Evaluation on Scientific and Technological Development of Electronic Information Industry in Guangxi

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Abstract

At present, the electronic information industry has become a strong growth engine of the economic development of provinces in China. During the "Twelfth Five-Year" Period, Guangxi will clearly focus on the development of electronic information industry as a priority in one of fourteen billion dollar industry. In this paper, the combination of AHP and empirical analysis is used to compare the science and technology development of electronic information industry in Guangxi and Guangdong province. And then the thinking of the development of electronic information industry in Guangxi is made of.

Keywords: Guangxi, Electronic information industry, Scientific and technological development, AHP, Empirical analysis

1. Introduction

The 21st century, Information technology is the important driving forces of economic and social development in the world, the electronic information industry is a strategic, fundamental and guiding pillar industry of national economy, it has a very important role in stimulating economic growth, adjusting the industrial structure, changing the mode of development and the promotion of social employment. As a less developed regions of Guangxi, It is especially important to develop the electronic information industry and promote the optimization of industrial structure. In 2010, the government of Guangxi announced "The decision to bigger and stronger the industry of Guangxi", which clearly focuses on the development of electronic information industry as a priority in one of fourteen billion dollar industry. How to develop the electronic information industry? In this paper, based on a comprehensive analysis of the current situation and environment for the development of electronic information industry in Guangxi, we uses AHP and empirical analysis to compare the electronic information industry in Guangxi and Guangdong province, and then make the thinking of the development of electronic information industry in Guangxi, so that it can provide a reference to the Technology Development Plan of the "Twelfth Five-Year" Period.

2. Current situation

Electronic information industry includes the manufacturing industry of electronic information product (hardware industry) and electronic information services (including software). Since "Ninth Five-Year", electronic information industry in Guangxi has maintained rapid growth in the background of economic globalization and rapid development of China's information industry, and the value added has rose from ¥1.615 billion in 1996 to ¥3.88 billion in 2000. In the first four years of "Tenth Five-Year", the growth rate of the electronic information industry in Guangxi was 8.8%, 8.1%, 10% and 11.6%. The income of all main business of industry has been ¥10.5 billion by 2008, which is in an increase of 28%.

(1)The manufacturing industry of electronic information product has formed certain industrial scale. It continuously speed up industrial restructuring, and product structure gradually develops to the high-quality and high value-added direction, so that it can form the development system of Matching production, teaching and research, and then have a comparative advantage and characteristics in field of communications products, new electronic components and application of electronic products.

(2) Telecommunications, radio, television and other information transfer services have a rapid development, which has been the pillar of the electronic information industry in Guangxi. The construction of communication

network, radio and television fiber trunk and computer network improve quickly, and the size of the network capacity, technical level and comprehensive ability has increased to unprecedented levels, so as to provide strong support and protection for the national economic and social development in Guangxi.

(3) Computer Services and software industry has the fastest growing. As an emerging industry, Software industry in Guangxi develops in average annual growth rate of 25%, and Nanning, Guilin and other software parks have been constructed. The capacity of software development is improving, and part of the application of software technology has been domestic leading even international advanced level, so that the environment of software development and production has been gradually formed.

3. Analysis on development environment

3.1 Advantage analysis

(1) Policy support

In recent years, in order to promote the development of electronic information industry, the country and autonomous region government approved and carried out a series of effective policies and measures. In 2009 it was introduced “Restructuring and revitalization plan of High-tech industry in Guangxi” which noticed that we should develop the eight high-tech industries such as electronic information industry to provide strong support for the building innovative Guangxi, and “The view on the establishment of Billion-dollar industrial R&D Center” which noticed that we would establish a number of billion-dollar industrial R&D Center in Guangxi including electronic information engineering R&D center.

(2) Regional cluster effect

In Guangxi, information enterprises coming from home and abroad mainly concentrate in the industrial information park of Nanning, Liuzhou, Guilin and Beihai. Nanning has constructed a High-tech Development Zone to develop computer and related products, in which there are more than 600 software enterprises concentrating currently, which account for more than 90% of the whole region. There is a National Information Industrial Park in Guilin, which mainly develops electronic, communication, software and other products, annual output value could be up to ¥8 billion according to estimation. Now more than one hundred domestic and foreign enterprises of electronic information have accumulated in Guilin, whose total output value account for more than 70% of electronic information industry in Guangxi.

(3) Merchants and Attracted funds

In recent years, Guangxi have introduced a number of projects such as Beihai electronic industrial park of China, The world "500" Japan's Sanyo Electric Co., Hundred private enterprises Yong Chang Group in Guangdong and so on. It is also effective to undertake the transfer of the electronics industry in eastern, 2005-2008, The four municipalities of Guigang, Yulin, Wuzhou, Hezhou in east region of Guangxi are full use of geographical advantage of neighboring Guangdong, Hong Kong and Macau, which have undertaken more than one hundred electronic transfer projects, and plan to invest ¥3.5 billion.

3.2 Disadvantages analysis

The industrial base is weak, and the scale is small. The total talent is lack of, and industrial key personnel required for the core outflow seriously. The overall financial investment is inadequate. The system of intermediary service is imperfect, and there is lack of municipal industry authority, so the development between regions is very uneven.

3.3 Analysis of development opportunities

Currently, Electronic Information Industry in Guangxi is facing a very favorable situation and a broad space for development.

(1) A new round of national strategy of developing the western region and the action to bring prosperity to border areas encourage the eastern industry and foreign investment transferred to central and western regions, and the layout of major projects will give full consideration to support the western development as same as southwest regional economic cooperation, Pan-PRD Regional Cooperation and other domestic regional cooperation, so as to inject new vitality and power for the rapid development of electronic information industry in Guangxi.

(2) China - ASEAN Free Trade Area is accelerated quickly, while China - ASEAN Expo, the Business and Investment Summit and a series of cooperation mechanisms have been established and implemented, which deepen China - ASEAN Cooperation, so that it will provide the basis of developing towards ASEAN.

(3) Our Country has attached great importance to the development of coastal areas in Guangxi, and explicitly

takes North Bay Economic Zone as the key areas of Western Development and opening up and cooperation for ASEAN, which gives Guangxi a new mission so as to provide a great development platform for the development of electronic information industry in Guangxi.

4. Construction of the evaluation System

4.1 The principle of selecting indicators

The indicator system is designed to establish an evaluation model, so as to evaluate comprehensively the science and technology development of electronic information industry in Guangxi, and then we can see the problems truly on it. Therefore, it should follow the scientific, objective and practical, simple and feasible, uniform and comparable principles.

4.2 Construction of the evaluation System on science and technology development

The indicator system is used to evaluate the technological strength of the electronic information industry synthetically, so it should be an index system with diversity. For the characteristics of electronic information industry and general factors of technological development, while considering the basis of previous studies, we construct the index system as shown in Table 1.

(1) The industrial scale

The science and technology activities of the industry can boost the rapid industrial upgrading and development, and achieve economies of scale, so as to promote the industry have been expanding. Scale of the industry can reflect development Status of it from the overall aspects, while it can reflect the level of industrial development from the side. The industrial-scale indicators include the number of enterprises, the number of employees and the annual output value of industry.

(2) The industrial investment of science and technology

Electronic information industry is knowledge-intensive and capital-intensive industries, so it needs the government to give special support and technological investment, which includes personnel, funds, equipment and other fixed assets investment, so we selected four most representative indicators such as industrial R&D personnel, industrial investment in R&D funding, the proportion of industrial R&D expenditure to total industrial output value, industrial fixed assets investment.

(3) The industrial output of science and technology

The output of science and technology can directly reflect the research capacity of industry and the results of science and technology targets, It generally includes direct and indirect output, we selected two indicators from the aspect of direct output such as the number of patents licensed and the number of scientific papers published, while the choices of indirect indicators is the proportion of the output value of new products to total industrial output value.

(4) The potential of science and technology

The sustainable development of electronic information industry must have a strong factor of scientific and technological potential as a guarantee. Firstly, we should train and reserve a number of R&D personnel, so the higher education is essential. Secondly, science and technology institutions are the innovation vectors, and they are the basis for research and development. We selected four indicators for potential factors such as the number of industrial research and development institutions, the number of students in colleges and universities of Guangxi, the education spending of Guangxi and the proportion of education expenses of Guangxi to total fiscal expenditure.

5. Evaluation

5.1 Determine the weight of indicators by AHP

AHP is put forward by Well-known U.S. Operations Research Home T. L. Saaty in 1970s.AHP is a method of making multiple criteria decision by a combination of qualitative and quantitative, which can effectively analyze non-sequence relationship between the level of targets for system, and it is systemic, compacts and practical.

(1) According to the index system on scientific and technological development of electronic information industry in Guangxi, we established a model of hierarchical structure.

(2) Calculate the relative weight of indicators to be compared with the guidelines, as shown in Table 1.

(3) Test the consistency.

5.2 The Empirical Study

5.2.1 Original data collection

In the empirical analysis, we need to select a standard which is used to measure the level of scientific and technological development, which is reflected it from the horizontal. As the scientific and technological development of electronic information industry in Guangdong Province has been very well developed, we selected it as a comparison standard. According to the data provided by "Guangxi Statistical Yearbook 2008", "Guangdong Statistical Yearbook 2008", "Statistical Yearbook of Information Industry of China 2008" and "Statistical Yearbook of high-tech industries in China 2008", we got the original data table of Guangdong and Guangxi provinces in 2008, as shown in Table 2.

5.2.2 The raw data normalized

In this paper, in order to solve the problem of different dimensions of each index which is difficult to carry out comprehensive summary, we need to deal with the measure for the original data. In this study, we used the relative treatment to eliminate the impact of dimension. The main principle is: First, Set a standard of evaluation, which is choose by the maximum value as the standard of comparison, then compare the actual value of each index and standard values. Dimensionless equation is $I = X/X_0$.

5.2.3 Calculation of Composite Index

On the basis of dimensionless, we used the method of weighted sum to comprehensively treat the indicator, the formula: Composite Index of scientific and technological development = Σ weight * non-dimensional numerical and we got the composite index table by calculation, as shown in table 3.

5.2.4 Analysis of evaluation results

From the index of science and technology development, we can see that the development of electronic information industry is still relatively backward in Guangxi, and there is a big gap compared with Guangdong Province, the main issues reflected in:

(1) The industrial scale is small.

Although the electronic information industry in Guangxi has developed rapidly in recent years, the introduction of large enterprises and large projects is not much as lack of the base and environment to attract investment projects. And because the basis of its own strength is thin, concentration level of electronic information industry is low, so the development of the industrial chain is not perfect..

(2) The industrial structure is unreasonable.

Unrealistically high in the case of structure of electronic information industry in Guangxi is there. Compared with the developed provinces such as Guangdong, the ratio of information equipment manufacturing, information services and information development industry (including software) is not enough coordination and reasonable.

(3) Overall input of the industry is low.

The importance of industrial investment in R&D in Guangxi is increasing, although the output is low, the proportion of industrial R&D expenditure to total industrial output value is satisfactory. It is worried about that the investment in infrastructure and renovation is too little. More seriously, the channel of financing is a single.

(4) The introduction of talent is inadequate.

Currently, Guangxi is lack of a specific countermeasure that can strategically attract technical talent of electronic information industry, especially for high-quality personnel and leaders in academic and technological innovation.

(5) The output of science and technology is low.

The dominant position of enterprises has not yet formed as the core of investment and technology development, and the number of R & D Center for electronic and Information Engineering is relatively small, so industrial innovation is still at the initial stage, which seriously affected the output of science and technology.

(6) There is some technological potential.

Not only the educational funding, but also the introduction and training of higher personnel, have been given a high priority by the government of Guangxi. However, the overall level of education in Guangxi is low constrained by geographical factors, so we need to further intensify of tapping the potential of science and technology.

6. Conclusion

In the paper, we initially built an evaluation system of scientific and technological development of electronic information industry in Guangxi, which is comprehensively evaluated by the combination of AHP and empirical analysis. Using the comprehensive evaluation method, we not only got the technological development index of electronic information industry in Guangxi, which could provide a comprehensive and complete information of technological development to decision-making departments at all levels, but also we have given the index of the industrial scale, industrial investment of science and technology, industrial output of science and technology and scientific and technological potential, so that the technology department of the Government can grasp the weak links of technological development of electronic information industry in Guangxi, and regulate the technological resources, then promote it to develop rapidly.

References

Bureau of Guangdong. (2009). Guangdong Statistical Year book.

Bureau of Guangxi. (2009). Guangxi Statistical Year book.

Du, Dong. (2008). *Modern methods of comprehensive Evaluation and selected cases.* Press of Tsinghua University.

Li, Hongyuan & Li, Shuren. (2002). Research of comprehensive evaluation index system of technological development in Taiyuan. *Information Development and Economy,* 1:131-134.

National Bureau of Statistics. (2009). China Statistical Yearbook.

National Bureau of Statistics. (2009). China Statistical Yearbook of high-tech industries.

Table 1. The index system and Weight table

The first level indicators	The second level indicators (W_i)	The third level indicators (W_i)	The weight of the total order
The science and technology development of electronic information industry in Guangxi	1.The industrial scale (0.19)	1.The number of enterprises (0.33)	0.0627
		2.The number of employees (0.25)	0.0475
		3.The annual output value of industry (0.42)	0.0798
	2.The industrial investment of science and technology (0.36)	4.Industrial R&D personnel (0.20)	0.072
		5.Industrial investment in R&D funding (0.30)	0.108
		6.The proportion of industrial R&D expenditure to total industrial output value (0.29)	0.1044
		7.Industrial fixed assets investment (0.21)	0.0756
	3.The industrial output of science and technology (0.25)	8.The number of patents licensed (0.43)	0.1075
		9.The number of scientific papers published (0.27)	0.0675
		10.The proportion of the output value of new products to total industrial output value (0.30)	0.075
	4.The potential of science and technology (0.20)	11.The number of industrial R&D institutions (0.34)	0.068
		12.The number of students in colleges and universities (0.20)	0.040
		13. The education spending (0.23)	0.046
		14.The proportion of education expenses to total fiscal expenditure.(0.23)	0.046

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Table 2. The original data table (2008)

The indicators	Guangxi province	Guangdong province
1.The number of enterprises	198	4819
2.The number of employees	121.3 thousand	507.2 thousand
3.The annual output value of industry	¥14834.3 million	¥1677720 million
4.Industrial R&D personnel	61 thousand	103 thousand
5.Industrial investment in R&D funding	¥1845.68 million	¥17013.47 million
6.The proportion of industrial R&D expenditure to total industrial output value	1.2%	1.0%
7.Industrial fixed assets investment	¥7494.63 million	¥70671 million
8.The number of patents licensed	1345	4694
9.The number of scientific papers published	26	112
10.The proportion of the output value of new products to total industrial output value	2.4%	12.4%
11.The number of industrial R&D institutions	48	155
12.The number of students in colleges and universities	484.1 thousand	1216.4 thousand
13. The education spending	¥25122.10 million	¥79798 million
14. The proportion of education expenses to total fiscal expenditure.	19.9%	21.1%

Table 3. Index of scientific and technological development

Project	Guangxi province	Guangdong province
Index of scientific and technological development	34	98
Index of the industrial scale	2	19
Index of scientific and technological investment	16	36
Index of industrial output of science and technology	6	23
Index of scientific and technological potential	10	20