



Study on the Information Measurement System under the Background of Embedded Infosphere

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1 PART

Background & Motivation

Research Background

● **Embedded Infosphere**

- Embedded Infosphere (EI): Internet of Things, Big Data, the Cloud, and Artificial Intelligence, working as an integrated system
- The EI has introduced a new stage in the discourse on information policy, but is not currently being sufficiently addressed
- In EI, networking and intelligence are embedded into everyday things which constantly monitor and measure our lives

Taylor, 2016

● **Level of informatization has already become an important indicator**

- **Evaluation index system for measuring the level of informatization should be updated**

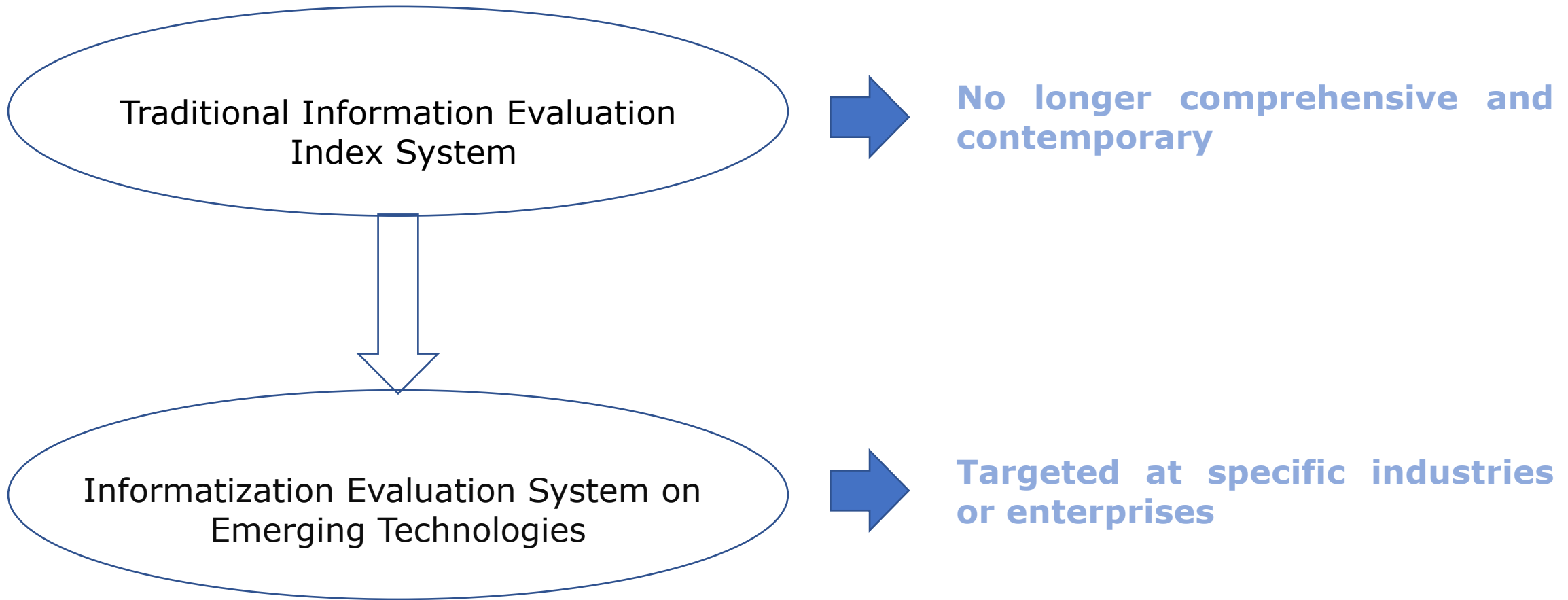
Research Motivation

- ◆ **Understand** the research status of information evaluation system
- ◆ **Establish** a reasonable evaluation index system based on the **Embedded Infosphere (EI)**
- ◆ **Analyze** the status of national informatization
- ◆ **Put forward** policy suggestions to develop informatization

2 PART

Literature Review

Literature Review



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PART

**Construction of Informatization
Level Index (ILI)**

Selection of Indicators

◆ **Information Resources**

- Information infrastructure and technology applications
- Hardware foundation for implementing informatization
- Prerequisite for information transmission

◆ **Emerging Technologies**

- Industry development and technology applications about Big Data, IoT, AI, the Cloud, Mobility
- Critical for the proper and correct measurement of the current situation of China's informatization development

Selection of Indicators

◆ **Industrial Development**

- The information industry: the main driving forces for economic growth
- The input and output obtained by the information industry
- The related professional talents: indirectly reflect the contribution of the information industry to China's social development and economic growth

◆ **Social Environment**

- Examine the innovation, science, education and residents' consumption
- Indirectly affect the innovation ability of the information

Informatization Level Index

First-Level indexes	Weight	Second-Level indexes	Third-Level indexes	Weight
Information Resources	0.2147	Infrastructure	Fixed telephone penetration rate	0.0245
			Mobile phone penetration rate	0.0021
			Internet penetration rate	0.0130
			Cable length per square kilometer	0.0479
		Internet Resources	Number of domain names per 100 people	0.0841
			Number of sites per thousand	0.0430
Emerging Technologies	0.6301	Technological Development	Big data market size	0.0854
			Artificial intelligence market scale	0.0822
			Internet of Things market size	0.0602
			Cloud computing market size	0.0721
		Technical Use	Number of patent applications related to artificial intelligence per 1000 people	0.0526
			Per capita mobile internet access traffic	0.1771
			Mobile Internet users	0.0264
			Enterprise cloud service industry financing round	0.0742
Industrial Development	0.1107	Input and Output	Per capita information transmission, software and information services fixed asset investment	0.0210
			Information transmission, software and information services production value as a percentage of total output value	0.0509
		Talents	Proportion of employment in information transmission, software and information services to total employment.	0.0127
			Average salary of employed persons in information transmission, software and information services	0.0260
Social Environment	0.0445	Educational Investment	Per capita public finance education funding	0.0205
		Consumption Level	Per capita disposable income	0.0240

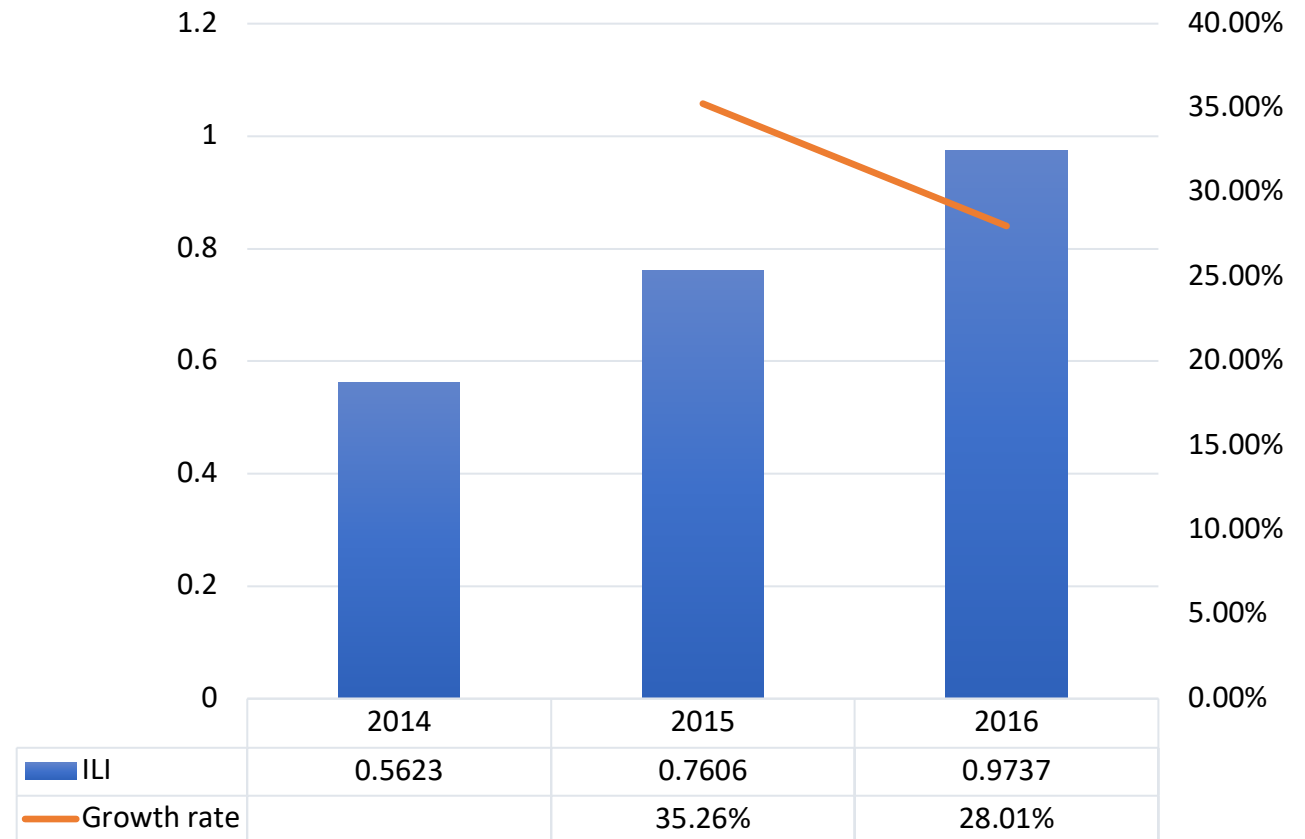
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Calculation & Analysis

China's ILI and Growth rate

From 2014 to 2016:

- The national informatization level index increased from 0.5623 to 0.9737
- The growth rate of China's informatization level index declined from 35.26% to 28.01%



Most Increased Indicators

- Ranking of the third-level indicators by the growth factor

Ranks up	Indicators	Growth multiple
1	Per capita mobile internet access traffic	3.4901
2	Number of domain names per 100 people	1.0265
3	Big data market size	1
4	Artificial intelligence market scale	0.9458
5	Cloud computing market size	0.7944
6	Internet of Things market size	0.625
7	Per capita information transmission, software and information services fixed asset investment	0.5225
8	Number of patent applications related to artificial intelligence per 1000 people	0.5119

Contribution rate

Third-Level indexes	14-15	15-16	14-16
Fixed telephone penetration rate	-0.3444%	-0.3289%	-0.7893%
Mobile phone penetration rate	0.0018%	0.0032%	0.0061%
Internet penetration rate	0.1042%	0.0931%	0.2302%
Cable length per square kilometer	1.1832%	1.1530%	2.7428%
Number of domain names per 100 people	3.6660%	2.8909%	7.5764%
Number of sites per thousand	1.3817%	0.6648%	2.2809%
Big data market size	2.8920%	3.4743%	7.5915%
Artificial intelligence market scale	2.6894%	3.2672%	7.1088%
Internet of Things market size	1.6460%	1.8253%	4.1150%
Cloud computing market size	2.2650%	2.5210%	5.6751%
Number of patent applications related to artificial intelligence per 1000 people	2.8422%	0.2383%	3.1646%
Per capita mobile internet access traffic	7.1533%	12.8089%	24.4791%
Mobile Internet users	0.3666%	0.3936%	0.8990%
Enterprise cloud service industry financing round	5.8641%	-2.8750%	1.9753%
Per capita information transmission, software and information services fixed asset investment	0.2673%	0.2353%	0.5855%
Information transmission, software and information services production value as a percentage of total output value	2.0012%	0.8152%	3.1039%
Proportion of employment in information transmission, software and information services to total employment.	0.1110%	0.0821%	0.2220%
Average salary of employed persons in information transmission, software and information services	0.4061%	0.3496%	0.8790%
Per capita public finance education funding	0.28%	0.21%	0.56%
Per capita disposable income	0.49%	0.19%	0.75%

Contribution rate

- Ranking of the third-level indicators by contribution rate
- The popularization and application of **the Internet, Big Data, AI, IoT, the Cloud, Mobility and other related technologies have the greatest impact on China's information development**

Ranks up	The most influential indicator	The least influential indicator
1	Per capita mobile internet access traffic	Fixed telephone penetration rate
2	Big data market size	Mobile phone penetration rate
3	Number of domain names per 100 people	Proportion of employment in information transmission, software and information services to total employment.
4	Artificial intelligence market scale	Internet penetration rate
5	Cloud computing market size	Per capita public finance education funding
6	Internet of Things market size	Per capita information transmission, software and information services fixed asset investment



Impact degree

- A total of 20 indicators are divided into large impact (rank 1-6), medium impact (rank 7-13) and less impact (rank 14-20)
- The number of third-level indicators included in the classification of first-level indicators is counted
- The development of **emerging technologies contributes most** to the ILI in China

	Information Resources	Emerging Technologies	Industrial Development	Social Environment
Great impact	1	5	0	0
Medium impact	2	3	2	0
Small impact	3	0	2	2

Forecast of China's Informatization Development

- The gray system model
- Predicted ILI of **2017** is about 1.235597, with a growth rate of 26.90%
- The informatization of China has maintained a stable development

a) Accumulated sequence $X^{(1)}$ once from the original data sequence $X^{(0)}$

	2014	2015	2016
$x^0(i)$	0.5623171	0.760614	0.973694
$x^1(i)$	0.562317	1.322931	2.296625

c) Model calculation results and actual values

	Model calculation values	Actual values	Residual	Relative error
	$\hat{x}^{(0)}(i)$	$x^{(0)}(i)$	$E(i)$	$e(i)$
i=2	0.756052	0.760614	0.004562	0.005998
i=3	0.966528	0.973694	0.007167	0.007360

a) According to the time response equation, calculate the fitted value $\hat{x}^{(1)}(i)$,

$$\hat{x}^{(1)}(K+1) = \left[x^1(1) - \frac{\hat{u}}{\hat{a}} \right] e^{-\hat{a}k} + \frac{\hat{u}}{\hat{a}} = 2.715819e^{0.2456k} - 2.153502$$

d) Let $K = 3$, get:

$$\hat{x}^{(1)}(4) = 2.715819e^{0.2456 \times 3} - 2.153502 = 3.520494$$

$$x^{(0)}(4) = 1.235597$$

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Conclusion & Suggestion

Conclusion

- Informatization level: rising, the growth rate: decreasing slightly.
- Mobility, Big Data, AI, the Cloud, and IoT have contributed the most to improving the informatization level index.
- Promotion of emerging technology and education is more beneficial for improving national informatization level.

Policy and Suggestion

(I) Adjust the focus of information infrastructure construction

- The basis for all information transmission, exchange and sharing
- To fully realize the overall benefits of informatization

(II) Strengthen support for emerging information technologies and industries

- People's attention to emerging information technology has been increasing
- Emerging technology-related industries: main driving forces for promoting social progress and economic growth

(III) Focus on talent training and increase investment in education

- The cultivation of informatization talents is the key
- Decides the development speed and quality of other elements of informatization construction
- Determines the future potential of the information industry

Thanks for listening

Q & A