

## Analysis on Development Differences of Informationization among the Four Regions of China

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**Abstract:** The paper has designed an evaluation index system for informationization which consists of 5 first-level indexes, 14 second-level indexes and 62 third-level indexes, based on the status quo of the evaluation index system research both at home and abroad. Through the adoption of factor analysis and Delphi investigation, the paper also evaluated the development of informationization in the east, west, central and northeast parts of China, so as to uncover their differences on the development of informationization.

**Key Words:** Comprehensive evaluation; Informationization; Factor analysis; Regional Differences

### 1 Introduction

Since the latter half of the the 20th century, with the scientific and technological advances and rapid socio-economic development, information becomes a trend of world's economic and social development, playing a huge role in the promotion of economic development and social change<sup>[1]</sup>. As the increasing advance of China's information construction and the constant improvement of the level of information, it is of great significance to research and measure the related issues of information technology. Through the establishment of the evaluation index system and the statistics and analysis of information indicators, it can quantitatively help measure the China's four regions' information technology development level, reveal differences in development and explore the inherent problems, which has great strategical and practical significance to enhancing each region's information construction level and promoting economic and social development<sup>[2]</sup>.

### 2 Establishment of Informationization Evaluation Index System

There have been numerous theoretical researches on the design of informationization evaluation index system both at home and abroad, among which the comparatively more influential are the following methods: the RITE model from Japan Telecommunication and Economy Institute, the Information Technology and Telecommunication (ITT) Classification from Canada, the Information Society Index (ISI) from International Digital Group and the National Information Quota (NIQ) put forward by China after 8 years' research, etc<sup>[3]</sup>.

In order to better and more systematically evaluate the differences on informationization development among the four parts of China, the paper adopts the NIQ as its research basis and refers to abundant relative researches both at home and abroad, so as to integrate the existing useful indexes and thus introduce new ones in terms of their scientific nature, objectivity, practicability, systematicness, representativeness and development nature, which finally puts forward an evaluation index system consisting of 5 first-level indexes, 14 second-level indexes and 62 third-level indexes (as is shown in the following Table 1)<sup>[4]</sup>.

**Table 1 Informationization Evaluation Index System**

First-level Indexes	Second-level Indexes	Third-level Indexes
Information Resources	Post and Telecommunication Resources	a1-business volume per capita in post and telecommunication, a2-annual number of letters per capita, a3-time length of long distance calls per capita, a4-time length of IP calls per capita
	Communication Resources	a5-volume of mobile telephone switchboard, a6-total volume of the switchboard in each headquarter of the post office, a7-volume of long distance calls switchboard, a8-length of optical cable lines in every hundred square kilometers, a9-internet broadband access ports among each 10,000 people
	Traditional Information Resources	a10—annual public radio broadcast time, a11—annual public TV programs broadcast time, a12—number of TV programs among each million people, a13—radio broadcast population coverage rate, a14—TV

		broadcast population coverage rate, a15—total number of printed books, journals and newspapers per capita, a16—number of newspapers and journals among every hundred people, a17—number of public libraries among each million people
Information Technology Application	Information Technology Application Scale	b1—year-end users of mobile telephones, b2—year-end users of fixed telephones, b3—number of cable radio and TV users, b4—number of digital TV users
	Penetration Rate of Information Technology Application	b5—internet penetration rate, b6—colorful TV penetration rate of urban residents, b7—home computer penetration rate of urban residents, b8—household fixed telephone penetration rate of urban residents, b9—mobile telephone penetration rate of urban residents, b10—fixed telephone penetration rate of rural residents, b11—mobile telephone penetration rate of rural residents, b12—colorful TV penetration rate of rural residents, b13—home computer penetration rate of rural residents, b14—cable TV penetration rate, b15—number of express delivery among every hundred people
Economic Development of Information Industry	Development of Manufacturing in Electronic Information Industry	c1—industrial added value of manufacturing in electronic information industry, c2—total industrial output value of manufacturing in electronic information industry, c3—manufacturing product sales revenues in electronic information industry, c4—total profit of manufacturing in electronic information industry
	Development of Software Industry	c5—software business income of software industry, c6—total profit of software industry, c7—added value of software industry
	Development of Telecommunication Industry	c8—gross income of telecommunication business
	Investment Development of Information Industry	c9—the proportion of electronic and communication equipment manufacturing investment to the finance expenditure, c10—investment on new urban fixed assets in information transmission, computer service and software business, c11—the proportion of investment on social fixed assets in information transmission, computer service and software business to the finance expenditure
Sci-tech Development of Information Industry	Sci-tech Funds of Information Industry	d1—the amount of funds raised by electronic and communication equipment manufacturing sci-tech activities, d2—new product development expenditure of electronic and communication equipment manufacturing, d3—the amount of enterprise capital in the funds raised by electronic and communication equipment manufacturing sci-tech activities, d4—internal expenditure of electronic and communication equipment manufacturing sci-tech activities, d5—software industry development funds, d6—the proportion of education expenditure to the budget expenditure
	Sci-tech Staffs of Information Industry	d7—number of software R&D staffs, d8—number of staffs in electronic and communication equipment manufacturing sci-tech activities, d9—the proportion of scientists to engineers in staffs of electronic and communication equipment manufacturing sci-tech activities
	Sci-tech Achievements of Information Industry	d10—number of application for patents in electronic and communication equipment manufacturing, d11—new product output value of electronic and communication equipment manufacturing
Development of the Main Body of Information Industry	Information Industry Employees	e1—number of employees in telecommunication and other information transmission service industry, e2—year-end number of employees in software industry, e3—average number of employees in manufacturing of electronic information industry, e4—number of staff workers in information transmission, computer service and software business, e5—number of employees in information transmission, computer service and software business of urban units
	Main Parts of Information Technology Application	e6—number of internet users among every 10,000 people, e7—number of students in higher institutions among every 100,000 people, e8—number of graduates in higher institutions among every 100,000 people

Note: The paper deems that information industry consists of electronic information industry and communication industry, among which electronic information industry can be divided into electronic

information manufacturing and software business. Compared with electronic information manufacturing, electronic and communication manufacturing covers one more industry, that is, computer manufacturing. Therefore, the latter industry can better replace the former one. Moreover, information transmission, computer service and software business also include other relative information transmission service, computer service and software business. It mainly focuses on information service industry, from which we can find out the development of information industry<sup>[5]</sup>.

### 3 Informationization Evaluation Model

#### (1) The use of Factor Analysis

Based on the index system and the factor analysis on “information resources, information technology application, economic development of information industry, sci-tech development of information industry, development of the main body of information industry”, the paper has achieved a comprehensive evaluation value from the above-mentioned five aspects<sup>[6]</sup>. The results of KMO and Bartlett show that the KMO values of the above five aspects are all between 0.5~1.0. Furthermore, the Bartlett results have also passed the test. Its progressive value of  $\chi^2$  is also relatively bigger than others, while, the corresponding significance probability is lower than 0.001. Therefore, all the data are adaptable for factor analysis<sup>[7]</sup>.

#### (2) The use of Delphi Investigation

The weight of those 5 first-level indexes has been proved by Delphi investigation method<sup>[8]</sup>. Since the development of information industry economy and the development of science and technology can reflect the situation of economic benefits and research power, so they can directly indicate the situation of informationization and their weight is also relatively higher than others, which is 25%. What's more, the development of information technology application also reflects its application situation, so it is very important for the development of informationization and its weight ranks No. 2, which is 20%. Finally, the main body of information industry and the situation of information resources indicate the basic power for informationization development from the aspects of labor and material resources. Therefore, they play a relatively less important role and their weight is 15%.

### 3 Comprehensive Evaluation on Informationization of the Four Regions of China

#### 3.1 The overall level on Informationization of the Four Regions of China

As we can see from Table 2 and Figure 1, among all the four regions, only the value of informationization in eastern China is bigger than 0, which means it is higher than the national average level and possesses obvious advantages. Therefore, it can be considered as the absolutely advantageous force in the development of national informationization. However, the values of the other three regions show little differences between each other. Northeastern China, comparatively more developed in informationization, only exceeds central China and western China respectively by 0.05 and 0.13, which results a small difference.

**Table 2 Overall Development of Informationization and Situation of Each Single Force of the Four Regions of China**

Part	Overall Development	Single Force				
		Resources	Technology Application	Industrial Economy	Industrial Science and Technology	Main Body of Information
Eastern China	0.5423	0.5506	0.6074	0.5940	0.4640	0.4916
Northeaster China	-0.2191	-0.1397	-0.2434	-0.2553	-0.2988	-0.0727
Central China	-0.2693	-0.2057	-0.3443	-0.2627	-0.2849	-0.2181
Western China	-0.3471	-0.3211	-0.3349	-0.3800	-0.3164	-0.3855

Data sources: 2009 Yearbook of China Information Industry, China Information Almanac, China Statistics Yearbook on High Technology Industry and China Statistical Yearbook.

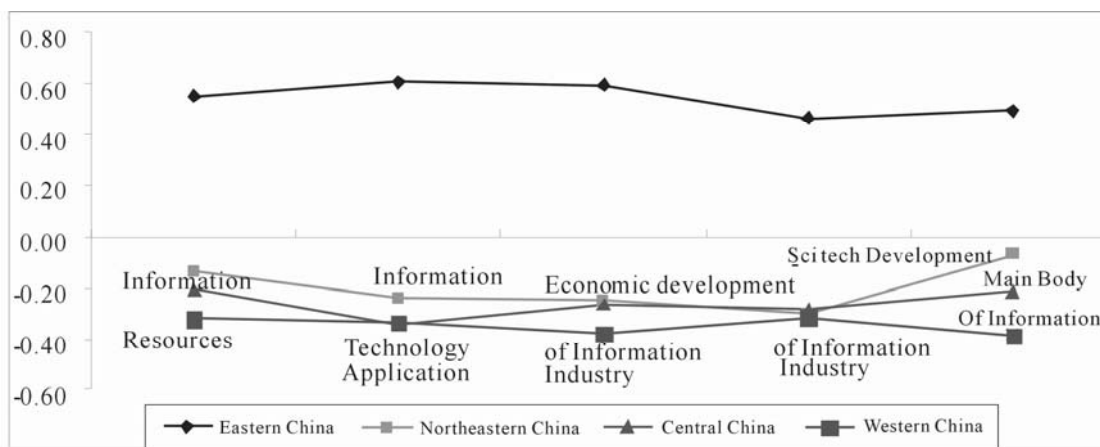


Figure 1 Line Graph on Single Force of the Four Regions of China

From the aspect of each single force, we can find out through Figure 1 that eastern China is far more advantageous than the national average level in terms of the five aspects. Besides, the value between each aspect also shows little difference, which indicates that eastern China has realized a balanced, rapid and integrated development concerning each factor of informationization. Moreover, the values of the other three regions are also lower than the average level. They also convey little difference between each other. However, concerning the overall situation of informationization, we can easily find out that northeastern China develops better than central China and central China develops better than western China. What's more, the value of northeastern China is close to the national average level in terms of information resources and the main body of information. It also develops relatively better.

### 3.2 The level on Informationization of the eastern part

As we can see, the eastern part has manifested obvious advantages. From the following Table 3, we can find out that eastern China has 8 provinces which are among the top 10 all over China in terms of the development of informationization with the proportion of 80%. What's more, among all the five single forces, eastern China has occupied all the top 8 in terms of information resources, information technology application and the sci-tech development of information industry. Meanwhile, eastern China has also occupied the top 6 in terms of the economic development of information industry and the main body of information. Therefore, judging from all the power of the four regions, eastern China ranks No. 1.

Table 3 Overall Development of Informationization and Situation of Each Single Force of Eastern China

Provinces	Overall Ranking	Single Force				
		Information Resources	Information Technology	Industrial Economy	Industrial Science and Technology	Main Body of Information
Beijing	2	3	3	3	3	2
Tianjin	8	6	7	10	7	17
Hebei	14	12	18	13	15	13
Shandong	6	8	8	5	5	6
Fujian	7	7	5	9	8	9
Shanghai	4	1	1	4	4	5
Jiangsu	3	5	6	2	2	3
Zhejiang	5	4	4	6	6	4
Guangdong	1	2	2	1	1	1
Hainan	27	28	22	29	-	28

Data sources: 2009 Yearbook of China Information Industry, China Information Almanac, China Statistics Yearbook on High Technology Industry and China Statistical Yearbook.

### 3.3 The level on Informationization of the western part

However, the weakest part is western China. From Table 4, we can see that, among all the 12 provinces in western China, only Sichuan ranks No. 9. What's more, Shaanxi ranks No. 11, Guangxi ranks No. 15, Chongqing ranks No. 19 and all the rest of the western provinces rank after No. 20.

Concerning each single force, except information technology application, western China has only 5 provinces ranking top 15. While, for the other four single forces, western China has only 2 provinces ranking top 15 in terms of each single force. That's to say, western China ranks the last except its information technology application, which exceeds central China slightly by 0.0093. In general, the value of informationization of western China is -0.3417, considered as the weakest of the four regions.

**Table 4 Overall Development of Informationization and Situation of Each Single Force of Western China**

Provinces	Overall Ranking	Single Force				
		Information Resources	Information Technology	Industrial Economy	Industrial Science and Technology	Main Body of Information
Inner Mongolia	21	18	21	21	-	18
Guangxi	15	22	9	20	17	22
Chongqing	19	25	12	22	19	21
Sichuan	9	15	15	7	9	8
Guizhou	28	31	25	26	24	26
Yunnan	22	26	13	25	25	23
Tibet	30	27	-	-	-	-
Shaanxi	11	16	10	15	12	15
Gansu	29	29	27	27	23	27
Qinghai	31	30	29	-	-	-
Ningxia	26	24	19	28	-	29
Xinjiang	25	10	30	24	26	25

Data sources: 2009 Yearbook of China Information Industry, China Information Almanac, China Statistics Yearbook on High Technology Industry and China Statistical Yearbook.

### 3.4 The level on Informationization of the central part

The level of central China is relatively lower. As we can see from Table 5, concerning its development of informationization, Hubei province ranks No. 12, Henan province ranks No. 13, Jiangxi province ranks No. 17 and Hunan province ranks No. 18; while, the rest of them all rank after No. 20. Judging from Table 2, we can find out that central China has four single forces ranking No. 3 and one ranking the last. The overall value of central China is -0.2693. It only exceeds western China. However, the values of its single force are all below 0; therefore, its power is obviously lower than other regions.

**Table 5 Overall Development of Informationization and Situation of Each Single Force of Central China**

Provinces	Overall Ranking	Single Force				
		Information Resources	Information Technology	Industrial Economy	Industrial Science and Technology	Main Body of Information
Shanxi	24	14	28	18	18	12
Anhui	23	21	26	16	14	20
Jiangxi	17	23	16	14	20	24
Henan	13	11	17	11	13	16
Hubei	12	13	14	12	10	14
Hunan	18	19	24	17	16	10

Data sources: 2009 Yearbook of China Information Industry, China Information Almanac, China Statistics Yearbook on High Technology Industry and China Statistical Yearbook.

## 4. Conclusions

Currently, the development of informationization in China manifests a trend that “eastern China has obvious advantages; western China is the weakest; and central China develops relatively lower”. What's more, eastern China has realized a balanced and rapid development in terms of each single force. Northeastern China develops better in terms of information resources and the main body of information. However, central China only presents a slight advantage in terms of sci-tech development of information industry.

Therefore, the development of informationization in China has followed the economic principle of “developing some areas with priority”, which are in accordance with the basic features of information industry that develops as a high technology industry<sup>[9]</sup>. Therefore, what should be done next is to promote the development of informationization in the prioritized areas, especially to improve their

sci-tech level, so as to change the situation of being controlled by other countries concerning the core technology in information industry<sup>[10]</sup>. Meanwhile, eastern China should also expand its power to other regions of China, so as to promote the application and popularization of information technology in other provinces and cities and thus realize the driving of developing other industries by informationization.

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