Chapter 3
Research on Science and Technology and Finance Scientific Positive Feedback Mechanism Based on Ceramic Industry Technology Innovation Strategic Alliance

Yong Huang, Funian Zheng and Zhijian Huang

Abstract In the ceramic industry regional industry, it needs to be centrally advantage to the formation of industry alliances, promoting the development of ceramic industry technology innovation strategic alliance. The development of ceramic industry science and technology as well as the financial market as the guide and the positive feedback system theory as a foundation, to analyze the science and technology strategy and the financial market are combined with positive feedback mechanism, and the customer as a benchmark to establish the model of positive feedback mechanisms of the ceramic industry technology and financial markets. Through the model establishment and analysis, they own positive feedback relationship of technology products and financial market. The final is shown that the change of ceramic industrial technology products status as well as the financial market structure is a quantitative change to cause the whole process of the qualitative change of which the most important is the financial system's transition. Therefore, the relationship between science technology and financial is influence, promote each other, etc.

Keywords Ceramics industry · Technological innovation · Technology finance · Positive feedback mechanism

Y. Huang (✉) · Z. Huang
Economic Management Department, Jingdezhen Comprehensive College, Jingdezhen 333000, China
e-mail: huang_yong11@126.com

F. Zheng
Jingdezhen Comprehensive College, Jingdezhen 333000, China

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3.1 Introduction

Science and technology competition is becoming increasingly fierce in the ceramic industry, to adopt the ceramic industry technology innovation strategic alliance which is one of the best choices [1]. With the rapid development of science and technology, market information updating, product innovation of science and technology, transformation industry, etc., they are increasingly strengthened. In order to study science and finance direct correlation with the positive feedback mechanism among them, it is conducive to promote the development of ceramic industry technological innovation alliance [2, 3].

3.2 Technology Finance Basic Theory

In theory, technology and finance definition has not been defined, however, the science technology finance in the practice process of industry and enterprises has been applied, which still do not have a scientific connotation's independent science. Some scholars believe that the complete definition of the science technology finance are the promotion of enterprise science technology research, industry, and product high-tech development have a series of financial market instruments, procedures, rules, perfect service, etc. They have the features of innovative and systematic [4]. It is composed of industry enterprises, intermediary organizations, national institutions and financial market, and other different subjects, and is subject of different activities to constitute a structure system that represents the states financial, a major component of scientific technological innovation system. The technology finance theory definition can be analyzed from four different perspectives of in-depth analysis: (1) Having the interaction between technology and financial, which emphasizes on the mutual promotion, mutual influence between technology and finance; (2) For financial, technology has a one-way demand characteristics, namely science technology product development, patent achievements transformation and the entire product industrialization process all need financial power tools, policies and services; (3) Emphasis on the industry association between science technology and finance, namely the financial is support for high-tech industry product development; (4) Between science technology and finance has an open system, its content is very extensive, including industry, government, market financial institutions, and other involved subject, and technology finance is the combination of means, system, and mechanism to guide. In the combination's market economy of financial and technology, society and industry cultural environment that exists in a complex system [5, 6].

At the same time, the development of science technology and finance is influenced by different factors, and also need many aspects of interaction, game. The interactive effects include: (1) The development of science technology can enhance the level of financial market, its expression is that information network

Table 3.1 The union mechanism of science technology and finance

Science technology and finance	Financial resources	Direct financing
		Indirect financing
	Investment venture	Public venture
		Private venture
	Capital science and technology market	Board and board of smal-l and medium-sized enterprises
		Gem
		New three-board market
		Technology property exchange
		Bond market
	Science technology loan	Commercial bank loans
		Policy science and technology loan
		Folk financing
		Financial lease
	Insurance	Commercial science and technology insurance
		Policy science and technology insurance
	Financial environment	

development effects the financial innovation, the tools of the trade, the innovation of means, the efficiency improved; (2) Financial innovation affects the information flow speed, convenient securities transactions, to promote the rapid development of trade financing, as well as globalization, real time.

Finance is the main performance for the development security of science technology: (1) Financial market system uses the technology of continuous innovation, and combines with a variety of financial instruments, systems, etc. And through the financing channels to meet the funding requirements of science technology activities; (2) in the science technology investment, finance has liquidity, transfer, price discovery and risk dispersion, and other functions [7].

At the same time, the structure between financial and science technology comprises six parts: financial resources, venture investment risk, capital science technology market, science technology loans, insurance, and science technology‘s financial environment. In this system, the capital science technology market of the direct financing and venture investment risk belong to indirect financing science technology loan. The structure is shown in Table 3.1.

Among them, financial resources refer to the government through financial budget and tax preferential policies and supports for sci-tech industry development, so science technology resources’ research for the science technology, more attention development. International is through the financing way of indirect and directs to influence the development of science technology and the study of quantity, structure, progress, etc. As the science technology basic research investment is too large, the risk is very high, the capital into the financial market is less, so the government should make some regulation.

The venture capital risks are high risk investment professional institutions, and can control the risks of market. The high growth of new technology enterprises especially high-tech industrial enterprises can gain high profit financial capital. From the entire industry development of enterprise life cycle angle, venture investment risk can become a high-tech enterprise, development and the development of early stable external financing good way.

Loan is as the enterprise science technology development, the transformation and so on, and a series of science technology activities provide the debt characteristic financial help, which is divided into four parts, including business technology, financial technology, policy science technology loan, and financial leasing. However, capital market to the science technology enterprises provides the direct financing market, due to different risk and liquidity; capital market can be divided into five parts, namely technical property, the bond market, the new gem, the third board market, main board, and medium enterprises board.

Insurance is the financial risk based on the science technology activities, science technology enterprise capital operation risk, financial instruments and policy risk to carry on science technology insurance, they aim to reduce a variety of the financial instruments of financing system risk.

Science technology finance environment represents the operating system environment in the economic, legal, and social of science technology finance. The effect operation efficiency of finance and science technology as well as the development level, which is a major component of the science technology financial system.

3.3 Establishment of Science Technology and Financial Positive Feedback Model of Ceramic Industry Technology Innovation Strategic Alliance

Aiming at the selection of technology product, it lies in the ceramic industry competition as well as the cylinder model that is the nonlinear Polya process modeling. The first step, the science technology product market as the area is an infinite cylinder, where in the sum of products is m different colored balls that are on behalf of selling ceramic industry product types, namely ceramic industry a and ceramic industry b, the two kinds of technology products, financial accumulation quantity sold to quantity expressed as $q_m = \left(q_m^1, q_m^2\right), q_m^1, i = 1, 2$ that stands for the technology products ceramic industry i in the m point of the financial market cumulative amount sold; when $i = 1$ is the initial state of science technology product, namely $q_0 = \left(q_0^1, q_0^2\right), \quad \left(q_0^1, q_0^2\right) = t_0$. In the m point the ceramic industry financial market share is represented as a vector $X_m = \left(X_m^1, X_m^2\right)$, while $X_m^i = q_m^i / t_m, t_m = t_0 + m X_0 = \left(X_0^1, X_0^2\right)$. Expresses its initial financial market share from m to $m + 1$, the customers with a science technology product are optioned, namely every science technology products is sold, many experienced process carry

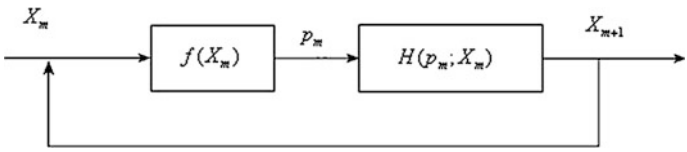

Fig. 3.1 The positive feedback relation diagram between technology products and financial behavior

on the random sample survey in cylinder, a random sample of the plurality balls; and then does not change the original financial technology products market share and the case of the structure to put them back; according to a choice of product function to the cylinder into a single ceramic industry ball that is representative for ceramic industry products. To be selected process changes the structure X_m of financial markets, to be selected initial probability is $p_0 = \left(p_0^1, p_0^2\right)$, namely $p_m = \left(p_m^1, p_m^2\right), p_m^1 + p_m^2 = 1$ therefore the selection function is $p_m^i = f(X_m), i = 1, 2.$ The final result vector is representation for $B_m = \left(B_m^1, B_m^2\right) B_m^i(X_m) = 1$ and Probability is $p_m^i(x)$.

Finally the formula can be adopted

$$X_{m+1}^i = X_m^i + \frac{1}{t}\left(B_m^i(X_m) - X_m^i\right) \tag{3.1}$$

According to the above formula can get the positive feedback and scientific mechanism cylinder model of technology and financial, the formula is

$$\begin{cases} p_m = f(X_m) \\ X_{m+1} = H(p_m; X_m) \end{cases} \tag{3.2}$$

As a result of the positive feedback relationship between financial behavior, technology products diagram are shown in Fig. 3.1.

$$X_m\, f(X_m)\; p_m\; H(p_m; X_m)\; X_{m+1}\; q_m^t \tag{3.3}$$

3.4 Analysis on Technological and Financial Positive Feedback Mechanism of Ceramic Industry Technology Innovation Strategic Alliance

Due to the ceramic industry market information is not clear, and the product alienation between ceramic industry products is smaller, the customer has no particular preference in the financial market. Therefore, through the ceramic products market sample random survey analysis, it can choose three kinds of ceramic product brands conducted model calculations. That has chosen three

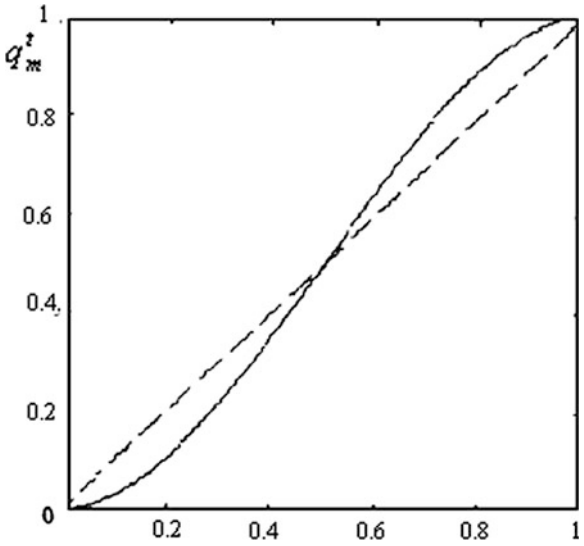

Fig. 3.2 Positive feedback mechanism cylinder model function of science technology and financial

different brands' ball, and expressed brand 1 is recommended the number of n (n > 2), then elected to the probability of a particular brand that is

$$p_m^1 = \frac{C_{p_m}^1 C_{p_m}^2 + C_{p_m}^3}{C_{t_m}^3} \tag{3.4}$$

Assumed that $p_m^1 > 2$, $t_m > 2$, it can be obtained:

$$p_m^1 \approx \left(X_m^1\right)^3 + 3\left(X_m^1\right)^2\left(1 - X_m^1\right) \tag{3.5}$$

The functional relationship is shown in Fig. 3.1.

It can be seen from the Fig. 3.2, the whole process of the ceramic industry technology products' status as well as the financial market structure's change is a quantitative change to cause the qualitative change, of which the most important are the financial system transition, this represents the interaction relationships between technological and financial.

3.5 Conclusions

In the ceramic industry technology innovation strategic alliance, the relationship between science technology and finance affects the development of ceramic industry. Through the cylinder model to study for its positive feedback scientific mechanism between them, which can get the positive feedback relation and function formula between technology products and financial behavior, advantageous to science technology and financial adjustment of really ceramic industry,

from the process of carrying on quantitative change to the qualitative change, of the ceramic industry and science technology development. Ceramic industry to finance and science and technology promote mutually, the mutual development of the correct path, to achieve the correct path of the mutual promotion and the mutual development between finance and science and technology under the ceramics industry.

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References

1. Xiehe H, Yang X (2011) Discussion on the cultural value of modern financial. Social Sci 16(7):56–58
2. Hong Y (2008) Technology and mechanism risk investment. Econ Theor Econ Manage J 15(11):5–9
3. Huang S, Zhang G (2010) Analysis of chinese listing corporation equity financing preference. Econ Res 15(11):12–20
4. Huang J (2004) The advantage of American innovation system. Global Sci Technol Econ Clothes Look 17(12):32–35
5. Long Y, Chang Q (2010) Research on the relationship for the innovation type of high-tech enterprises, financing mode and strategic alliance. J Ind Manage Eng 15(2):13–21
6. Li L, Zen R (2007) 1979–2006 Chinese financial reform, vol 18(8). Shanghai people's publishing house, Shanghai pp 121–135
7. Zheng W (2007) A positive feedback system theory. Syst Eng Theor Pract 17(3):28–34