INTERNATIONAL STANDARD

ISO/IEC 30146

First edition
2019-10

Information technology — Smart city ICT indicators

Technologies de l'information — Indicateurs des TIC dans les villes intelligentes

Reference number
ISO/IEC 30146:2019(E)

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Published in Switzerland

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Foreword

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Smart city is a concept that has been widely used by city administrators, planners and implementers for decades. Although the precise definition of smart city has not been agreed upon among different international standardization organizations, the significance of information and communication technology (ICT) as indispensable key enablers is universally recognized. During the global development of smart cities, the issue of effectively adopting ICT in smart city programs as key enablers has become a common focus among scientific research institutions, industries, city administrators and construction implementers. This document supports the United Nations Sustainable Development Goals[1][7][8].

It is an urgent and important task to develop standard evaluation methods and indicators focusing on the area of ICT within the smart city, with which the city stakeholders can understand the smart city performance from the perspective of ICT. The evaluation methods and indicators focus on the individual efficient functioning of different systems, infrastructures and facilities. In addition, they also provide the guidance on how cities function holistically and facilitate innovation and growth in an integrated and coherent way.

The purpose of establishing smart city ICT indicator systems and conducting smart city evaluations is to guide and promote a systematic construction of a smart city. The indicators can be used as a whole package to evaluate a smart city holistically. The package can also be tailored as individual parts when evaluating cities or certain aspects of cities. The indicators can be used to:

— evaluate the city ICT preparation state before starting the smart city construction;

— evaluate the effect of city ICT during and after the smart city construction;

— compare the smart city construction between cities in the area of city ICT in a certain area to promote smart city healthy competition and development.

This document establishes criteria to evaluate in making cities smarter. This document can be used to evaluate the level of smart city development. It is applicable to city, municipality or the local government. For city administration organizations, it can be used for self-evaluation and to develop corresponding ICT strategies to make cities smarter. For related evaluation agencies and scientific research institutions, it also provides guidance and reference in developing smart city ICT indicators.

The indicators in this document are consistent with the overall work of ISO/TC 268/WG 2 on smart city indicators.

Information technology — Smart city ICT indicators

1 Scope

This document defines a comprehensive set of evaluation indicators specially related to information and communication technologies (ICT) adoption and usage in smart cities. Firstly, it establishes an overall framework for all the indicators. Then, it specifies the name, description, classification and measurement method for each indicator.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purpose of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
performance indicators
<generic> category of quantized and pre-authorized benchmarks that reflect the realization of the goals

[SOURCE: ISO 15746-1:2015, 2.7]

3.2
performance indicators
<smart city> set of indicators used to measure the level of convenience, habitability, comfort, security and happiness felt by city users for related ICT infrastructures, applications and services in developing a smart city

3.3
capability indicators
<smart city> set of indicators used to measure the level of design, development, innovation and coverage area of ICT infrastructures, applications and services in developing a smart city

3.4
e-government
digital interaction between a government and citizens, government and businesses, and between government agencies

[SOURCE: ISO 19101-1:2014,4.1.10]

3.5
city model
appropriate set of data which models those physical and social aspects of the city that are relevant for its objectives

3.6
real-world feature
physical or social feature that exists in the city

EXAMPLE Buildings and voting districts.

3.7
feature catalogue
agreed set of feature types which represent those *real-world features* (3.6) in the *city model* (3.5)

4 Abbreviations

API application programming interface

APP application

CCTV closed circuit television

FTTH fiber to the home

ICT information and communication technologies

5 General architecture

The general architecture of smart city ICT indicators is shown in Figure 1. From the figure, the taxonomy of indicators in this document is defined.

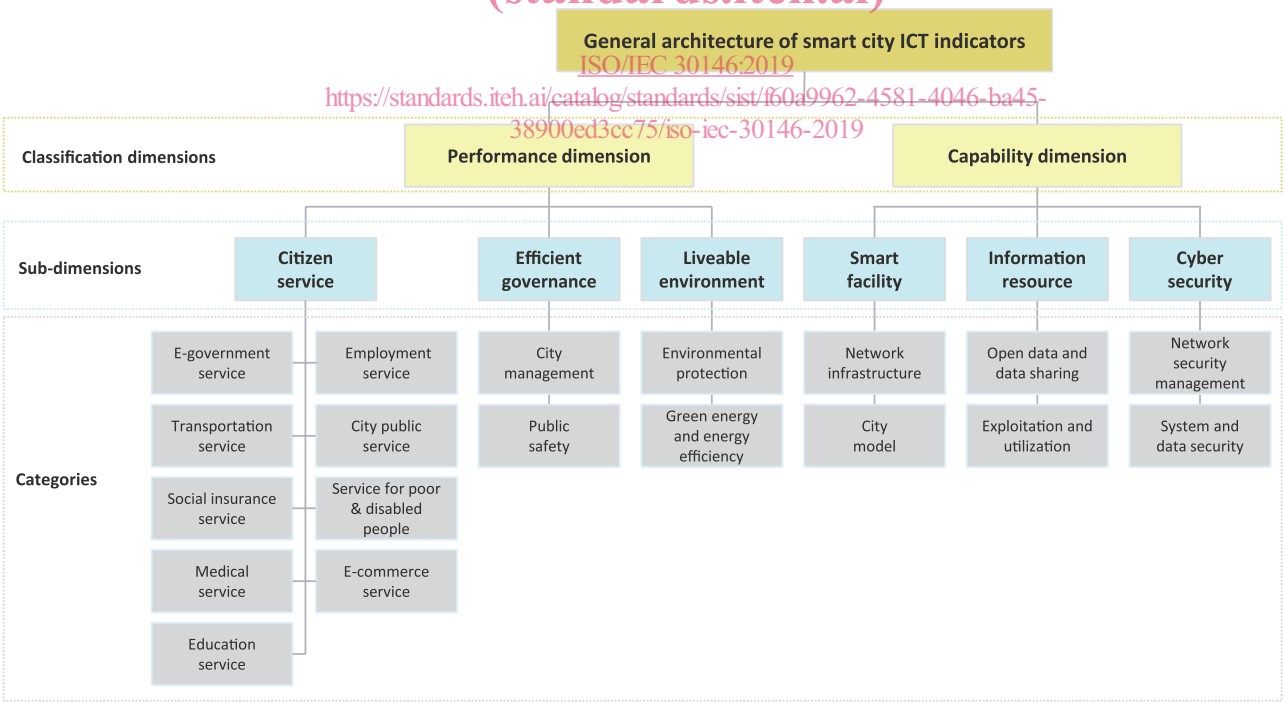

Figure 1 — General architecture of smart city ICT indicators

Smart city ICT indicators are classified as performance indicators and capability indicators. The smart city performance indicators include citizen service level, efficient governance level and liveable environment level. The smart city capability indicators include the smart facility level, information resource level and cyber security level.

The system of smart city ICT indicators is categorized into two dimensions and each dimension includes three levels. First-level and second-level indicators are basic classifications of indicators. Third-level indicators are specific indicators which are used in the smart city evaluation process.

6 General principles

6.1 Indicators selection

The design principles of the smart city ICT indicators are provided as below:

— Clear and unambiguous

  — Each indicator needs to have a clear definition and measurement method.

  — A measurement method needs to be a simple formula.

— Scientific and reasonable

  — The indicators need to reflect the connotations and characteristics of the smart city.

  — The quantity of listed indicators needs to be reasonable. There is no need to have too many indicators.

— Representative

  — The indicators need to be citizen oriented and performance oriented. A large proportion of performance indicators are related with citizen benefits and citizen experience.

  — The indicators need to take the vision of the city into account.

— Collectable and quantifiable

  — The indicators need to be objective, not subjective.

  — The indicators need to have a clear data source.

— Consistent

  — The indicators need to be in line with related International Standards.

— Continuously updated

  — The indicators need to be continuously updated with the development status of the smart city.

6.2 Indicators description

In this document, tables are used to describe the indicators. Each table has 4 columns named by number, indicator name, description and measurement method.

The system of smart city ICT indicators includes three levels, as shown in Figure 1. This document uses "*L1*" to "*Ln*" to represent the first-level indicators. For example, it uses "*L1*" to represent the first-level indicator. "*L1.1*" represents the second-level indicator which is categorized into the first-level indicator "*L1*". "*L1.1.1*" represents the third-level indicator which is classified to the second-level indicator "*L1.1*".

When specifying the measuring method of each indicator, a hundred-mark system is adopted in this document.

7 Indicators description

7.1 Citizen service

7.1.1 E-government service

The indicator “e-government service” is used to assess the convenience of government services. This indicator is used to assess the ICT’s contribution to the performance of the government to promote innovative services for citizens.

Related third-level indicators are shown in Table 1.

Table 1 — Evaluation indicators related to e-government service

Number	Indicator name	Description	Measurement method
L1.1.1	Percentage of one-stop government services	Physical convenience evaluation of government services, that all required procedures can be processed at one physical location	(number of one-stop government services/total number of government services) × 100
L1.1.2	Percentage of government services which can be solved via single sign in	Online convenience evaluation of government services	(number of government services which can be accessed via single web portal/total number of government services) × 100
L1.1.3	Implementation of electronic or digital signature	Effectiveness of implementation of electronic/digital signatures	(number of governmental services or departments using digital signatures/total number of governmental services in the city) × 100
L1.1.4	Percentage of citizen service requests which can be processed appropriately by government	Evaluation of government service effectiveness based on citizen requests	(number of citizen requests processed correctly/total number of citizen requests) × 100 NOTE Citizen requests from citizens to local government to cope with the problems in public services, which are submitted through the phone call, e-mail, social media and messages through APPs.

7.1.2 Transportation service

The indicator “transportation service” is used to assess the ICT’s contribution to the convenience of public transportation services and travel information services.

Related third-level indicators are shown in Table 2.

Table 2 — Evaluation indicators related to transportation service

Number	Indicator name	Description	Measurement method
L1.2.1	Release of operation information of public transportation services	Evaluation of public transportation information service	(b1 + b2 + b3), where b1 = 60, when a city has opened the public transportation information, including real time status of transportation services; otherwise b1 = 0; b2 = 20, when a city has opened the public transportation information through at least one of e-board, TV, broadcasting, APPs and etc.; otherwise b2 = 0; b3 = 20, when a city has opened the public transportation information at the level of second tier main roads and above; otherwise b3 = 0. NOTE City road network includes fast track, main road, second tier main road, minor road and bypass.
L1.2.2	Percentage of available forecasting information of public vehicles	Evaluation of public transportation forecasting service	(number of public transportation routes supporting real time arrival forecast/total number of public transportation routes) × 100
L1.2.3	Percentage of e-payment used in public vehicles	Evaluation of public transportation payment service	(average number of trips per day using e-payment on public transportation/total average number of trips per day taking public transportation) × 100

7.1.3 Social insurance service

The indicator "social insurance service" is used to assess the ICT's contribution to the effectiveness of public social insurance services.

Related third-level indicators are shown in Table 3.

Table 3 — Evaluation indicators related to social insurance service

Number	Indicator name	Description	Measurement method
L1.3.1	Online social insurance service	Evaluation of online social insurance service	online services provided via: Web sites, self-service machines, APPs on cell phone, hotline and short message. 25 points for each method, the total score is 100
L1.3.2	Percentage of communities supporting self-service for social insurance services	Evaluation of communities supporting social insurance services in self-service way	(number of communities supporting self-service for social insurance services/total number of residence communities) × 100
L1.3.3	Degree of social insurance services which are available across the city	Evaluation of promoting social insurance services that are available across the city	services across the city include: social insurance relationship transfer, social insurance authentication, balance accounts of medical service, social security status inquiry and comparison. 25 points for each service, the total score is 100

7.1.4 Medical service

The indicator "medical service" is used to assess ICT's contribution to the efficiency of health services.

Related third-level indicators are shown in Table 4.