

# technology

**IEC, ISO and information  
communication technology**



In our hyperconnected world, information communication technology pervades all areas of our lives. Virtually everything we do and touch leaves in its wake a trail of data that doubles in quantity almost every two years<sup>1)</sup>.



1) "9 Technology Mega Trends That Will Change The World In 2018", by Bernard Marr – [forbes.com](http://forbes.com)

The base of connected devices is predicted to hit 75 billion by 2025<sup>2)</sup> and cyber-attacks are now said to be the third-largest threat after natural disasters and extreme weather events<sup>3)</sup>. International Standards help organizations make sense of information communication technology (ICT), providing internationally agreed tools and ways of doing things that allow interoperability, security and innovation to flourish.

## Why do we need standards for ICT?

A fundamental element in the power and growth of ICT is the ability of component parts from different manufacturers to “talk to each other” using a common language that is universally accepted. International Standards are key to this interoperability as they lay down the specifications and requirements of the many parts, products and systems that make up this complex industry.

International Standards by the International Electrotechnical Commission (IEC) and the International Organization for Standardization (ISO) bring together the world’s leading experts in each field to establish the most effective ways of doing things, thus representing global best practice. The ISO/IEC Joint Technical Committee for Information Technology (JTC 1) is one of the largest and most prolific technical committees in international standardization. With over three thousand published standards developed under the umbrella of the committee and its 22 subcommittees, JTC 1 makes a huge impact on the ICT industry worldwide.

2) IHS Technology, *IoT platforms: enabling the Internet of Things*, March 2016

3) Cisco News, “Top 10 Trends for ICT in 2018”, January 2018

## Who benefits from IEC and ISO standards for ICT?

### Industry

Almost every organization that uses ICT systems or products can benefit from ISO/IEC standards, which cover an extensive range of fields from security of information and systems to cloud computing and big data. In addition, manufacturers and retailers of ICT-related products or systems can rest easy knowing that what they are developing conforms to international best practice and is compatible with components and systems the world over.

### Consumers

International Standards for ICT systems and products provide a platform from which the technology can develop and grow, allowing consumers to benefit from state-of-the-art devices, better-performing systems, and organizations that work more effectively. What's more, consumers enjoy increased protection of their personal data thanks to the advances in information security achieved through standards.



### Regulators

Regulators can rely on ISO/IEC standards for ICT to provide internationally harmonized solutions that are continually reviewed and improved. They establish a solid technical base that governments can use to write and implement ICT-related policy, and help develop technologies that directly benefit them on issues such as identity management and information security.



## What standards do IEC and ISO have for ICT?

### Information security

In our hyperconnected world, the security of our information has never been more crucial. Cyber-attacks and data breaches are not only more common, they are increasingly complex and their consequences more damaging than ever before.

With this in mind, IEC and ISO have developed a “cybersecurity toolkit” featuring standards that help organizations keep their information assets secure. This is known as the ISO/IEC 27000 series for IT security techniques, which covers areas such as financial information, intellectual property, employee details and information entrusted to an organization by third parties.

ISO/IEC 27001, *Information technology – Security techniques – Information security management systems – Requirements*, sets the framework for an information security management system. It is further supplemented by other standards in the series that provide additional detail on specific areas. These include ISO/IEC 27002 (code of practice for information security controls), ISO/IEC 27003 (guidance on ISO/IEC 27001:2013), ISO/IEC 27005 (information security risk management) and ISO/IEC 27008 (guidelines for the assessment of information security controls). In addition, other ISO/IEC standards are in development in specialized fields such as cryptology, which helps protect against hacking by quantum computers.

## What ICT sectors do IEC and ISO cover?

-  Information security
-  Artificial intelligence
-  Internet of Things
-  Smart cities
-  Smart cards
-  Software and systems engineering
-  Emerging technology and innovation
-  Blockchain
-  3D printing and scanning
-  Edge computing



75 % of enterprise applications are predicted to use AI by 2021.

## Artificial intelligence

Artificial intelligence (AI) essentially refers to a collection of technologies that enable intelligence in machines. It is a growing field, with 75 % of enterprise applications predicted to use AI by 2021<sup>4)</sup>, and covers everything from machines in manufacturing that improve process efficiencies to machine-learning platforms, to personal robots and autonomous cars.

ISO/IEC JTC 1's subcommittee SC 42, *Artificial intelligence*, was created to develop requirements and guidance in this area while carrying out research into future domains of application. Standards and deliverables published or in development include the ISO/IEC 20547 series for big data reference architecture as well as documents on issues such as bias in decision making, trustworthiness, governance implications and more.

This work is complemented by that of related JTC 1 subcommittees. In particular, SC 37, *Biometrics*, is responsible for the standardization of biometric technologies that support interoperability and data interchange between applications for the authentication of individuals (such as those used in airports), while SC 38, *Cloud computing and distributed platforms*, focuses on cloud-based applications for biometrics.

<sup>4)</sup> International Data Corporation, *US Government Cognitive and Artificial Intelligence Forecast 2018-2021: Federal and State and Local Should See Moderate Growth*, March 2018

## Who develops IEC and ISO standards for ICT?

IEC and ISO standards are developed by groups of experts within technical committees (TCs). TCs are made up of representatives and international experts from industry, non-governmental organizations, governments and other stakeholders who are put forward by IEC and ISO members from all over the world. Each TC deals with a different subject or specialist area.

Joint technical committee ISO/IEC JTC 1, *Information technology*, is the hub for the development of standards for ICT and can be used by other IEC and ISO TCs.

It is made up of more than 4 500 experts from 99 countries, grouped in 22 subcommittees covering specialist areas from biometrics to cybersecurity to artificial intelligence. ISO/IEC JTC 1 has published 3 175 standards, with an additional 517 under development. Learn more about the committee's work at its dedicated Website: <https://jtc1info.org>.

Other IEC/TCs that develop standards related to ICT include IEC/TC 65, *Industrial-process measurement, control and automation*, and the IEC Systems Committee for Smart Cities (SyC Smart Cities).

Other ISO/TCs involved in developing standards related to ICT include ISO/TC 307, *Blockchain and distributed ledger technologies*, and ISO/TC 268, *Sustainable cities and communities*.

## Internet of Things

The Internet of Things (IoT) is an infrastructure of interconnected entities, people systems and information resources together with services, which process and react to information from the physical and virtual world.

IoT is the key enabling technology for new paradigms such as smart homes, smart manufacturing, advanced agriculture, smart grids, smart health, smart transportation, smart cities and ambient intelligence, to name but a few. Its wide adoption across multiple areas will help build a world that is more responsive and sustainable.

IoT systems and systems of systems are data-intensive distributed computing systems that integrate many technologies covered by JTC 1 subcommittees, such as networking, cloud computing, cybersecurity, big data and artificial intelligence.

To support uptake, IEC and ISO develop standards that help integrate these multiple IT technologies to build IoT systems as well as bridge the gap between IoT and its multiple domains of application. Thus, there is a particular emphasis on foundational standards such as reference architectures, interoperability and trustworthiness. These include ISO/IEC 30141, *Internet of Things (IoT) – Reference Architecture*, which defines a common international language for a variety of IoT topics.



### Smart cities

As we move towards a world population of nearly ten billion people by 2050<sup>5)</sup>, most of which will be urban, the pressures on our cities are likely to increase. A “smart city” can be defined as a city that develops sustainably to improve the quality of life of its citizens while adapting to the challenge of rising urbanization.

IEC and ISO have a range of International Standards that provide the tools, foundations and platforms to help cities meet these challenges. The IEC Systems Committee for Smart Cities (SyC Smart Cities) fosters the development of standards in the field of electrotechnology to help with the integration, interoperability and effectiveness of city systems. These include key standards on smart cities reference architecture and reference architecture methodology.

ISO 37101, *Sustainable development in communities – Management system for sustainable development – Requirements with guidance for use*, presents cities with an overall framework for defining what “being smart” means to them. It shows how they can meet this target by setting the basic requirements for sustainable development in communities, how to determine their sustainable development objectives and ultimately put in place a viable strategy to achieve them.

5) United Nations Sustainable Development Goals, press release, June 2017

Interconnectivity and interoperability are at the root of today's well-functioning cities.



Interconnectivity and interoperability are at the root of today's well-functioning cities, and the two organizations have collaborated on a number of standards that pool together their individual areas of expertise. ISO/IEC 30182, *Smart city concept model – Guidance for establishing a model for data interoperability*, provides a conceptual model for smart cities that facilitates interoperability between the component systems of urban living, such as place, community, services and resources, affording a practical basis for real-world applications.

Other standards under development include:

- ISO/IEC 21972, *Information technology – An upper level ontology for smart city indicators*
- ISO/IEC 27550, *Information technology – Security techniques – Privacy engineering*
- ISO/IEC 27551, *Information technology – Security techniques – Requirements for attribute-based unlinkable entity authentication*



### Smart cards

From banking to healthcare, to transportation and retail, smart cards have become an essential element of our modern way of life. Used by millions of cardholders, they are hard at work processing point-of-sale transactions, managing records and securing facilities, making smart card technology more important than ever.

International Standards are essential to this sector as they underpin the interoperability and common language that enable cards to “talk” to all the many functions and systems they interact with on a daily basis. This ensures they work

as intended in all areas of life, whether that's opening the door of a building in your home town or drawing money from a cash machine overseas.

ISO/IEC JTC 1's subcommittee SC 17, *Cards and security devices for personal identification*, is responsible for creating the standards behind these cards, defining everything from their physical dimensions to the technology that supports them, such as microchips and magnetic stripes. In addition, it develops standards that enable mobile devices to be used for personal identification.

## Software and systems engineering

Software enables our control over modern devices. Its pervasiveness in society dictates the need for flexible, reliable and usable tools and processes that support the development and maintenance of quality software systems. ISO/IEC JTC 1's subcommittee SC 7, *Software and systems engineering*, develops standards that cover the processes, supporting tools and technologies for the engineering of software products and systems.

Key standards in this area include the ISO/IEC 20000 series on service management systems and ISO/IEC 26514, which gives requirements for the design and development of user documentation for application software. Additionally, developed in conjunction with the Institute of Electrical and Electronics Engineers (IEEE), ISO/IEC/IEEE 90003, *Software engineering – Guidelines for the application of ISO 9001:2015 to computer software*, leads organizations through the process of considering key elements of their quality management as it relates to software.

## Emerging technology and innovation

With technology evolving at such a fast pace, highly complex standards must be delivered and adopted by industry faster than ever before. What's more, their development will require more active collaboration with other standards development organizations to avoid duplication of work.

To this end, a new IEC and ISO Joint Advisory Group (JAG) was established in 2016 to assess the needs of the evolving ICT industry, identify risks and opportunities and then make recommendations to JTC 1 on future standardization activities. The Joint Advisory Group on Emerging Technology and Innovation – or JETI as it is known – has identified 15 priority technologies that need to be considered. Four of these, namely digital twin technology, quantum computing, brain-computer interface and autonomous vehicles, will undergo in-depth analysis while other areas of standardization continue to be identified.

## Blockchain

Blockchain technology holds immense promise when it comes to revolutionizing financial transactions while, at the same time, improving a whole host of things, from financial inclusion to efficiencies in government, health and all areas of business.

ISO technical committee ISO/TC 307, *Blockchain and distributed ledger technologies*, develops standards for blockchain that will help this technology grow securely and robustly, notably in the fields of reference architecture, taxonomy and ontology. Currently, finance offers the strongest use cases for the technology in applications such as security and privacy, identity management and smart contracts.

## 3D printing and scanning

Standards development plays a pivotal role in speeding up adoption of additive manufacturing in existing production environments. ISO/IEC JTC 1 develops standards for 3D printing and scanning that can serve as a basis for the development of other standards in the future, especially in the field of additive manufacturing.



## Edge computing

Edge computing refers to the computational processes being done at or near the “edge” of a network. To address the new challenges this technology poses, the integration of edge computing and the Internet of Things (IoT) is emerging as a promising solution. Standardization for edge computing involves aligning standards related to IoT with those for cloud computing to ensure they have the same definitions of concepts and terminology.

## About IEC

The IEC (International Electrotechnical Commission) brings together 171\* countries and close to 20 000\* experts who cooperate on the global IEC platform to ensure that products work everywhere safely with each other. The IEC is the world's leading organization that prepares and publishes globally relevant International Standards for the whole energy chain, including all electrical, electronic and related technologies, devices and systems. The IEC also supports all forms of conformity assessment and administers four Conformity Assessment Systems that certify that components, equipment and systems used in homes, offices, healthcare facilities, public spaces, transportation, manufacturing, explosive environments and energy generation conform to them.

For more information, please visit [www.iec.ch](http://www.iec.ch).

## About ISO

ISO (International Organization for Standardization) is an independent, non-governmental international organization with a membership of 164\* national standards bodies. Through its members, it brings together experts to share knowledge and develop voluntary, consensus-based, market-relevant International Standards that support innovation and provide solutions to global challenges. ISO has published more than 22 500\* International Standards and related documents covering almost every industry, from technology to food safety, to agriculture and healthcare.

For more information, please visit [www.iso.org](http://www.iso.org).

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