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## Information technology — Smart City ICT reference framework —

### Part 2: Smart city knowledge management framework

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## Foreword

ISO/IEC (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO/IEC member bodies). The work of preparing International Standards is normally carried out through ISO/IEC technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO/IEC, also take part in the work. ISO/IEC collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

- The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO/IEC documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. [www.iso.org/directives](http://www.iso.org/directives)

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For an explanation on the meaning of ISO/IEC specific terms and expressions related to conformity assessment, as well as information about ISO/IEC's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/IEC JTC 1.

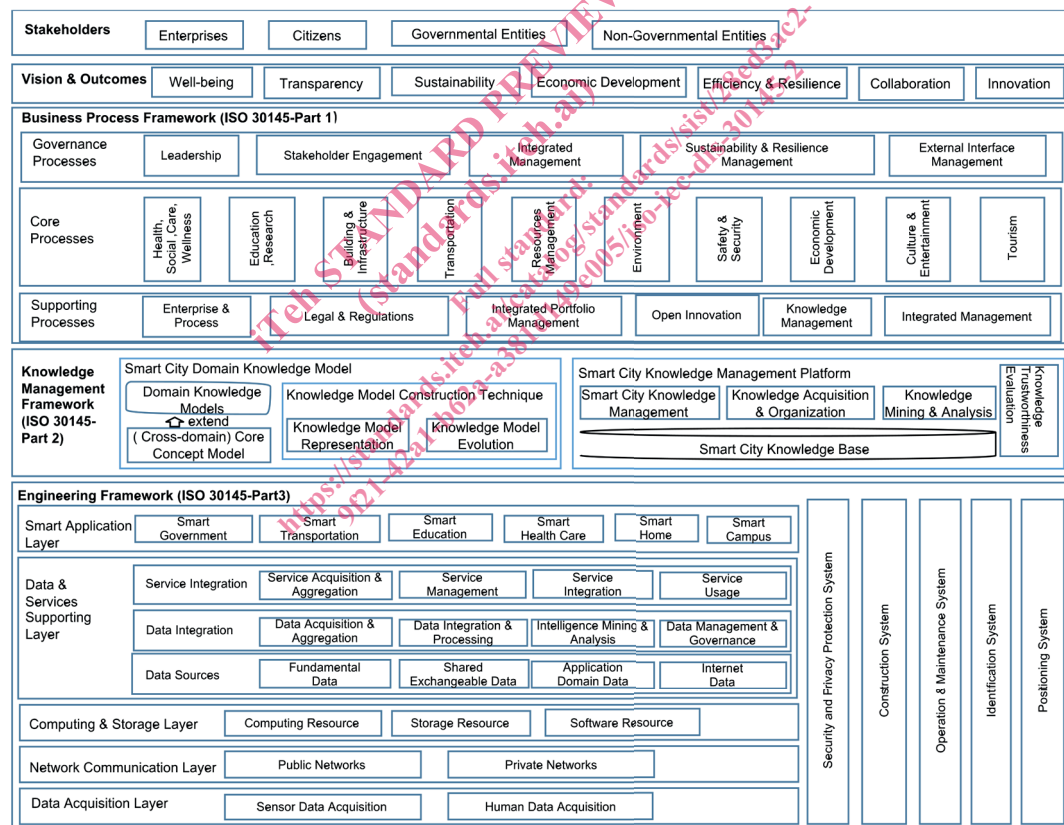
# Introduction

## 0.1 General

The purpose of this document, smart city ICT Reference Framework, is to assist city Chief Information Officers (CIO) and other stakeholders in planning and implementing a smart city. It comprises the following three parts:

- Part 1: Smart City Business Process Framework
- Part 2: Smart City Knowledge Management Framework
- Part 3: Smart City Engineering Framework

Each of the three parts are each aimed at a different role or viewpoint within the city and thus separate focus needs to be maintained. The "separation of concerns" is a principle for the development of a city as it uses ICT to deliver the vision and objectives for the city. The value of using the separation of concerns is to simplify development and maintenance of the architecture as the city both develops and delivers improved outcomes for the city stakeholders.



**Figure 1 — Smart City ICT Reference Framework**

Figure 1 shows the components of the smart city ICT reference framework which consist of 5 components: stakeholders, vision and outcomes, business process framework, knowledge management framework, and engineering framework. This document describes the Knowledge Management Framework. The Business Process Framework and the Engineering Framework are described in Part 1 and Part 3 respectively. While stakeholders, vision and outcomes, and engineering framework are described in ISO/IEC 30145-3 and the business process framework is described in ISO/IEC 30145-1, knowledge management framework is described in this document.

## 0.2 Stakeholders

The stakeholders served by the smart city ICT Reference Framework are businesses, citizens, government organizations and non-government organizations. This stakeholder list is not exhaustive but defines the key stakeholders in a smart city and the user for the smart city ICT reference framework.

## 0.3 Vision and Outcomes

The motivation for making a city smart is a result of a shared vision and a set of agreed outcomes from all the city stakeholders. The vision and outcomes of the smart city ICT Reference Framework are Well-being, Transparency, Sustainability, Economic Development, Efficiency & Resilience, Collaboration and Innovation. This vision and outcomes list are not exhaustive but defines the key vision and outcomes of a smart city. The smart city ICT Reference Framework articulates a vision that the smart city will be transparent in the delivery of city services which meet city sustainability ambitions. This vision uses collaboration and innovation approaches to deliver desired city outcomes. City outcomes are expected to improve efficiency and resilience of city services and promote economic development activities which enhance the well-being of citizens.

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# Information technology — Smart City ICT reference framework —

## Part 2: Smart city knowledge management framework

### 1 Scope

This document specifies a generic knowledge management framework for a smart city focusing on smart city knowledge creating, capturing, sharing, using and managing. It also gives the key practices which are needed to be implemented to ensure the use of knowledge, such as interoperability of heterogeneous data and governance of multi-sources services within a smart city.

### 2 Normative references

There are no normative references to this document.

### 3 Terms and definitions

For the purposes 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

##### **data**

reinterpretable representation of information in a formalized manner suitable for communication, interpretation, or processing

Note 1 to entry: Data can be processed by humans or by automatic means.

[SOURCE: ISO/IEC 2382:2015]

#### 3.2

##### **information**

data (3.1) that are processed, organized and correlated to produce meaning

Note 1 to entry: Information concerns facts, concepts, objects, events, ideas, processes, etc.

[SOURCE: ISO/IEC 22320:2011, 3.9]

#### 3.3

##### **knowledge**

collection of facts, events, beliefs, and rules, organized for systematic use

[SOURCE: ISO/IEC 2382:2015]

### 3.4

#### **ontology**

formal representation of phenomena of a universe of discourse with an underlying vocabulary including definitions and axioms that make the intended meaning explicit and describe phenomena and their relationships

[SOURCE: ISO/IEC 19101-1:2014, 4.1.26]

### 3.5

#### **management**

coordinated activities to direct and control an organization

Note 1 to entry: Management can include establishing policies and objectives, and processes to meet these objectives.

### 3.6

#### **smart city**

city that increases the pace at which it provides social, economic and environmental sustainability outcomes and responds to challenges such as climate change, rapid population growth, and political and economic instability by fundamentally improving how it engages society, applies collaborative leadership methods, works across disciplines and city systems, and uses data information and modern technologies to deliver better services and quality of life to those in the city (residents, businesses, visitors), now and for the foreseeable future, without unfair disadvantage of others or degradation of the natural environment

Note 1 to entry: A smart city also faces the challenge of respecting planetary boundaries and taking into account the limitations these boundaries impose.

Note 2 to entry: There are numerous definitions of a smart city; however, the definition that is used within TC268 is the official one agreed to by the ISO/IEC Technical Management Board.

[SOURCE: ISO/IEC 37122:2019, 3.4]

### 3.7

#### **knowledge management**

combination of processes, actions, methodologies and solutions that enable the creation, maintenance, distribution and access to knowledge

[SOURCE: ISO/IEC 30400:2016, 14.1, modified – deleted 'organizational']

### 3.8

#### **information and communication technology(ICT)**

technology for gathering, storing, retrieving, processing, analysing and transmitting information

[SOURCE: ISO/IEC 9241-20:2008, 3.4, modified – replaced '/' by 'and' in the term]

### 3.9

#### **trustworthiness**

Trustworthiness corresponds to the ability to meet stakeholders expectations in a verifiable way.

Note 1 to entry: Depending on the context or sector, and also on the specific product or service, data, and technology used, different characteristics apply and need verification to ensure stakeholders expectations are met.

Note 2 to entry: Characteristics of trustworthiness include, for instance, reliability, availability, resilience, security, privacy, safety, accountability, transparency, integrity, authenticity, quality, usability, and accuracy.

Note 3 to entry: Trustworthiness is an attribute that can be applied to services, products, technology, data and information as well as, in the context of governance, to organizations.



**3.10****city model**

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

Note 1 to entry: preference should be given to city models that conform to open standards.

**4 Background**

The sharing of data and services for the benefit of all stakeholders is a fundamental requirements of smart city applications and operations. A smart city consists of organizations from all sectors (public and private) and the work these organizations do should rely on the sharing of interoperable data and common knowledge of the city. smart city data and services are shared based on a common description of their semantic meaning. smart city knowledge provides the basis for understanding multi-source data and the support for data interoperation.

Smart city knowledge is created, captured, shared, used and managed by an infrastructure for knowledge management. This document specifies the framework of knowledge management to provide a guidance on how to build such infrastructure.

**5 Aims of the knowledge management framework**

The knowledge management framework aims to give an instruction on how to build infrastructure for knowledge management, define activities related to knowledge management and give an instruction on how to apply the knowledge in the smart city.

The framework provides a way in which the city can extract, manage and apply knowledge to operate city services for the benefit of the citizen. It also provides the basis for understanding and utilizing heterogeneous data and services in the smart city.

**6 Overview of the smart city knowledge management framework**

The framework gives a conceptual vision of the activities of knowledge management in the smart city and the usage of the framework is to improve decision-making processes and enhance the value-added of the business processes of the smart city.

The framework comprises a core concept model and its domain-specific extensions (such as knowledge models for citizen livelihood, knowledge model for smart transportation, etc.), the techniques of constructing domain knowledge models, the knowledge base, the acquisition and organization of knowledge, the mining and analysis of knowledge, and knowledge trustworthiness evaluation.

Figure 2 illustrates the framework of smart city knowledge management. As shown in Figure 2, from an ICT view, there are two layers in the knowledge management framework for smart city, one is the smart city domain knowledge model and the other is the smart city knowledge management platform which will be the basis on which a city implements the ICT technical solution. The smart city domain knowledge model layer gives the foundations and supports knowledge acquiring, mining, using and evaluation. The smart city knowledge management platform layer collects the feedbacks through the phases of knowledge practices and returns them to the smart city domain knowledge model layer for knowledge model to help the domain knowledge model to evolve and meet up with the development of smart city.

Annex A shows use cases for a smart city knowledge management framework.