

Research on Technology Innovation and Income-generating Efficiency of Enterprises from the Perspective of Science and Technology Management

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Abstract. Under the background of technological innovation, enterprises gradually attach importance to building an innovation ecosystem to improve innovation and income-generating efficiency. However, how to carry out technological innovation in order to improve the efficiency of scientific and technological income generation is the key problem of enterprise innovation ecosystem research. In view of the relationship between technological innovation and income-generating capacity of science and technology. Based on the analysis of the difficulties of science and technology management, system dynamics and Pearson correlation method were adopted. From the perspective of qualitative and quantitative, the influence degree and relationship between science and technology innovation and income generation were analyzed. The results show that R & D investment and innovation platform are significantly positively correlated with corporate technological income. This paper puts forward the idea and implementation path of scientific and technological innovation management, and provides reference for technological innovation and income generation of enterprises.

Keywords: Innovation ecosystem; Technological innovation; Technology income; Correlation.

1. Introduction

At present, with the increasing change of the global economy, China 's manufacturing enterprises have gradually changed from 'Made in China ' to 'Intelligent Manufacturing in China '. Technological innovation needs to be broken through, and industrial development is in the ascendant ^[1]. Science and technology management plays an important role in the main organization of enterprise technology innovation and technology income. In order to pressingly improve the management of enterprises'scientific and technological innovation, comprehensively strengthen the high-quality development of enterprises'scientific and technological innovation, and continuously tap the innovation potential, it is necessary to rely on scientific and technological management activities, layout the development direction of technological innovation, strengthen the construction of scientific and technological innovation platform, implement the transfer and transformation of scientific and technological achievements, and improve the efficiency of scientific and technological income generation, so as to continuously support the high-quality development of enterprises. However, due to the lack of attention to science and technology management in many enterprises, innovation efficiency is reduced, resulting in lower income generation, which affects the sustainability of overall innovation and collaborative innovation ^[2]. It is of great research value to explore how to improve the technological innovation and income-generating efficiency of enterprises from the perspective of science and technology management, and effectively use the policy guidance to ensure the sustainable innovation of enterprises.

In recent years, many scholars generally pay attention to the improvement of enterprise technology innovation ability. From the perspective of evolution, Xiong Jun proposed that strengthening the integration of technological innovation resources such as industry-university-research cooperation can promote the technological innovation and output of enterprises under the condition of scientific

and technological management ^[3]. Chen Huihang and others in China for manufacturing enterprises, the study found that the establishment of innovation platform such as industrial innovation center has positive effect on the innovation and development of industrial chain ^[4]. Peng Chen and Vovk take state-owned enterprises as examples to demonstrate that enterprises need to actively use external resources and science and technology policies to obtain higher technological innovation output ^[5-6]. Li Lei confirmed that government R & D subsidies have a positive correlation with the technological innovation output of enterprises through the technological innovation data of 50 new energy automobile enterprises ^[7]. In fact, in order to enhance scientific and technological innovation, enterprises need to strengthen cooperation and common innovation between government, industry, research and use under the unified planning of scientific and technological management, and form complementary advantages to maximize benefits.

This paper analyzes the coupling relationship and influence of enterprise technology innovation and income-generating efficiency improvement, puts forward the implementation path and verifies the feasibility.

2. Difficulty Analysis of Enterprise Technology Innovation and Management of Science and Technology Income

In the process of scientific and technological management, in order to improve the level of technological innovation and scientific and technological income, it is usually based on scientific and technological innovation business planning as the main starting point to carry out innovation activities around the scientific and technological innovation management system. However, in the process, scientific and technological innovation activities include project research and development, patents, standards, awards and other activities. Due to the different functions of technology and control departments, there is a coupling between guiding technology research and development and output results. In terms of factors, market demand and policy support orientation are unstable and time-lag, which are difficult to meet the ideal management requirements.

2.1. Coupled analysis

Science and technology management is reflected in many aspects of enterprise technology innovation and income generation. It provides necessary talent support, management incentives and institutional support, guides enterprises to carry out technical research according to market demand and development planning, integrates advantageous resources when necessary, and forms an innovative mode of combining government, industry, research and application. The process of scientific and technological innovation includes R & D investment, platform construction, scientific research project management, innovation output, etc. In this process, scientific and technological management needs policy identification, achievement transformation, and technological innovation is realized through technological innovation, management innovation and platform utilization. Therefore, there is a high degree of coupling between technological innovation and technological income generation. The degree of innovation requires the simultaneous improvement of scientific and technological management and technological innovation. After the improvement of innovation ability, scientific and technological income is also improved under scientific and technological management. The coupling between technological innovation and income-generating process and supporting factors is shown in Figure 1.

2.2. Time-delay analysis

In reality, the improvement of the level of scientific and technological innovation of enterprises requires organizational planning, product development, product trial to output results. The scientific and technological achievements generated in this process are also affected by policies, funds, personnel and other factors. Innovation results and income-generating information are affected by large time lag and multiple factors, and the time lag is also affected by the policy effect.

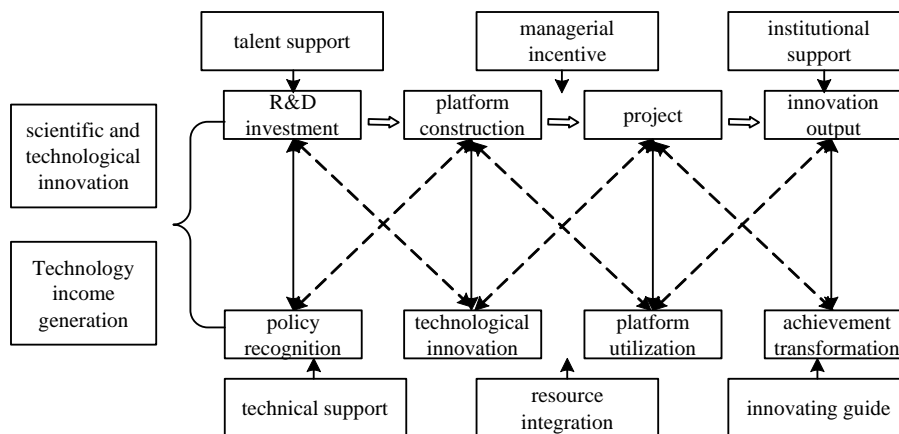


Figure 1. Coupling among technological innovation, income-generating process and supporting factors

3. Impact of Technology Income on Enterprise Technology Innovation

3.1. Research Methods

Correlation analysis is used to describe the linear relationship between two continuous variables. In order to qualitatively describe and test the impact of scientific and technological income on technological innovation, eight data related to scientific and technological innovation of a rail transit L enterprise from 2015 to 2021 are selected as the research samples. As shown in Table 1, the correlation between Pearson correlation coefficients is used to test the correlation of the analysis results^[8].

Table 1. Enterprise Science and Technology Innovation Data Table 2015-2021 of L

year	Technology income generation	patent application	standard	Award	undertaking external projects	innovation platform	operating income	R&D investment
2015	868.09	127	16	7	3	12	563257	30162
2016	1238.78	111	26	6	12	14	600148	35785
2017	567.35	152	14	5	34	15	618973	29997
2018	1169.51	157	32	7	41	20	690250	35187
2019	2077.3	188	29	8	37	26	708197	40354
2020	2163.7	219	63	15	52	28	1059702	50255
2021	2521.2	236	39	21	49	32	1115455	46513

Correlation analysis mainly from the correlation coefficient r and significant level P two indicators. The value range of correlation coefficient r is generally $[-1,1]$. -1 indicates that there is a negative correlation between variables, and 1 indicates that there is a positive correlation. The closer the absolute value of correlation degree is to 1 , the higher the correlation degree is. The lower the P value, the stronger the visibility. Correlation coefficient and significant size of the city is divided into the following cases :

- 1) When $P < 0.01$, $0.8 < |r| < 1$, indicating strong differences in factors with strong correlation ;

2) When $0.01 \leq P \leq 0.05$, $0.6 < |r| > 0.8$, indicating significant differences in factors, indicating strong correlation.

3) When $P > 0.05$, $0.4 < |r| > 0.6$, indicates that the factor difference is moderately correlated ; when $0.2 < |r| > 0.4$, if the factors are relevant ; when $0 < |r| > 0.2$, the factor is irrelevant.

3.2. Correlation validation and analysis

In order to verify the impact of science and technology income on enterprise technological innovation, SPSS20.0 software is used to analyze the correlation of the selected sample data, and the correlation coefficient and the significant value of the above variables are solved one by one. The correlation is shown in Table 2.

From the results of table 2, it can be seen that the conditions of R & D investment and innovation platform have the greatest impact on enterprise science and technology income. Among them, the impact of innovation platform is greater, and the correlation and aboriginality are strong. On the contrary, science and technology income can also affect and promote the construction of enterprise science and technology investment and innovation platform. Business income, patent applications, science and technology awards have a strong correlation with enterprise science and technology income, mainly reflected in patents, science and technology awards can improve the overall innovation ability of enterprises, so as to obtain more science and technology income and business income. Technical standards, as the voice of scientific and technological products in the industry, the number of standards can not directly affect scientific and technological income, but to some extent, it can also bring benefits to scientific and technological income.

Table 2. Correlation Analysis of Technology Income and Enterprise Technology Innovation

First level indicator	Second index	Technology income generation		analysis result
		Pearson correlation	Explicitness (bilateral)	
Innovation input	R&D	0.929**	0.003**	extremely strong
Innovation conditions	innovation platform	0.937**	0.002**	extremely strong
innovation performance	operating income	0.851*	0.015*	relatively strong
	application amount of patent	0.848*	0.016*	relatively strong
innovation output	technical standard	0.748	0.053	moderately correlated
	Awards	0.843*	0.017*	relatively strong
	Number of external projects	0.398	0.069	low correlation

4. Scientific and technological innovation management ideas an implementation paths

4.1. Scientific and technological innovation ideas

Through the correlation analysis of technological innovation and scientific and technological income index, taking scientific and technological management as the starting point, integrating and utilizing internal and external scientific and technological resources, giving full play to the role of scientific and technological media resources, actively utilizing innovation support policies, strengthening the construction of scientific and technological innovation platform and innovation

input, improving the output of innovation achievements, further improving business income, and promoting the improvement of scientific research ability and business quality of enterprises.

4.2. Implementation path

As far as the enterprise is concerned, there is a significant positive correlation between scientific and technological income and technological innovation. Combined with the analysis process and conclusions, it can be further improved in the following aspects : in terms of innovation investment, it is necessary to strengthen scientific and technological R & D investment, and strive for R & D awards, technological transformation and other industrial development income according to innovation policies ; in terms of innovation conditions, we should strengthen the construction and maintenance of innovation platform, integrate internal and external scientific and technological resources, actively carry out industry-university-research cooperation, and improve the level of innovation platform. In terms of innovation output, we should build a science and technology income-generating community, adopt positive assessment and incentive, actively carry out research projects according to the development needs of dragging enterprises, and strive to undertake external projects ; continue to tap patent applications, standards development, science and technology awards, etc., to enhance the output of science and technology innovation, science and technology income generation.

5. Conclusion

In view of the relationship between technological innovation and technological income generation, this paper establishes an innovation ecosystem model of technological innovation, analyzes the difficulties in technological management, and uses the system dynamics and Pearson correlation method to analyze the influence degree and relationship between technological innovation and technological income generation from the qualitative and quantitative perspectives. In the near future, the management ideas and implementation paths of technological innovation are given, which has certain reference significance for enterprise technological management.

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