



# Intelligent Standard is Just in Time

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**Abstract.** China has built a huge standard system with symbiotic development of national standards, industry standards, local standards, group standards and enterprise standards. The role of standards in supporting various fields is becoming more and more obvious. In this paper, we introduce the background of standard intelligence, the progress of international intelligent standard, the current situation of domestic standard intelligence policy, and the progress of domestic intelligent standard work. Finally, we put forward several aspects of work that need to be solved urgently in order to achieve the goal of standard intelligence.

**Keywords:** Intelligent standard · Machine readable standard · IEC · ISO · Standard resource pool

## 1 Introduction

The use of massive data [23], deep learning [21], blockchain [25] and other new information technology to achieve the transformation of standards from traditional paper text to digital standards, combined with the application scenarios and product demand output intelligent standard services, not only related to the long-term sustainable development of China's social economy, but also related to China's international competitiveness and participation in global governance to achieve leadership. In this paper, we briefly introduce the importance and necessity of standards intelligence, the recent progress of the world's major standards bodies in the direction of intelligent standard.

The test of this paper is presented as follows: Sect. 2 introduces the need for intelligent standards. Section 3 introduces international intelligent standard progress. In Sect. 4, we put forward several aspects of work that need to be solved urgently in order to achieve the goal of intelligent standard and in Sect. 5 we summarize the paper.

## 2 The Need for Intelligent Standard

### 2.1 Traditional Standard Setting and Services Cannot Meet the Realistic Development Needs

In the context of the era of rapid technological development, highly segmented industries and fierce competition among enterprises, cross-domain, cross-region, cross-industry and cross-technology integration and innovation has become a trend of social development.

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The development of standards through consensus mechanisms may cause the standards to miss the best timing to function in the innovation cycle because of the excessive time consuming. The traditional standard preparation and process approval cycle is long, the standard application and implementation effect is difficult to evaluate, the standard application feedback mechanism is missing, the standard professionals are lacking, and the explanation of inter-relationship between standards is insufficient to adapt to the current reality of rapid renewal and iteration of various products, integration and innovation of multiple technologies, fierce competition in international economy and trade, and large demand for standard development. Therefore, the transformation of intelligent standard has become an inevitable choice to adapt to social and economic development, enhance social production capacity, and strengthen product innovation ability.

## **2.2 The Development of Technology Provides Scientific Tools for the Development of Intelligent Standard**

Artificial intelligence [21] technologies are changing human work and life in diverse ways. From the process change brought by digital technology, i.e., issue setting to intelligent analysis and decision making [24], to knowledge formation and sharing and public participation, digital technology provides novel development models for social progress. The current massive data aggregation and processing, transfer learning, reinforcement learning [19, 20] and other big data technology use, digital twin simulation [27] and deduction, artificial intelligence analysis and intelligent decision-making, as well as the emerging technologies that will continue to be derived in the future provide scientific tools for the development of intelligent standard. This promotes the realization of open access to information or knowledge, the optimization of data access capability, and the rapid transformation of standard research results to socio-economic benefits.

## **3 International Intelligent Standard Progress**

### **3.1 U.S.**

The United States actively promote the digitization of standards, built a relevant standard data platform to provide standards, standard reference data and related services.

#### **3.1.1 U.S. Standard Digital Strategy**

In 2018, the Center for Strategic and International Studies (CSIS) released a National Machine Intelligence Strategy for the United States [2], which argues that the U.S. government can start by harmonizing its own data structure and labeling standards and working with companies to develop standards for government-industry data sharing to advance standards digitization works.

#### **3.1.2 Standard Database**

The National Institute of Standards and Technology (NIST), part of the U.S. Department of Commerce, provides standards, standard reference data, and related services through

a combination of scientific research and development, metrology and standardization, and technological innovation. Under the Standard Reference Data Program, NIST has established a series of reliable, evaluated Standard Reference Data (SRD) [1] databases for engineers and researchers from all sectors of society to rely on NIST's SRD for decision making in solving technical, research, and development problems, and is an important source of standards data sets for engineering and research. Source of data sets.

### **3.2 European Region**

The CEN/CENELEC Strategy 2030 [22] proposes to enable customers to benefit from the most advanced digital solutions. The European Committee for Standardization/European Electrotechnical Commission (CEN/CENELEC) has developed a Strategic Plan for Digital Transformation. CEN, CENELEC conducts legal analyses around intellectual property rights (IPR) protection for digital standards content, with the aim of addressing the legal issues associated with the transformation of standard texts into machine-readable/translatable content, IPR issues related to open source and online standards writing platforms.

### **3.3 China**

National Standardization Development Outline was released by the Central Committee of the Communist Party of China and the State Council in October 2021, it is proposed to develop machine-readable standards and open source standards, and promote the transformation of standardization work to digitalization, networking and intelligence, which indicates that the development goal of standard digitization is standard intelligence, i.e. to fully explore the information in the standard and process it into standard knowledge, so that it can serve the standard makers and users.

### **3.4 International Electrical Commission**

International Electrical Commission (IEC) has placed great emphasis on digital transformation, including the study of machine-readable standards.

### **3.5 International Organization for Standardization**

The digital transformation of International Organization for Standardization (ISO) can be divided into two phases: the first phase is the implementation of the Standard Tag Suite (STS) [3]; the second phase is to promote the SMART standard, to achieve the Standard Machine Accessible, Readable and Transferrable.

As seen above, the international community is making active attempts around the standard. The current focus of attention is on machine-readable standards, the specification of the standard structure, and the construction of the standard database. Further research on the implementation path of intelligent standard transformation and the output of standard intelligent services will be the key direction of future standard development.

## 4 Urgent Work Directions

### 4.1 Complete Standard Data Aggregation, Build Standard Resource Pool and Realize Standard Data Retrieval in One Site

For the existing stock of standards, build a standard taxonomy system, complete the convergence of multiple standard data: the formation of international standard resource pool, national standard resource pool, group standard resource pool, local standard resource pool, industry standard resource pool, enterprise standard resource pool and other standard resource pool construction, to provide data support for the digital application of standards.

Based on the standard resource pool, form the technical index database, standard model database, calculation method database, service requirement database, etc. Relying on the data of the standard resource pool, the standard data full-text retrieval [26] service capability is formed to provide standard resource retrieval function and provide standard digital services for industrial applications.

### 4.2 Provide Standard Digital Management Tools

Form a classification model of machine-readable standards, unify the standard description language, provide standard digital extraction and parsing tools, read, parse, store and understand the stock of standards, and form machine-readable standards.

Through data dictionary [5], image enhancement [6], layout analysis, OCR [4] and other technologies to provide standard digital operation tools.

### 4.3 Complete the Construction of the Standard Knowledge Graph to Achieve Standard Relevance Analysis and Standard Conformity Assessment

A unified standard identification system is constructed, machine learning and data mining technologies are used to model and mine the development process, association rules, institutional scholars, and hot events of specific standards and related field technologies. Through data cleaning [8], NLP word segmentation [10, 11], named entity recognition [12], information extraction [13] and other related technologies, multi-source data aggregation [14], and data calibration, relational data is formed to build a standard knowledge graph [15].

Based on the standards knowledge graph, it can provide external standards correlation analysis [16] services to help users design, upgrade their products, and may improve the performance of their products.

### 4.4 Domain-Specific Knowledge Transfer and Construction of Training Sample Database to Support Domain-Specific Standards Research

In domain-specific or resource-constrained environments with small amounts of data and ambiguous correlation data, small data [18] modelling is used to generate sample data through sample generation techniques for model training. Through transfer learning techniques [17], knowledge is transferred to specific restricted tasks, and through reinforcement learning [19, 20], the computer system is learning knowledge through interacting with the environment, thus supporting the research of specific domain standards.

#### 4.5 Standard Work Collaborative Platform to Build Diverse Standard Services

Through the standard work platform, provide standard online preparation, intelligent generation [9] services, standard application implementation plan design services, standard application consulting services, specific field standardization research and analysis services, empowering different industries, different needs of users, build specialized, customized, diversified standard service capabilities.

## 5 Conclusion

Although the world has recognized that intelligent standard is a major trend and has put forward relevant plans and implementation schemes, the current applications are still in their early stages. In this paper, we briefly introduce the importance and necessity of standards intelligence, the recent progress of the world's major standards bodies in the direction of intelligent standard. In view of the successful application of artificial intelligence in several fields, we propose several directions that may produce significant results and need to be addressed. We hope that this paper will stimulate the research interest of researchers, technicians, standards-related personnel, and other interested parties, and promote the rapid development of intelligent standard.

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