Analysis on Influencing Factors of Service Outsourcing Industry in Langfang— Based on the grey relation theory

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Abstract: With the rapid development of economic globalization and information technology, the service outsourcing industry is developing vigorously, and the market competition of undertaking service outsourcing is becoming fierce. If Langfang wants to take a place in the competition, it is very important to find out the main factors affecting the development of service outsourcing and its actual situation. By using the method of grey relational analysis, the paper selected 8 influencing factors that influence the development of service outsourcing industry in Langfang, ranked the impact of these 8 factors on the capacity of Langfang to undertake service outsourcing, and analyzed the ranking result in depth to provide some reference for the policy formulation of service outsourcing industry in Langfang.
Keywords: grey relation, service outsourcing.

INTRODUCTION

Since the end of the twentieth Century, the global production service system has gradually completed the integration development model, and the economic globalization led by service industry entered the era of "global value chain". Service outsourcing industry is a kind of industry based on communication network, an important part of modern high-end information industry and high-end service industry, the development of new modern technologies, such as big data and cloud computing, has gradually become a new impetus for the growth of service outsourcing.

The development of service outsourcing plays an important role in changing the mode of foreign trade growth, improving the quality and efficiency of foreign trade, optimizing the structure of foreign investment and promoting structural upgrading.

After the global financial crisis, more and more enterprises are aware of the importance of reducing costs and looking for quality partners. With the advantages in overall economic, human resources, service costs, and social stability, China has become the focus of global service outsourcing. The outsourcing industry in Langfang started at the beginning of this century, now it has a certain basis for development, andhas created a number of service outsourcing platform; it planned the "airport service outsourcing base" near the Beijing Daxing International Airport; and it also planned the "Wanzhuang financial backstage" base in Wanzhuang, which reserved space for the development of service outsourcing. The service outsourcing platforms in Langfang are fully functional, geographically advantageous, and relatively inexpensive, which undoubtedly become the targets of domestic and international outsourcing enterprises. To

develop service outsourcing industry is an important choice and approach for Langfang to adjust its industrial structure and change its mode of growth. Langfang should seize the opportunity to continuously improve the comprehensive competitiveness of service outsourcing, and in order to take a place in the competition, it is particularly important to recognize the main factors that affect the development of service outsourcing.

There are many literatures on the factors influencing the development of service outsourcing industry. Xu Xingfeng used the theory of national competitive advantage to analyze the situation and influencing factors of China's service outsourcing economy in an all-round way [1]. E Lili believes that the construction of government and the country, the differences between nature and culture, as well as knowledge and skills reserves are the three important factors that affect the competitiveness of outsourcing providers [2].Chai Yuanzhe studied the competitiveness level of China in undertaking service outsourcing from the aspect of state, city and enterprise, based on the comparison of service outsourcing development

between China and Ireland and India, [3]. Wei Ying used the diamond model to do empirical research on the competitiveness and its influencing factors China's service outsourcing, and he believed that the infrastructure of our country was comparatively perfect, and the structure of human resource supply and demand was unbalanced [4]. Chen Rongjiang pointed out that the larger economic scale and perfect infrastructure can attract more service outsourcing by analyzing and studying the service outsourcing industry of BRICs [4]. Hu Jianbo analyzed the successful service outsourcing of the Irish Free Trade Zone, and put forward some suggestions: implementing the service outsourcing policy measures in the free trade zone, enhancing the ability of enterprises to deal with the market and cultivating professional fields of technical staff [5].

On the basis of predecessors' research, this paper determined 8 quantitative indexes of Langfang service outsourcing, and used the grey relational theory to rank the influencing factors and analyzed the ranking results.

Establishment of index system of influencing factors of service outsourcing industry
Index system

As service outsourcing is a new industry, it lacks a unified statistical caliber, so it is difficult to obtain complete data.In the process of selecting indicators, some indicators are difficult to quantify such as government support, legal environment, cultural environment and so on;some indicators, such as regional extraversion, lack of relevant data or incomplete in data, cannot be carried out for multi-year quantitative analysis, so they are not included in the index system. Through the research and analysis of service outsourcing in Langfang City, taking into account the availability, testability and representativeness of the data, three first-level factors and eight secondary factors, as well as their proxy variables, are determined, as shown in Table 1.

Table-1: Influecing factors of service outsourcing industry in Langfang

First-level factors	Secondary factors	Evaluating indicator
Foundation of industry development	Development level of service outsourcing industry	X0 Added value of high and new technology industry
	Development levelof regional economic	X1 Regional per capita GDP
	Development level of service industry	X2 Increasing output value of service industry
	Infrastructure	X3 Number of Internet users
Opening-up level	Opening-up degree	X4 Total imports and exports
Scientific and technological innovation and manpower	Development level of science and technology Talent reserve Manpower cost	X5 Number of patent applications X6 Number of college and secondary school students X7 Average wage of urban employees

Index system description
(1) Basic indicators of Industrial Development
Development level of service outsourcing industry: as the service outsourcing industry in Langfang is a newly emerged industry in recent years, the relevant data is incomplete and unified, and it is difficult to obtain the index data of receiving and sending source capability of outsourcing enterprises and offshore outsourcing contract amount. In this paper, the added value index of high and new technology industry is used to express the development level of service outsourcing industry in Langfang.

Development level of regional economic: in view of the population growth factors, in order to better reflect the development level of regional economic, in this paper, the GDP per capita is used to indicate the level of economic development in Langfang.

Development level of service industry: The development level of service industry has gradually become an important indicator of whether a country is developed or not. As a part of modern service industry, service outsourcing is also influenced by the development of service industry. In this paper, the added value of the third industry, that is, the added value of service industry is used to represent the development level of service industry in Langfang.

Infrastructure construction: as an important basis for the development of urban industry and service industry, infrastructure construction has an important influence on attracting foreign investment and economic development, and the service outsourcing industry is based on information technology, and has a higher requirement on the level of network and communication. In this paper, the number of Internet users is selected to represent the level of infrastructure construction in Langfang.

Opening-up level

This paper uses the opening-up degree to express the regional opening-up level. Offshore outsourcing, as an important component of service outsourcing, is an important approach for the region to participate in international cooperation and division of labor. This paper uses the total import and export of Langfang to represent the opening-up level.

Technology and manpower

Development level of science and technology: as the service outsourcing industry has higher requirement on level of knowledge, scientific research and innovation, as well as the development level of regional science and technology. In this paper, the number of patent applications is used to represent the development level of science and technology in Langfang.

Talent reserve: the higher professional division of labor and higher knowledge flow of service outsourcing industry require higher quality and knowledge level of employees. In this paper, the number of students in colleges and secondary schools of Langfang is used to indicate the reserve of talents.

Manpower cost: Because of the high added value of knowledge of service outsourcing industry, human resource cost is an important component of service outsourcing enterprises. In this paper, the average wage of workers in urban and rural areas in Langfang is used to indicate labor cost.

Model selection and empirical analysis

Grey Theory is a systematic and scientific theory proposed by Professor Deng Julong, a famous scholar in 1982. The grey relational analysis is to determine the degree of correlation between the factor sequences based on the similarity degree of the geometric of Variation curve of each sequence, if the curve is closer, then the correlation between the corresponding sequences is greater, and smaller on the contrary. The grey relational analysis method has no strict requirement on the sample capacity, it can be at the least of 4, and it can obtain relatively accurate results in the case of relatively less data samples.

As the service outsourcing industry is newly developed in recent ten years, it is a new emergent industry for Langfang, and its data statistics are lack of uniform caliber and are difficult to obtain. Therefore, a large amount of data cannot be found for data processing and analysis. Therefore, this article selects the grey relational analysis method, and obtains the importance ranking of influence degree of each index on service outsourcing industry in Langfang by calculation.

Empirical analysis process

This paper collects data of time series from 2006 to 2015.As service outsourcing is a new industry, it lacks unified statistical caliber, so it is difficult to obtain complete data. This paper sorts out the relevant data of service outsourcing in Langfang from 2006 to 2015 through China service outsourcing network, Ministry of Commerce website, Langfang municipal government network, Langfang Statistics Bureau website, Government work report and Statistical Yearbook of Langfang over the years. Because there is no special statistical data, it may be biased inevitably, but overall, it reflects the development of service outsourcing industry in Langfang in recent years.

The first step is to determine the reference sequence and the comparison sequence. A sequence of data that reflects the feature of system behavior is called reference sequence, and a sequence of data composed by factors that affects the system behavior is called comparison sequence. The reference sequence in this paper is X0 (added value of new and high-tech industries) in Table 1, and the comparison sequence is X1—X7.

The second step is the nondimensionalization treatment of the reference sequence and The comparison sequence. Because of the different effect of the factors in the system, the dimension of the data is not the same, so it is not suitable to compare. Therefore, when dealing with the grey relational analysis, it is common to carry out nondimensionalization data processing, such as initialization, equalization and interval. In this paper, the initial data is non-dimensional by initial value method, and the initial processing method is as follows:

$$X_0 = (1, \frac{X_0(2)}{X_0(1)}, ..., \frac{X_0(k)}{X_0(1)}, ..., \frac{X_0(n)}{X_0(1)})$$

$$X_i = (1, \frac{X_i(2)}{X_i(1)}, ..., \frac{X_i(k)}{X_i(1)}, ..., \frac{X_i(n)}{X_i(1)}), i = 1, ..., m$$

The list of dimensionless data is shown in Table 2:

Table-2: The list of nondimensionalization treatment

X1	X2	X3	X4	X5	X6	X7	X0
1	1	1	1	1	1	1	1
1.175958	1.245614	1.235278	1.508475	1.207513	0.968153	1.935966	2.056777
1.175775	1.511442	1.658158	1.427966	1.903399	1.008917	2.110232	2.701465
1.453819	1.760107	2.353483	2.033898	2.010733	0.989809	2.49591	3.543956
1.679679	2.126621	3.027115	2.241525	2.372093	0.980892	2.680434	4.661172
1.852943	2.391304	3.163409	2.131356	3.432916	0.90828	3.021389	6.249084
2.047893	2.73913	3.431958	2.500000	4.025045	1.036943	3.292879	2.439560
2.210063	3.26163	3.610565	2.241525	5.304114	1.597452	3.723749	2.551282

The third step is to compute the difference sequence between the reference sequence and the comparison sequence, the specific data are shown in Table 3,

Table-3 The list of difference sequence

$\Delta_1(k)$	$\Delta_2(k)$	$\Delta_3(k)$	$\Delta_4(k)$	$\Delta_5(k)$	$\Delta_6(k)$	$\Delta_7(k)$
0	0	0	0	0	0	0
0.88081	0.811163	0.821498	0.548302	0.849263	1.088624	0.12081
1.52569	1.190024	1.043307	1.273499	0.798066	1.692548	0.591233
2.09013	1.783849	1.190473	1.510058	1.533223	2.554147	1.048046
2.98149	2.534551	1.634057	2.419647	2.289079	3.68028	1.980738
4.39614	3.85778	3.085675	4.117728	2.816168	5.340804	3.227695
0.39166	0.29957	0.992397	0.06044	1.585484	1.402618	0.853319
0.341219	0.710346	1.059283	0.309757	2.752832	0.95383	1.172467

Calculate the two ranges (minimum and maximum values),the calculation formula：

$$\min_i(\min_k|X_0(k)-X_i(k)|)=0 \quad \max_i(\max_k|X_0(k)-X_i(k)|)=5.340804$$

Then calculate the correlation coefficient, the calculation formula：

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

In which, the resolution ratio is ρ, $0<\rho<1$, usually it is 0.5, and the specific results are shown in table 4:

Table-4: The list of correlation coefficient

$\xi_1(k)$	$\xi_2(k)$	$\xi_3(k)$	$\xi_4(k)$	$\xi_5(k)$	$\xi_6(k)$	$\xi_7(k)$
1	1	1	1	1	1	1
0.751939	0.766985	0.764715	0.82963	0.758682	0.710366	0.956711
0.636367	0.691706	0.719036	0.677064	0.769881	0.612028	0.818709
0.560908	0.599481	0.691625	0.638747	0.635227	0.511088	0.718119
0.472441	0.513013	0.620345	0.524594	0.538406	0.420454	0.574102
0.377858	0.409021	0.46389	0.393357	0.486678	0.333300	0.452719
0.872074	0.89912	0.729031	0.977865	0.627426	0.655598	0.757808

Fourth, calculate the correlation degree of each index, the calculation formula is $R_i = \dfrac{1}{n} \sum\limits_{k=1}^{n} \xi_i(k)$ **.** The

calculation results are: $R_1 = 0.667371$ $R_2 = 0.697047$ $R_3 = 0.712664$

$R_4 = 0.720180$ $R_5 = 0.688043$ $R_6 = 0.606119$ $R_7 = 0.754024$

Thus, the correlation degree between the influencing factors and the dependent variable index is ranked as follows:

$R_7 > R_4 > R_3 > R_2 > R_5 > R_1 > R_6$,

The ranking of the factors affecting the service outsourcing in Langfang is shown in table 5.

Table-5 the ranking table of the factors affecting the service outsourcing in Langfang

First-level factors	Secondary factors	Evaluating indicator	Correlation degree	Ranking
Foundation of industry development	Development level of regional economic Development level of service industry	X1 Regional per capita GDP X2 Increasing output value of service industry	0.667371 0.697047	6 4
	Infrastructure	X3 Number of Internet users	0.712664	3
Opening-up level	Opening-up degree	X4 Total imports and exports	0.720180	2
Scientific and technological innovation and manpower	Development level of science and technology	X5 Number of patent applications	0.688043	5
	Talent reserve	X6 Number of college and secondary school students	0.606119	7
	Manpower cost	X7 Average wage of urban employees	0.754024	1

Empirical results analysis and conclusions

The result shows that as the labor cost index, the average wage of urban employees is in the first place, which is the most important factor affecting the development of Langfang's service outsourcing industry. Service outsourcing industry is an industry with high technology and knowledge. Because of its service characteristics, employee salary is an important component of its enterprise cost. With the continuous improvement of human cost, more and more enterprises are focusing on the cities or countries with lower manpower and office costs. The manpower cost of Langfang is only about 30% of the first-tier cities such as Beijing and Shanghai. It has a great advantage in human cost and has a strong attraction for outsourcing enterprises.

The total import and export volume is in the second place. We can see the important influence of the opening up level on the development of regional service outsourcing. With the development of globalization, trade between countries is becoming closer and closer. Langfang has long been an inland city, the opening-up degree is not high, and the contribution of exports to the economy is also low. Foreign companies are important contracting parties for service outsourcing business, so Langfang should make full use of the regional advantages near Beijing and Tianjin, and actively develop offshore outsourcing, and strive to go out and actively seize the international service outsourcing market.

The index of internet users ranks the third, which also shows the basic function of infrastructure construction and informatization level in developing service outsourcing. The development of service outsourcing business mainly takes information technology as an important carrier, and the international Internet speed and load amount play a supporting role in the development of service outsourcing industry. In addition, infrastructure such as convenient transportation and logistics, comfortable office and living environment will attract outsourcing enterprises and talents. There are a lot of undertaking platforms in the high-tech and industrial parks of Langfang, which are the important base for Langfang to develop service outsourcing business.

Per capita GDP and value-added services are in the behind. As the foundation of superstructure, economy plays an important role in the development of all aspects of society. The economic development level of Langfang and even Hebei still lags behind in the national rankings. It should accelerate the adjustment of industrial structure upgrading, and actively develop the service outsourcing industry, making it a new "growth pole" of Langfang and Hebei province's economic development.

The number of patent applications ranked the fifth, ranking relatively backward. Langfang's scientific and technological foundation and scientific research level are weak. Therefore, there is an urgent need for Langfang to increase research investment in related fields of service outsourcing industry, especially to strengthen the research on big data, cloud computing and Internet of things, so as to provide technical support for outsourcing enterprises, and occupy the heights of service outsourcing industry in the future.

Talent pool is the last factor in all factors. Although Langfang city has many universities and research institutes, as the "siphon effect" of Beijing and Tianjin on talent, it is short of the high-quality specialized personnel. The difficulties in attracting and retaining talent have long been a problem in the process of developing service outsourcing in Langfang. On the one hand, it should improve the level of treatment, provide preferential policies to attract excellent outsourcing personnel; on the other hand, the schools and enterprises should cooperate to train special personnel for enterprises. It should provide personnel protection for the development of service outsourcing in Langfang through a variety of ways.

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