



Research
iCity & Big Data—Article

The City Intelligence Quotient (City IQ) Evaluation System: Conception and Evaluation

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ABSTRACT

After a systematic review of 38 current intelligent city evaluation systems (ICESs) from around the world, this research analyzes the secondary and tertiary indicators of these 38 ICESs from the perspectives of scale structuring, approaches and indicator selection, and determines their common base. From this base, the fundamentals of the City Intelligence Quotient (City IQ) Evaluation System are developed and five dimensions are selected after a clustering analysis. The basic version, City IQ Evaluation System 1.0, involves 275 experts from 14 high-end research institutions, which include the Chinese Academy of Engineering, the National Academy of Science and Engineering (Germany), the Royal Swedish Academy of Engineering Sciences, the Planning Management Center of the Ministry of Housing and Urban-Rural Development of China, and the Development Research Center of the State Council of China. City IQ Evaluation System 2.0 is further developed, with improvements in its universality, openness, and dynamic adjustment capability. After employing deviation evaluation methods in the IQ assessment, City IQ Evaluation System 3.0 was conceived. The research team has conducted a repeated assessment of 41 intelligent cities around the world using City IQ Evaluation System 3.0. The results have proved that the City IQ Evaluation System, developed on the basis of intelligent life, features more rational indicators selected from data sources that can offer better universality, openness, and dynamics, and is more sensitive and precise.

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1. Classification of existing intelligent city evaluation systems (ICESs)

1.1. Features of existing ICESs

Because intelligent city evaluation systems (ICESs) are established with diverse purposes, by multiple subjects, and for diverse objects, there have been no unified standards for ICESs on a global scale [1]. Currently, 38 independent ICESs can be identified worldwide, having been established in East Asia, Europe, North America, and Oceania. The creation of these 38 systems involves 20 university research teams, 8 governmental departments, and

10 business enterprises and associations, and covers the time period from 1995 to 2015, see Table 1 [2–23]. Some systems, such as the TU Wien System [2] and the Intelligent Community Forum (ICF) System [3], are still under continuous development.

The tertiary indicators of these 38 systems are all quantifiable. Only 17 of the 38 consist of integrated primary, secondary, and tertiary indicator systems, and out of these 17 only the GONG Bingzheng System [24] and the China Wisdom Engineering Association System [25] have quantifiable secondary indicators. Therefore, for practical purposes, contradictions can occur between the assessment results derived from secondary indicators and the results derived from tertiary indicators within the same

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Table 1
The 38 intelligent city evaluation systems (ICESs) from around the world.

No.	ICES	Year	Sponsor	Research team	Research approach	Number of primary indicators	Content of primary indicators	Number of secondary indicators	Number of trinary indicators
1	Australian System	2004	State government	Australian government	AHP	8	Technical dimension, Internet use, access level, infrastructure dimension, use, cose, e-commerce, e-governance	0	29
2	Japanese System	2005	State government	Japanese government	AHP	5	ICT expense rate, ICT quality, ICT mobility, ICT popularization, ICT construction	0	10
3	Nanjing System	2010	Local government	Xianfeng Deng	AHP	4	Internet field, industrial field, service field, humanity and culture field	0	24
4	Hubei System	2011	Local government	Xianyi Li, Boya Cheng	AHP	4	Ubiquitous network, intelligent application, public support platform, value recognition	19	57
5	Ningbo System	2012	Local government	Dedao Gu, Wen Qiao	AHP	7	Intelligent class, intelligent infrastructure, intelligent governance, intelligent livelihood, intelligent economy, intelligent environment, intelligent planning and construction	21	48
6	Shanghai Pudong System	2012	Local government	Shanghai Pudong Smart City Research Institute	AHP	5	Infrastructure, public management and service, information service for economic development, humanity and science attainment, citizen awareness	18	37
7	National Pilot Intelligent City Indicator System	2012	Professional administrative department	Ministry of Housing and Urban-Rural Development (MoHURD)	AHP	4	Security system and infrastructure, intelligent construction and livability, coordination and service management, intelligent industry and economy	11	59
8	Ministry of Industry and Information Technology System	2013	Professional administrative department	Ministry of Industry and Information Technology (MIIT)	AHP	3	Intelligent preparation, intelligent management, intelligent service	9	45
9	Richard Florida System	2002	Academic team	Richard Florida	AHP	3	Residents' innovation potential, collective intelligence, environmental intelligence	3	3
10	TU Wien System	2007	Academic team	Rudolf Giffinger	AHP	6	Intelligent economy, intelligent population, intelligent governance, intelligent mobility, intelligent environment, intelligent living	31	74
11	Lazaroiu System	2007	Academic team	George Cristian Lazaroiu	AHP	4	Intelligent economy, intelligent governance, intelligent environment, intelligent energy and mobility	0	18
12	Donato Toppeta System	2010	Academic team	Donato Toppeta	AHP	6	Economy 2.0, human resource and social capital development, e-democracy/government 2.0/intelligent government, information mobility and intelligent transportation system, eco-system, life quality and sustainability	0	11
13	MAO Yanhua System	2012	Academic team	Yanhua Mao	AHP	7	Intelligent class, intelligent infrastructure, intelligent governance, intelligent livelihood, intelligent economy, intelligent environment, intelligent planning and construction	23	42
14	LU Yanping Information Industry Competitiveness System	2012	Academic team	Yanping Lu, Ping Hu	AHP	3	Comprehensive economy, technological innovation, environmental support	9	24
15	LI Jian System	2012	Academic team	Jian Li, Chunmei Zhang	AHP	3	Application performance, information infrastructure, practical application effect	3	–
16	Karima Kourtit System	2012	Academic team	Karima Kourtit	AHP	3	Prosperous commerce and social-cultural attraction, labor and municipal facility capacity, high-end e-service usage	0	11
17	Patrizia Lombardi System	2012	Academic team	Patrizia Lombardi	SDA	6	Universities, knowledge, industry, market, government, learning	0	6

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