

CES/SEM.52/WP.4  
28 November 2003

ENGLISH ONLY

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**Joint UNECE/UNCTAD/UNESCO/ITU/OECD/Eurostat Statistical Workshop:  
Monitoring the Information Society: Data, Measurement and Methods  
(Geneva, 8-9 December 2003)**

**Event related to the World Summit on the Information Society**

**THE EVALUATION AND COMPARISON OF CHINA'S INFORMATIZATION  
FROM 1999 TO 2001\***

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\* Paper posted on the Web as submitted by the country.



# **The Evaluation And Comparison Of China's Informatization From 1999 To 2001**

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2003.11.20



## Part One: The Effects and Process of the Evaluation of Informatization

- Informatization is very important to the social economy and is obtaining more and more significance in globalization and social transformation. Thus the evaluation of informatization and its development has gained more and more attention among countries. International organizations, such as United Nations and OECD, are also studying how to analyze and compare the informatization levels among regions and countries with proper indicator systems and methods, to forecast the future development of informatization and provide exact supports to national economy developing strategies and concerning policies.



## Part One: The Effects and Process of the Evaluation of Informatization

China's The Tenth-Five Year Plan shows that, modernization in China must adopt the way of Improving industrialization with informatization and promoting informatization with developed industrialization. To develop informatization, the basis is to make object evaluation and analysis to the informatization level. So, to perfect the indicator system of informatization, collect concerning data, study to improve the analysis method, make objective and scientific evaluation, compare and analyze the informatization levels among regions in China, become very important to China's government to decide practical informatization development strategies and policies.



## Part One: The Effects and Process of the Evaluation of Informatization

International Statistical Information Center ( ISIC) in National Bureau of Statistics(NBS) has take up the study of evaluating and comparing informatization levels among regions and countries from 1996 and has gained plenty of experience in this research area. Under the entrustment of the former State Council Informatization Office of China (SCIO), ISIC made a research of evaluating and comparing informatization levels among 31 regions in China from 1995-1998. The research result has obtained many experts' approvals in this area and much attention of the state and provincial directors. At present, entrusted by the current State Council Informatization Office of China, we improved the setup and evaluation methods of the informatization indicator system in the evaluation and analysis study of China's informatization from 1999-2001 according to the discovered problems of the early research and feedbacks from provinces, and accomplish essential breakthrough.



## Part Two: Indicator System of Evaluating China's Informatization Level

Sub-index	Code	Indicator	Implication	Sources
I. Information resources	1□	Occupied time of Radio and television broadcasting per 1,000 people	Reflects the extent of traditional audio and video resources	Broadcasting and Television Yearbook of China
	2	Printing sheets of books, newspaper and periodicals per 10,000 people	Reflects the extent of traditional print media resources	Statistical Yearbook of China
	3	network database space per 10□000 people	reflects the extent of network information resources	reports from CNNIC
	4	WWW sites per 10,000 people	reflects the actual utilization of internet resources	reports from CNNIC
	5□	Telephone calls per person	reflects the actual information transmission capability	Post And Telecommunication Yearbook Of China



## Indicator System of Evaluating China's Informatization Level(Con.)

Sub-index	Code	Indicator	Implication	Sources
II. Information infrastructure	6	Length of long distance fiber per 100 sq. Km	reflects the scale of telecommunication infrastructure	Post And Telecommunication Yearbook Of China
	7	Microwave connections per 100 sq. Km	reflects the scale of telecommunication infrastructure	Post And Telecommunication Yearbook Of China
	8	Number of terrestrial satellite communication stations per 100 sq. Km	reflects the scale of terrestrial satellite communication	Broadcasting and Television Yearbook of China
	9□	Telephone main lines (including mobile phone subscribers) per 100 people	Reflects the scale of fixed telecommunication network	Post And Telecommunication Yearbook Of China
	10	On-line host computers per 10,000 people	reflects the development of internet	reports from CNNIC



## Indicator System of Evaluating China's Informatization Level(Con.)

Sub-index	Code	Indicator	Implication	Sources
III. Information human resources	11	Number of people with a college-or-above education background per 10,000 people	reflects the popularity of advanced education	Statistical Yearbook of China
	12	Staff engaged in science and technology per 10,000 people	reflects the popularity of science and technology	Science Statistical Yearbook of China
	13	People engaged in information industry as percentage of total labor force	reflects the employment structure and the scale of labor force in information industry	Statistical Yearbook of China





## Indicator System of Evaluating China's Informatization Level(Con.)

Sub-index	Code	Indicator	Implication	Sources
IV. Dissemination and application of information technology	14□	Cable television subscribers per 1,000 people	reflects the coverage of cable networks	Broadcasting and Television Yearbook of China
	15□	Internet users per 1,000,000 people	reflects the utilization of internet	reports from CNNIC
	16□	Computers per 1,000 people	reflects the permeation of computers	Statistical Yearbook of China
	17□	Television sets per 100 households	reflects the permeation of traditional information sets	Statistical Yearbook of China
	18	Mobil phones per 100 households	reflects the scale of mobil telecommunications	Post And Telecommunicati on Yearbook Of China
	19	trade value of e-commerce per capita	Trade value of e-commerce indices the total value dealed by means of electronic or computer networks. This indicator reflects the application of information technologies.	statistical documents from cities
	20	Credit cards per 1,000 people	here credit cards refer to the cards issued by financial agencies	Financial statistics



## Indicator System of Evaluating China's Informatization Level(Con.)

Sub-index	Code	Indicator	Implication	Sources
V. Development of information industry	21□	R&D expenditure in information industry as percentage of GDP	reflects the government investment scale in R&D of information industry	R&D Statistical Bulletin
	22□	Investment of information infrastructure as percentage of total investment of infrastructure	reflects the government investment scale in the development of information industry	Statistical Yearbook of China
	23	Exports of information industry as percentage of total exports	reflects the national competitiveness in information industry	data from the ministry of commerce of China, ministry of information industry of China
	24□	Value added of information industry as percentage of GDP	reflects the importance of information industry to the national and regional economy	Statistical Yearbook of China
	25□	information consumption coefficient	reflects people's purchasing power of information goods and services	Statistical Yearbook of China



- After evaluating the five sub-indices and computation of weighted average, we get the informatization index. Informatization index covers five aspects of informatization development. It is a scientific and integrated analysis to the informatization development. After we compare the sub-indices and informatization index of regions, we can know the regional superiorities and inferiorities in informatization development. Thus the research can provide a scientific and quantitative basis for further analysis of divides among regions in informatization development, forecast of informatization trends and related policy decisions.



## Part Three: Method Improvement of Informatization Evaluation

- There are two main improvements: 1) improvement of standardizing method of the original data; 2) direct computation with the original data instead of computation by the growth rate and base year's value.
- The most important principal and aim in the computation of informatization index is to make the final indices and sub-indices clearly show the rankings of provinces during different years, and to observe directly the increase or decrease of the informatization level from the final results.



## Part Three: Method Improvement of Informatization Evaluation

- To solve the problems, we divide the indicators into two types and employ different standardizing methods .
- Type One: As to percentage data and those with good quality, we employ the formula below to convert those original data into dimensionless indicators.

$$\frac{X_i - X_{\min}}{X_{\max} - X_{\min}}$$

$X_i$ : the original data of a certain region in a certain year

$X_{\min}$ : the minimum of the original data among years and regions

$X_{\max}$ : the maximum of the original data among years and regions



## Part Three: Method Improvement of Informatization Evaluation

- Type two: as to those data with large difference between the maximum and minimum( especially 100 times) or those with a especially bias data distribution, we employ the formula below to standardize those data.

$$\frac{\log X_i - \log X_{\min}}{\log X_{\max} - \log X_{\min}}$$



## Part Three: Method Improvement of Informatization Evaluation

- Before the standardization, it is very important to decide and select the threshold value for each indicator(or the maximum and the minimum). The threshold value is to be decided by the maximum and the minimum of each indicator in all the regions and selected years. The selection principles are:1)to make the index value during a certain period lies between 0 and 100( when 100 indicates the best and 0 indicates the worst); 2) the computation result can reflect correctly the ranking and its increase and decrease in the ranking of all the regions.



## Part Three: Method Improvement of Informatization Evaluation

It is important to know that, the threshold value is decided artificially, depended on the maximum and minimum of certain indicators in certain years. With the development of informatization the threshold value need to be adjusted, or to compute the informatization index again with the new threshold value in a new period. If we need compare the evaluation results under different threshold values during different periods, we should convert the informatization indices during different periods with a conversion value to get comparable indices. And the converted comparable index values may exceed 100.





## Part Four: Evaluation Of Informatization Index

1. The computation formula
2. The evaluation method
3. The computation of informatization growth rate
4. The informatization evaluation results of China



# 1. The Computation Formula

- We compute the informatization index by a weighted average

$$II = \sum_{i=1}^n W_i P_i$$

$P_i$  is the standardized value of the indicator  $i$ ;

$W_i$  is the weight of  $P_i$ ;

$II$  (Informatization Index) is the informatization index.

- A more accurate formula is

$$II = \sum_{i=1}^n W_i \left( \sum_{j=1}^m W_{ij} P_{ij} \right)$$

$II$  is the national and regional informatization index;  $n$  is the number of sub-indices;  $m$  is the numbers of indicators in sub-index  $i$ ;  $P_{ij}$  is the  $j$ th standardized indicator in sub-index  $i$ ;  $W_{ij}$  is the weight of  $P_{ij}$ .



## 2. The evaluation method

- The steps of the synthetic grading method is:
  - 1) Make correlation analysis to selected indicators and give up those with high correlations to avoid that similar indicators appear in the computation, thus improve the indicators' representativeness and the results' effectiveness.
  - 2) Standardize the original data to make different indicators with different dimensions convert to values capable of direct computation.
  - 3) Decide the indicator weights by Delphi technique, or evaluation and grading by experts. First we distribute designed surveys to the experts in this area, then we integrate all the experts' opinions and get final averages as the weights. In the evaluation, the weights of the five sub-indices and the information.



### 3. The Computation Of Informatization Growth Rate

To observe the movements of informatization index and sub-indices and to analyze the causes of the movements, it is necessary to compute the informatization growth rate. After select a base year, we compute the weighted average of the actual indicator (before standardization) growth rates to get the growth rates of the sub-indices and compute the informatization index growth rate with the growth rates of the sub-indices.



## 4. The informatization evaluation results of China

Informatization index from 1999 to 2001

Province	2001		2000		1999	
	Rank	Score	Rank	Score	Rank	Score
<b>Nation</b>		<b>54.73</b>		<b>50.8</b>		<b>46.88</b>
Beijing	1	78.52	1	74.93	1	72.85
Shanghai	2	72.08	2	67.93	2	66.15
Tianjing	3	66.29	3	63.06	3	60.27
Guangdong	4	62.21	4	58.52	4	54.87
Zhejiang	5	61.68	6	56.94	7	51.2
Fujian	6	61.39	5	57.02	6	51.44
Liaoning	7	60.78	7	56.55	5	53.97
Shanxi	8	59.83	8	55.21	8	50.38
Jiangsu	9	58.11	9	53.85	10	49.68
Shanxi	10	57.46	10	52.91	11	49.26



## 4. The informatization evaluation results of China

Five sub-indices of informatization index in 2001

Province	Information resources	Information infrastructure	Information human capital	Application of information technology	supports to informatization and resulting effects	information consumption coefficient
<b>Nation</b>	<b>50.57</b>	<b>60.04</b>	<b>45.03</b>	<b>64.15</b>	<b>52.99</b>	<b>58.10</b>
Beijing	64.93	80.30	86.37	80.85	78.53	75.58
Shanghai	65.13	83.31	72.06	84.02	51.51	69.62
Tianjing	55.52	66.31	72.41	74.60	60.47	58.51
Guangdong	61.74	66.61	49.20	72.67	59.64	68.76
Zhejiang	59.15	71.36	48.13	74.68	53.70	64.40
Fujian	59.97	68.60	48.13	68.57	63.08	62.08
Liaoning	57.49	64.60	61.93	65.71	53.25	55.18
Shaanxi	47.00	64.84	55.44	60.87	72.01	64.57
Jiangsu	51.85	62.86	53.84	66.71	52.99	61.52
Shanxi	46.86	65.72	58.13	60.90	54.55	57.01



## Part Five: Analysis Of China's Informatization Level And Development

### 1. Analysis Of China's Informatization Index

- 1) The national informatization index of China in 2001 is 54.73
- 2) The average annual growth rate of the national informatization index is 30.5% from 1999 to 2001
- 3) The divide between the undeveloped west regions and the developed east regions is narrowing due to the higher growth rate of west regions.

### 2. Comparison Of Five Sub-Indices Of China's Informatization

- 1) Comparison of five sub-indices of the nation in 2001
- 2) Comparison of the growth rates of the five sub-indices from 1999 to 2001
- 3) Comparison of the five sub-indices of all the provinces in China.

### 3. Comparison of five type regions in China.



# 1. Analysis Of China's Informatization Index

- 1) The national informatization index of China in 2001 is 54.73.

The national informatization index of China in 2001 is 54.73. Beijing(78.52) ranks the first in 31 provinces. Shanghai(72.08) ranks the second. Tianjing(66.29) ranks the third. Guangdong(62.21) ranks the fourth, Zhejiang(61.68) ranks the fifth. The last three provinces are Tibet(42.24), Guizhou(42.27) and Anhui(48.77).





# 1. Analysis Of China's Informatization Index

- 2) The average annual growth rate of the national informatization index is 30.5% from 1999 to 2001

In 2001 the national informatization index increased by 70.3% compared to that in 1999, increasing by 30.5% annually. The growth rates of the national informatization index in 2000 and 2001 are 29% and 32%. The fact that the growth rates hold a relative high level and tend to accelerate shows that informatization in China keeps a quick steady development in recent years.



# 1. Analysis Of China's Informatization Index

- 3) The divide between the undeveloped west regions and the developed east regions is narrowing due to the higher growth rate of west regions

The five provinces with highest growth rates of the informatization index in 2001 are Tibet(116%), Hainan((49%), Shaanxi ( 40%), Qinghai ( 40%) and Hubei(39%). The five provinces with lowest growth rates of the informatization index are Tianjing(24%), Anhui(24%), Xinjiang(25%), Beijing(26%) and Inner Mongolia(27%).



- From the three years' development from 1999 to 2001, we can see that although some regions drop behind in informatization currently due to historical and economic causes, their growth in informatization recently appear high. The main reason of that is the execution of Western China Development strategy by China's government. We can see that some undeveloped regions have higher growth rates due to their original low base and some developed regions have low growth rates due to their original high base, thus the divide between the west and the east is narrowing.



## 2. Comparison Of Five Sub-indices Of China's Informatization

### 1) Comparison of five sub-indices of China's informatization

Three points may draw our attention in the comparison of the five sub-indices of China's informatization.

- First, the highest sub-index is application of information technology(64.15), which means the application of information technology is better than other aspects of informatization.
- Second, the sub-indices of information infrastructure(60.04) and supports to informatization and resulting effects(52.99) are relatively high compared with other sub-indices, which means that the direction of informatization development in China is correct, the informatization has contribute a lot to the society but still has much developing space.
- Finally, the sub-indices of information resources(50.57) and information human capital(45.03) are low. This is behind China's general informatization development, has restricted China's informatization development and requires immediate support and development.



## 2. Comparison Of Five Sub-indices Of China's Informatization

- 2) Comparison of the five sub-indices of all the provinces in China
- in 2001, the first places in the five sub-indices rankings are Beijing and Shanghai: Shanghai ranks first in information resources, information infrastructure and application of information technology. Beijing ranks first in information human capital and supports to informatization and resulting effects.



In the comparison of five sub-indices, large divides lie both between the first three and the last three in the rankings of each sub-index and between the first and the second of each sub-index. Especially in the information human capital and supports to informatization and resulting effects, the divides between the first and the second are 14.31 and 27.02, which reflects large imbalance in informatization development of China.



### 3. Comparison Of Five Type Regions In China

The comparison of the informatization index of China in 2001 shows large divides and imbalance lie among provinces in informatization. According to the informatization evaluation results, 31 provinces in China can be divided into four types:

- Most developed areas
- Developed areas
- Developing areas
- Less developing areas



## Part Six: The Suggestion to China's Informatization Development

1. Foster the human resources on information field. Such as computer and internet education in primary and middle schools, training for teachers, civilian servants, etc.
2. Deepen develop and use various of information resources efficiency.
3. Strengthen the construction on information infrastructure.
4. Promote the application of information technology on traditional industry.
5. Consistent with the international development.
6. Set up state information data base and supervisory system.





# Thank You



