

Research on the Cooperation Development between Science & Technology Service Industry and Strategic Emerging Industries in Shannxi

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Abstract

Science & technology service industry can provide knowledge and technology for strategic emerging industries, and strategic emerging industries' demands for technology can accelerate science & technology service industry's development. The paper constructs a statistical model describing the cooperation development between science & technology service industry and strategic emerging industries, analyses the cooperation development between science & technology service industry and strategic emerging industries. The result indicates that the degree of cooperation development between science & technology service industry and strategic emerging industries is high. Therefore, in order to accelerate science & technology service industry's development as well as strategic Emerging Industries' development, Shannxi should take different measures, such as changing the idea and raising awareness, improving technology service industry's comprehensive service ability and so on.

Keywords

Science & Technology Service Industry; Strategic Emerging Industries; Cooperation Development.

1. Introduction

The science & technology service industry belongs to the field of knowledge (Daniel bell, 1974), providing knowledge-based intermediary products or services (Mill, 1995), concretely speaking, science & technology service industry is the use of scientific knowledge, scientific methods and technical means to provide a variety of services for the generation, dissemination and application of science and technology: it is the intermediary organization of the effective combination of science & technology and economy, as well as the booster of science & technology progress and the transformation of science & technology achievements (K.Y. Liu, 2014). In 1976, the German physicist Rianne Ten Haken made a systematic exposition of the coordination theory. He believes that there are interactions and mutual cooperation among micro-systems or macro-system. Therefore, in theory, science & technology service industry and strategic emerging industry interact with each other, promote and develop together.

Chinese scholars M. Zhou, J. Xu and X. Z. Wang (2010) took 13 cities in Jiangsu province as samples established mathematical statistics model to analyze the relationship between science & technology service industry and tertiary industry. The results show that the science & technology services industry promote the rapid transformation of growth mode of the primary industry and secondary industry by providing science & technology and knowledge, and speed up the development speed of the primary industry and secondary industry. By providing information and technology to the tertiary industry to accelerate its information and networking development, thereby promoting the rapid development of the tertiary industry. H. Chen, N. Zhou and J. Y. Liu (2012) pointed out that there is a close relationship between the development of science & technology service industry and the upgrading of industrial structure, with the mutual influence and promotion of the relationship. X. P. Shen, L. B. Zhu and H. Yin (2011) analyzed the relationship between the development of key industries and the development of science & technology service industry in Guangdong province,

which found that the key industrial policy and its development can promote the development of the science & technology service industry: at the same time, the development of science & technology service industry can meet the scientific & technological needs of key industries better. The above research has certain theoretical value and reference significance, but at present, there is no scholar to study the relationship between Shaanxi science & technology service industry and the strategic emerging industries. In order to make up for this defect, this paper will establish mathematical statistical analysis model, and test the concrete relationship between them empirically.

2. Research methods and data sources

2.1 Research methods

Professor J. L. Deng pioneered by grey correlation analysis is a system analysis method based on grey system theory. It is the quantitative description and comparison of the development trend of the system. As the grey system theory has the advantages of “small sample” uncertainty system as the research object, after continuous development and improvement, it has been widely used in various fields such as economy, society and so on (J. H. Xu, 2002). According to the geometric relationship between the relevant statistical data and the similarity degree during the research period, the method is used to analyze and determine the specific correlation degree between the various studies. Since the relevant statistical departments in recent years have begun to make statistics on the relevant data of strategic emerging industries, it is difficult to obtain a large number of accurate analysis data, therefore, in order to improve the science and rationality of the research conclusion, this paper uses the grey relational degree analysis method, specifically analyzes the relationship between Shaanxi science & technology service industry and strategic emerging industries, and determines whether there is a collaborative relationship between the two. The specific steps are as follows:

2.1.1 Determine the sequence of analysis

According to the specific research purpose, a dependent variable factor and multiple independent variables are determined. The establishment of each year contains m indicators, the reference number is:

$$X_0(K) \quad K=1, 2, \dots, n \quad (1)$$

The comparative series is:

$$X_i(K) \quad i=1, 2, \dots, m \quad (2)$$

2.1.2 The variable sequence is carried on Dimensionless method

Because the original sequence has different dimension or quantity level, in order to ensure the reliability of the analysis results, the variable sequence needs to be outline. The common dimensionless methods include initial value method, maximum method and mean value method. The calculation formulas are as follows:

$$Y_j(k) = \frac{X_j(k)}{X_j(1)} \quad (3)$$

$$Y_j(k) = \frac{X_j(k)}{\max(X_j(k))} \quad (4)$$

$$Y_j(k) = \frac{X_j(k)}{\frac{1}{n} \sum_{k=1}^n X_j(k)} \quad (5)$$

$k=1, 2, \dots, n; j=0, 1, 2, \dots, m$

2.1.3 Calculation of correlation coefficient

$$\xi_i(k) = \frac{\min_i \min_k |X_0(k) - X_i(k)| + \rho \cdot \max_i \max_k |X_0(k) - X_i(k)|}{|X_0(k) - X_i(k)| + \rho \cdot \max_i \max_k |X_0(k) - X_i(k)|} \tag{6}$$

In formula (6): p is the resolution coefficient, in (0, 1) the value is taken, generally 0.5, the smaller the value can improve the difference between the correlation coefficient. The $\xi_i(k)$ is the correlation coefficient between the kth element of the comparison sequence X_i and the kth element of the reference sequence X_0 .

2.1.4 Solve correlation degree

$$\gamma_i = \frac{1}{n} \sum_{k=1}^n \xi_i(k) \tag{7}$$

The γ_i is the correlation between the comparison of the sequence X_i and the reference number X_0 .

2.2 data sources

The data used are mainly from the statistical yearbook of Shaanxi (2016), Shaanxi economic information network (<http://www.sn.stats.gov.cn/>). Currently, Shaanxi province has not been comprehensive, systematic statistical energy-saving environmental protection industry and new materials added value of the new materials industry, therefore, this part selects the science & technology service industry, high-end equipment manufacturing industry, new generation information technology, new energy industry, new energy automobile industry and bio-pharmaceutical industry as the research sample, with its industrial added value as the research index.

3. The empirical analysis of the Collaborative development of Shaanxi science & technology service industry and strategic emerging industries

3.1 Determining the sequence of analysis

Taking the industrial added value of science & technology service industry as reference sequence, it is recorded as X_0 , high-end equipment manufacturing industry, new generation information technology; new energy industry, new energy automotive industry and bio-pharmaceutical industry are X_1, X_2, X_3, X_4 , and X_5 respectively. Among them, $i = 0, 1, 2 \dots 5$; $K = 1, 2 \dots 5$.

3.2 The variable sequence is carried on Dimensionless method

This paper selects the initial value method to conduct the original data, has eliminated the dimension, and transformed it into a data series with strong comparability. According to the formula, the sequence table after the initial value is obtained (as shown in table 1).

Table 1 Initial value table

	1	2	3	4	5
X0	1	1	1	1	1
X1	153.6669	181.1908	175.7423	42.22841	43.69855
X2	13.83313	16.03884	18.40514	18.93115	3.501641
X3	73.76721	87.33129	96.03619	59.45067	197.8659
X4	40.10396	47.29084	45.8781	11.02382	11.40506
X5	17.19138	15.93111	16.39299	6.383613	6.786217

3.3 Calculation of correlation coefficient

In this paper, the value of p is determined as 0.5, i.e. $p = 0.5$, the calculated results are shown in table 2:

Table 2 grey correlation coefficient table

	1	2	3	4	5
$\zeta_1(K)$	0.40197	0.362261	0.369487	0.722709	0.715181
$\zeta_2(K)$	0.907146	0.889513	0.871342	0.867403	1.00000
$\zeta_3(K)$	0.589571	0.546289	0.521709	0.643372	0.341805
$\zeta_4(K)$	0.733873	0.697429	0.704304	0.930644	0.927384
$\zeta_5(K)$	0.880569	0.890358	0.886745	0.97224	0.968484

3.4 Calculating the degree of grey correlation

The relationship between Shaanxi science & technology service industry and strategic emerging industries is shown in table 3.

Table 3 Grey comprehensive correlation matrix of Shaanxi science & technology service industry and its strategic emerging industries

Degree of association	High-end equipment manufacturing industry	New generation information technology	New energy industry	New energy automobile industry	Bio-pharmaceutical industry
Science and technology service industry	0.702626	0.67717	0.670717	0.827274	0.790571

4. Conclusion of empirical analysis

From table 3, the following conclusions can be obtained:

The high-end equipment manufacturing industry, the new generation information technology, new energy industry, new energy automobile industry and the bio-pharmaceutical industry are positively related to the science & technology services industry, and their correlation coefficients are: 0.702626, 0.67717, 0.670717, 0.827274 and 0.790571. This indicates that the development of high-end equipment manufacturing, new generation information technology, new energy industry, new energy automotive industry and bio-pharmaceutical industry promotes the development of Shaanxi science & technology service industry. Meanwhile, the development of science & technology service industry can also significantly promote the development of Shaanxi high-end equipment manufacturing industry, new generation information technology, new energy industry, new energy automobile industry and bio-medicine industry. Therefore, the science & technology service industry has played a decisive role in the development of strategic emerging industries in Shaanxi, and the economic development of Shaanxi province. The reason is that the science & technology service industry as an intermediary, its service activities strengthen the effective communication between the science & technology innovation institutions and the strategic emerging industries, promote the transformation of scientific & technological achievements, improve the technological improvement and labor productivity of strategic emerging industries.

The contribution of the science & technology service industry to the new energy automobile industry in Shaanxi is the most significant. The conclusion shows that the correlation coefficient between new energy vehicle and Shaanxi science & technology service industry is as high as 0.827274, that is, the development of the science & technology services sector increased by one percentage point, will promote the development of new energy vehicle industry to increase by 0.827274 percentage points, which is 0.124648 percentage points higher than the high-end equipment manufacturing industry, the new generation information technology industry, the new energy industry and the bio-pharmaceutical industry, which is more than 0.124648 percentage points, 0.150104 percentage points, 0.156557 percentage points and 0.036703 percentage points higher than the high-end equipment manufacturing, the new generation information technology industry, the new energy industry and the

bio-pharmaceutical industry respectively, and it is the high-end equipment manufacturing, the new generation of information technology industry, new energy industry and the bio-medical industry 1.18 times, 1.23 times, 1.23 times and 1.05 times. Visible, the science & technology services industry to the promotion of new energy vehicles is the most significant. The main reason is that the degree of technological innovation is the core of the development of the industry, which determines the competitiveness level and sustainability of the industry to a large extent.

The science & technology services industry and the bio-medical industry have a good relativity. The development level of the science & technology service industry increase by 1 %, which will increase the bio-medical industry in Shaanxi province by 0.790571 %, the correlation between the two is only next to the new energy vehicle industry, which is 0.956 times of the new energy automobile industry. However, the correlation between the technology services industry and the bio-medical industry is 0.087945 percentage points higher than the high-end equipment manufacturing industry, 0.113401 percentage points higher than the new generation of information technology industry, 0.119854 percentage points higher than the new energy industry, respectively. It is 1.13 times, 1.17 times and 1.18 times of the high-end equipment manufacturing, the new generation of information technology industry, the new energy industry respectively. The main reason is the promulgation and implementation of the opinions of the central Committee of the communist party of China and the state Council on deepening the reform of the medical and health system, which strengthened the awareness of Biotechnology Enterprises' scientific & technological innovation, and strengthened the exchange and cooperation between the bio-medical industry and the scientific and technological service industries.

The correlation between new energy industry and Shaanxi science & technology service industry needs to be improved. The empirical analysis shows that the correlation between Shaanxi new energy industry and science & technology service industry is 0.670717. It is 0.031909 percentage points lower than high-end equipment manufacturing, 0.006453 percentage points lower than the new generation of IT industry, 0.156557 percentage points lower than the new energy automotive industry, 0.119854 percentage points lower than the bio-medical industry, respectively, it is 0.95 times, 0.99 times, 0.81 times and 0.85 times of high-end equipment manufacturing, the new generation information technology industry, new energy automotive industry and the bio-medical industry. Visible, the new energy industry and Shaanxi science & technology services industry is the lowest correlation. The main reason for this phenomenon is that the new energy industry starts late, the scale is small, the profitability is limited, the risk bearing capacity is weak and the financing is more difficult. In a word, the development of science and technology service industry and Shaanxi high-end equipment manufacturing industry, new generation information technology, new energy industry, new energy vehicle industry and bio-pharmaceutical industry have significant positive correlation, and there is a clear correlation with the strategic emerging industries of Shaanxi, they have mutual influence, collaborative development relationship.

5. Conclusions and revelation

5.1 Change the concept and raise awareness

(1) Strategic Emerging Industry understands of the transformation of scientific and technological resources. In order to promote the integration of science & technology service industry and strategic emerging industries, to achieve the development of strategic emerging industries with scientific and technological progress, firstly, we must update the concept. First of all, the strategic leadership of emerging industries at all levels must follow the trend of the times, advance with the times, update their ideas, and change their thinking, attention to technological progress. Leaders at all levels should place scientific and technological development with technological progress work at the same height as the main business development and give a high degree of attention and full understanding so that they can play a more effective and effective role in their development. And then support the work of scientific and technological innovation and technological progress actively, make the technological innovation and technological progress as a task of the development of the industry, develop specific

and detailed support policies, effectively implement the relevant measures to comprehensively enhance the level of scientific and technological innovation, speed up its technology Progressive development. Finally, all the strategic emerging industries must recognize the important role of technology services in the transformation of scientific and technological achievements.

(2) Update the views of science & technology services. The first one is to comprehensively learn and understand the importance of science & technology activities, significance and so on. Second, correctly understand the science & technology service industry functions. The degree of knowledge of the functions of science & technology services has a certain influence on the transformation of scientific & technological resources and the technological progress of strategic emerging industries. In the process of technological transformation and technological innovation, the main function of science & technology service industry is to provide efficient service for the participants in order to strengthen the effective communication between scientific & technological innovation institutions and strategic emerging industries, promote scientific and technological resources' transformation, and improve the strategic emerging industries of technological progress. Third, to establish a scientific and rational main business. According to the functions of science & technology services, the main business identified as the relevant technology services activities.

5.2 Enhance the comprehensive service capacity of science & technology service industry

(1) To improve the infrastructure. The first is the establishment of a public service website, and with the help of the network to vigorously promote the main business category, process and other content. The second is to improve the quality of technical information network services, the establishment of public service platform for science & technology services, such as large-scale scientific and technological literature database, etc., to improve the transparency of public information disclosure technology at the same time; we should update the site information to ensure the novelty and correctness of the information. The third is to add more online trading function. The opening of online trading function will help to attract foreign participation in science & technology activities, expand the service area of science & technology service industry, and promote its cross-regional development.

(2) Improve the service level of human resources. The first is to formulate scientific personnel recruitment and training policy of scientific & technological service industry, and establish the selection, cultivation, use, evaluation and incentive mechanism of scientific talents. The second is to introduce high-level personnel to work in science & technology services or to set up various kinds of science & technology services institutions, and formulate policy measures to tilt the professional people in science & technology services. The third is to optimize the structure of human resources. Introduce high-level professional technical personnel, increase the proportion of senior professional technicians; Formulate the policy measures to the technical personnel of science & technology services, increase the professional and technical personnel, and reduce the proportion of administrative personnel to increase the proportion of senior professional and technical personnel. The forth is to strengthen the training of professional ethics, professional skills and other related knowledge to further improve the professional skills and theoretical knowledge of human resources further.

(3) Play a synergistic effect between the scientific & technological service institutions.

The scientific & technological service institutions should strengthen the communication and cooperation with the industry enterprises in the following aspects to give full play to the synergy effect between the science & technology services. The first is to establish the national science & technology service center and the regional science & technology service center, and publish the relevant information and large literature database of the science & technology services. The second is to strengthen the exchange and cooperation in the science & technology service industry. Held regularly every year service for domestic and international science & technology exchange meeting, BBS, exhibitions, to establish a wide range of science & technology service collaboration site, to

encourage the research and development of open mode, as well as exchange, collaborative development, achieve win-win situation.

5.3 Strengthen the effective communication between the scientific & technology service industry and the strategic emerging industries

The effective communication determines the connection and common development of the scientific & technology service industry and the strategic emerging industries to some extent. Therefore, shaanxi should further strengthen the effective communication between the scientific & technology service industry and the strategic emerging industries further. The scientific & technology service industry should collect the scientific and technological demand of strategic emerging industries, introduce advanced scientific and technological achievements, application prospects, timely, detailed and accurate introduction to strategic emerging industries; Strategic emerging industries must transfer their own scientific and technological needs information to the science & technology services industry. Through effective communication, the science and technology demand, fruits and other information could timely passed to the related benefit main body, make the innovation of science and technology agency in a timely manner to understand the technology needs of strategic emerging industries, strategic emerging industries quickly understand the dynamic and trend of the development of new technologies, improve the science & technology service industry and strategic emerging industries common benign development.

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