpha coefficient to measure the internal consistency reliability of the scale questions, ensuring that the measurement indicators of each variable have high reliability. In the formal investigation, preliminary screening is conducted on the collected questionnaires to eliminate invalid ones, in order to ensure the quality and reliability of the data.

3.3 Analysis of Survey Results

A total of 112 questionnaires were distributed to the management and technology personnel of 17 high-tech enterprises in this survey, and 98 were collected, with an effective response rate of 87.5%. By organizing and analyzing these questionnaire data, detailed first-hand information has been provided for the research.

Descriptive Statistics. Table 1 shows the descriptive statistical results of each variable.From the statistical results of the mean values of variables, it can be seen that among all variables, the mean value of "talent importance" is the highest, with a score of 3.25 out of 5, indicating that the company attaches great importance to scientific and technological talents, and tilts benefits such as housing subsidies and research subsidies towards them.

The lowest score is "Talent Security Situation", with an average score of 2.72, indicating that enterprises still need to strengthen their protection of scientific and technological talents. It is necessary to further improve the salary and benefits of scientific and technological talents, maintain a better material life for them, solve their worries, and enable them to engage in research work with peace of mind.

Table 1. Mean Statistics of Various Variables

Variable	N	Minimum Value	Maximum Value	Mean	Standard Deviation
Talent Identification and Evaluation	98	1.5	4	3.19	0.58
Talent Importance	98	2	4	3.25	0.51
Talent Training and Development	98	2	4	3.07	0.56
Talent Utilization	98	1.6	3.8	3	0.55
Talent Incentive	98	1.75	4	3.14	0.56
Talent Security	98	0.75	4	2.71	0.74
Working Conditions	98	1	4	2.95	0.8
Innovation Atmosphere	98	1.33	4	3.13	0.67
Talent Cultivation	98	1.54	3.86	3.06	0.5

Differential Analysis. This section will conduct a difference analysis between the demographic variables in the questionnaire and the variables in the scale, in order to understand the perception differences of different types of personnel towards the technology talent policies formulated by the enterprise, thus facilitating the formulation of targeted technology talent training policies by the enterprise. The specific analysis results are as follows:

1）Gender differences

Using SPSS, independent sample t-tests were conducted on the evaluation of different variables by different genders. The results are shown in Table 2. There were significant differences between genders in the five variables of "talent emphasis", "talent training and development", "talent utilization", "talent motivation", and the overall variable "talent cultivation". Women scored lower than men on the above variables.

Table 2. Differences by Gender

Variable	Male (Mean ± SD)	Female (Mean ± SD)	T-value	P-value
Talent Recognition & Evaluation	3.28 ± 0.58	3.03 ± 0.56	1.50	0.14
Talent Valuation	3.41 ± 0.54	2.97 ± 0.28	3.74	0.00
Talent Training & Development	3.26 ± 0.58	2.76 ± 0.34	3.79	0.00
Talent Utilization	3.12 ± 0.61	2.80 ± 0.36	2.01	0.05
Talent Incentive	3.29 ± 0.63	2.89 ± 0.27	3.07	0.00
Talent Security	2.79 ± 0.62	2.58 ± 0.92	0.94	0.35
Work Conditions	3.02 ± 0.76	2.83 ± 0.87	0.77	0.45
Innovation Atmosphere	3.18 ± 0.75	3.04 ± 0.50	0.78	0.44
Talent Cultivation	3.17 ± 0.57	2.86 ± 0.28	2.13	0.04

2）Differences in educational qualifications

Through independent sample t-test, it can be seen that there are significant differences in the 8 sub variables among different educational backgrounds, The results are shown in Table 3, indicating that master's and undergraduate degrees have completely different perceptions of corporate technology talent training policies, and undergraduate degrees are evaluated lower in various dimensions than master's degrees.

Table 3. Differences by Education Level

Variable	Master's (Mean ± SD)	Bachelor's (Mean ± SD)	T-value	P-value
Talent Recognition & Evaluation	3.53 ± 0.37	2.96 ± 0.59	3.810	0.00
Talent Valuation	3.48 ± 0.45	3.09 ± 0.49	2.762	0.00
Talent Training & Development	3.33 ± 0.50	2.90 ± 0.53	2.905	0.00
Talent Utilization	3.28 ± 0.40	2.81 ± 0.56	3.255	0.00
Talent Incentive	3.38 ± 0.46	2.98 ± 0.57	2.536	0.02
Talent Security	3.00 ± 0.55	2.52 ± 0.80	2.337	0.02
Work Conditions	3.23 ± 0.56	2.76 ± 0.89	2.072	0.04

Innovation Atmosphere	3.42 ± 0.55	2.93 ± 0.68	2.686	0.01
Talent Cultivation	3.33 ± 0.34	2.87 ± 0.51	3.511	0.00

3）Differences in age groups

The results of the independent sample t-test show that there are significant differences among different age groups in dimensions such as "talent recognition and evaluation," "talent emphasis," "talent training and development," "talent utilization," "talent motivation," "innovation atmosphere," and the total variable "talent training," and the scores of individuals under 40 years old are lower than those above 40 years old. Young talents under the age of 40 have lower satisfaction with talent cultivation policies. The statistical results are shown in Table 4.

Table 4. Differences by Age

Variable	40 Years & Under (Mean ± SD)	Over 40 (Mean ± SD)	T-value	P-value
Talent Recognition & Evaluation	2.95 ± 0.65	3.40 ± 0.42	-2.97	0.00
Talent Valuation	3.08 ± 0.51	3.40 ± 0.45	-2.37	0.02
Talent Training & Development	2.88 ± 0.55	3.24 ± 0.51	-2.36	0.02
Talent Utilization	2.72 ± 0.55	3.25 ± 0.42	-3.78	0.00
Talent Incentive	2.85 ± 0.51	3.40 ± 0.47	-3.95	0.00
Talent Security	2.63 ± 0.95	2.79 ± 0.50	-0.71	0.48
Work Conditions	2.80 ± 0.98	3.08 ± 0.59	-1.16	0.25
Innovation Atmosphere	2.91 ± 0.81	3.32 ± 0.45	-2.18	0.04
Talent Cultivation	2.85 ± 0.57	3.24 ± 0.35	-2.89	0.01

4）Differences in marital status

In the questionnaire design, there are five types of survey options for marital status: "unmarried," "married without children," "married with children," "divorced without children," and "divorced with children." However, the marital status of the surveyed subjects is only three types: "unmarried," "married without children," and "married with children." The differences in variable evaluations among the three types of marital status personnel require analysis of variance. Based on the results of the analysis of variance, there are significant differences in the perception of the variable "talent recognition and evaluation" among different marital statuses, with "married without children" having the lowest evaluation of the unit's "talent recognition and evaluation". The results are shown in Table 5.

Table 5. Differences by Marital Status

Variable	Unmarried (Mean ± SD)	Married No Children (Mean ± SD)	Married with Children (Mean ± SD)	T-value	P-value
Talent Recognition & Evaluation	3.38 ± 0.43	2.25 ± 0.43	3.24 ± 0.55	4.99	0.01
Talent Valuation	3.38 ± 0.43	2.92 ± 0.29	3.26 ± 0.52	0.78	0.46
Talent Training & Development	3.08 ± 0.48	2.67 ± 0.58	3.1 ± 0.56	0.86	0.43
Talent Utilization	3 ± 0.92	2.47 ± 0.23	3.04 ± 0.51	1.56	0.22
Talent Incentive	3.25 ± 0.58	2.83 ± 0.29	3.15 ± 0.58	0.53	0.59
Talent Security	2.5 ± 0.58	3 ± 0	2.71 ± 0.78	0.38	0.69
Work Conditions	2.88 ± 1.01	3 ± 0	2.95 ± 0.82	0.02	0.98
Innovation Atmosphere	3 ± 1.15	2.83 ± 0.29	3.16 ± 0.64	0.40	0.67

5）Differences in housing conditions

According to the statistical results in Table 6, it can be seen that individuals with different housing conditions have significant differences in the variables of "talent identification and evaluation" and "talent utilization". Among them, those who purchase property rights houses have the highest rating on "talent identification and evaluation". As these individuals have already solved the housing problem, they have no worries about the development of talent identification standards by the unit. The fairness of talent evaluation methods and procedures is relatively recognized. On the contrary, those who do not have a house and rent their own may have fewer opportunities for training in the early stage, and relatively speaking, their wealth accumulation is insufficient. They have a lower recognition of the unit's "talent recognition and evaluation situation". Similarly, in the indicator of "talent utilization", those who "purchase property rights houses" have the highest score, followed by those who "do not have a house, and the unit provides collective dormitories". Those who "do not have a house, and rent their own house" have the lowest score, indicating that those who "do not have a house, and rent their own house" believe that the unit cannot provide funding and support to young scientific and technological talents who are in the initial stage but have great development potential, and also do not have many opportunities to undertake important research (scientific research) project.

Table 6. Differences in Housing Conditions

Variable	No Housing, Renting Own	No Housing, Provided Dormitory by Employer	Own Property	T-value	P-value
Talent Identification and Evaluation	2.25±0.43	3.13±0.14	3.26±0.56	4.99	0.01
Talent Importance	2.92±0.29	3.25±0.29	3.27±0.53	0.69	0.51
Talent Training and Development	2.67±0.58	2.83±0.19	3.13±0.57	1.39	0.26

Talent Utilization	2.47±0.23	2.6±0.46	3.08±0.54	3.16	0.05
Talent Incentive	2.83±0.29	3±0.29	3.18±0.59	0.66	0.52
Talent Security	3±0	2.5±0.58	2.71±0.78	0.38	0.69
Working Conditions	3±0	2.63±0.72	2.98±0.84	0.35	0.71
Innovation Atmosphere	2.83±0.29	2.83±0.96	3.17±0.66	0.77	0.47
Talent Cultivation	2.74±0.06	2.84±0.47	3.1±0.52	1.16	0.32

4 Discussion

The results of this study reveal various problems in the mechanism of cultivating scientific and technological talents in high-tech enterprises in Guangdong Province.

From a theoretical perspective, the low score of talent security is highly consistent with the two factor theory. According to this theory, wages, benefits, housing security, and other factors are considered health factors. If a company cannot meet the demand for technology talents in these areas, it will directly trigger dissatisfaction among talents, thereby affecting their work enthusiasm and creativity. In this study, the lower level of talent security makes it difficult for technology talents to fully devote themselves to scientific research work, which theoretically verifies the fundamental supporting role of health factors on employees' work status. Further analysis from the motivation health theory framework in human resource management theory shows that when constructing a talent cultivation mechanism, enterprises must comprehensively consider both incentive and guarantee factors to ensure their synergy in promoting talent development.

In terms of practical significance, there are differences in the recognition of enterprise technology talent training policies among personnel of different genders, educational backgrounds, ages, marital status, and housing conditions, which puts forward refined requirements for enterprise talent management practices.

In terms of gender differences, women have lower ratings. Enterprises should adjust their training policies based on gender equality theory and provide equal and targeted development opportunities for women. In terms of educational differences, undergraduate and master's degrees have lower scores. Enterprises need to follow a competency based talent concept, build a diversified talent training system, and fully tap into the innovative potential of talents at all levels based on the ability characteristics and development needs of talents with different educational backgrounds. In terms of age, young technology talents under the age of 40 have low satisfaction. Starting from the theory of innovation ecosystem, enterprises should attach importance to the cultivation and integration of young talents, establish a fair and just talent ecological environment that encourages innovation, such as setting up youth innovation funds, providing more opportunities to participate in core projects, accelerating the growth of young talents, and ensuring the intergenerational inheritance and development of enterprise innovation capabilities. Among the differences in marital status, the satisfaction of "married without children" is relatively low, indicating that the existing evaluation system of enterprises has not fully considered the special needs and career development stage characteristics of this group. Enterprises should

introduce the theory of family work balance, improve talent evaluation standards, and maintain the stability and enthusiasm of various talent teams. The difference in housing situation shows that young technology talents who have no housing and rent are facing greater pressure. Ignoring this reality in talent training policies by enterprises will increase the risk of talent loss. Enterprises can learn from the theory of corporate social responsibility and take on the responsibility of providing basic living security for talents, such as providing housing subsidies or temporary housing support, reducing the burden on talents' lives, enhancing their sense of belonging and loyalty to the enterprise, and retaining key young talents for enterprise innovation activities.

5 Conclusion

The average recognition of technology talent training policies among surveyed enterprises in Guangdong Province is at a relatively low level, with a particularly prominent low score in talent security. Other economically developed regions in China, such as Beijing and Shanghai, have relatively more advantages in maintaining market competitiveness in salary and benefits, and constructing diversified welfare systems. From a global perspective, the talent guarantee gap between the surveyed enterprises in Guangdong Province and internationally renowned high-tech industry clusters such as Silicon Valley in the United States is more significant. Silicon Valley enterprises, with strong financial support and a comprehensive welfare system, have attracted a large number of top technology talents, laying a solid foundation for continuous innovation. Enterprises in Guangdong Province urgently need to strengthen talent security measures, enhance talent attraction, and cope with the challenges brought by the intensification of talent mobility.

In terms of the differences in recognition of talent cultivation policies among different genders, educational backgrounds, ages, marital status, and housing conditions, Guangdong Province is relatively similar to other cities at home and abroad, reflecting the universality of differences in recognition of talent cultivation policies among talents with different characteristics. However, the diversified industrial structure and mature development of intelligent manufacturing in Guangdong Province, coupled with the highly market-oriented and outward oriented economic environment in which enterprises operate, give these differences a certain degree of specificity.

In summary, the survey results of the training mechanism for scientific and technological talents in high-tech enterprises in Guangdong Province have common problems with other regions at home and abroad. However, due to the characteristics of Guangdong Province's outward oriented economy and diversified industries, the situation in Guangdong has certain particularities. Enterprises and governments should collaborate to formulate and improve talent cultivation strategies and policies based on these conclusions, promote the high-quality development of high-tech enterprises in Guangdong Province, and provide useful reference examples for other regions in China, helping to improve the overall innovation level of China's high-tech industry.

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