

Trends of Human-Centered Design Standardization in Japan and Overseas

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Given the comprehensive scope of human-centered design (HCD) and the extreme difficulty in systematically understanding its nature, most standardization efforts for HCD to date have been limited to describing its future orientation or giving a partial prescription of its concept. However, some attempts have begun to understand HCD in broader frameworks and to introduce more specific tests and perspectives. As part of this trend, many fact-based approaches are seen in various areas of the world. Particularly, Japan has played an important role in international standardization efforts and is expected to further contribute to this initiative in future. This paper surveys the current HCD frameworks that encompass Japanese and international standards, de facto standards, regulatory provisions, and other requirements regarding HCD. It also describes recent trends in both Western and Asian countries.

1. Introduction

While human-centered design (HCD) is a development concept centered on a design process, it is important to approach this initiative based on broad frameworks while giving consideration to the products and services generated through the concept as well as the people and organizations that use it (**Figure 1**).

However, a standard that addresses the area in the scope of HCD is yet to be established even if the area of a similar concept, Universal Design (UD), is taken into account. The primary reason for this situation is that the items to be considered encompass an enormous range of aspects owing to the variety of people in the scope, and all the aspects are mutually correlated in a complex manner, so it is difficult to understand the whole picture systematically.

Further, not only rules and standards such as ISO and Japanese Industrial Standards (JIS), but also globally applicable de facto standards

such as W3C (World Wide Web Consortium) guidelines as well as regulatory rules such as the three rehabilitation-related acts in the USA (ADA, §508 of the Rehabilitation Act, §255 of FCC; these will be described in detail in the section of “Trends in Europe and the United States”) need to be considered within the frameworks of HCD.

Therefore, this report introduces these frameworks related to HCD and they are reviewed from the viewpoints of usability and accessibility—the two essential elements that support HCD. This report also discusses the latest trends in this area.

2. Frameworks to be considered and the current status of the standards

While usability and accessibility have some similarities in their concepts, there are some differences in their targeted scope of people and the targeted purposes to be considered as a premise,

which leads to a difference of interpretations among the opinion leaders and researchers depending on their specialties and stances. However, both viewpoints are equally important and they should be considered as significant elements that complement each other in promoting HCD. The frameworks for HCD can be summarized as shown in **Table 1** when they are categorized from the aforementioned two viewpoints.

2.1 Current status of international standards and Japanese standards

First of all, from the viewpoint of usability, ISO9241 (established in 1998) and ISO13407 (established in 1999) can be cited as international standards to cope with HCD.

ISO9241 prescribes ergonomic requirements for office work using visual display terminals (VDTs). In Section 10 of this standard, “seven rules for interaction” (suitability for task, self-descriptiveness, controllability, conformity with user expectations, error tolerance, suitability for individualization, and suitability for learning) are cited. Usability is defined based on three elements (effectiveness, efficiency, and level of satisfaction) in Section 11. This standard was inte-

grated with JIS in 1999.

ISO13407 refers to “Human-centered design processes for interactive systems.” While the contents are centered on the usability viewpoints because they are based on ISO9241, it is one of the first international standards to address HCD in an upfront manner. However, because of its insufficiency in describing specific methods of evaluation and techniques, revision of that standard’s contents has been in progress since 2006. The revision work is significantly behind schedule, further requiring a couple of years before it is complete. The contents of ISO13407 were translated and issued in November 2000 as JIS Z8530.

Meanwhile, from the accessibility viewpoint, ISO/IEC Guide 71 “Guidelines for developers of standards to address the needs of older persons and persons with disabilities” established in 2001 has attracted public attention as a program established under the Japanese initiative. The contents of this Guide are based on JIS Z8071 “Guidelines for standards developers to address the needs of older persons and persons with disabilities”, which is a guidance of a higher level that lists considerations when formulating an international standard. As a realization of this initiative, a series of standards was established as the JIS X 8341 series between 2003 and 2006.

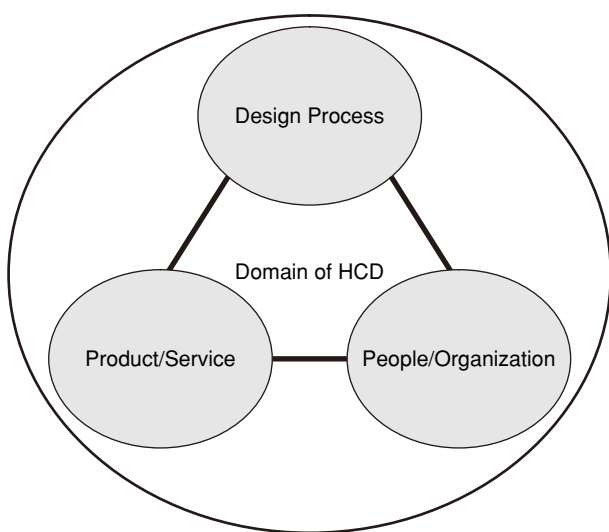


Figure 1
Domain of human-centered design.

Table 1
Frameworks to be considered in HCD.

	Usability	Accessibility
Standard	ISO 9241 series (JIS Z8511-8527) ISO 13407 (JIS Z8530)	ISO/IEC Guide71 (JIS Z8071) JIS X 8341 series
De facto standards	GUI guideline for each OS	W3C/WAI Web contents Accessibility guideline
Laws and ordinances	N/A	Three rehabilitation-related acts in the USA (ADA, §508 of Rehabilitation Act, §255 of FCC) Laws for Barrier-Free Traffic Approach in Public Transportation Heart Building Law

Currently, JIS standards are structured, as shown below, under the JIS Z 8071 as a common guide: “Guidelines for older persons and persons with disabilities—Information and communications equipment, software and services—Part 1: Common Guidelines” followed by JIS X8341-2, 3, 4 and 5; “Part 2: Information processing equipment; Part 3: Web content; Part 4: Telecommunications equipment; and Part 5: Office equipment”¹⁾ (Figure 2).

The characteristic of these individual standards are their comprehensive domains that encompass everything from the planning stage of each product and service to the operation process. Instead of using categories based on the model types and disabilities concerned, products and services are categorized based on each interface element so that the standards can address even the latest technologies. Further, giving consideration to the practical benefits, items are categorized into critical requirements and recommended requirements depending on their priority. Another characteristic is the frequent use of examples

and references to make the standards easier to understand.

2.2 JIS development process

Standardization of JIS X 8341-1 as a common guide was promoted by the Information Technology Research and Standardization Center (INSTAC) of the Japan Standards Association. And the standardization of individual guides from JIS X 8341-2 to JIS X 8341-5 was developed under the initiative of each industry concerned. To be specific, JIS X 8341-2 was developed by Japan Electronics and Information Technology Industries Association (JEITA), JIS X 8341-4 by Info-communication Access Council whose secretariat is in Communications and Information network Association of Japan (CIAJ), an electric communication service provider. JIS X 8341-5 was drafted by the Japan Business Machine and Information System Industries Association (JBMIA). The Technical Committee for International Standardization of Information Accessibility in INSTAC was responsible for draft-

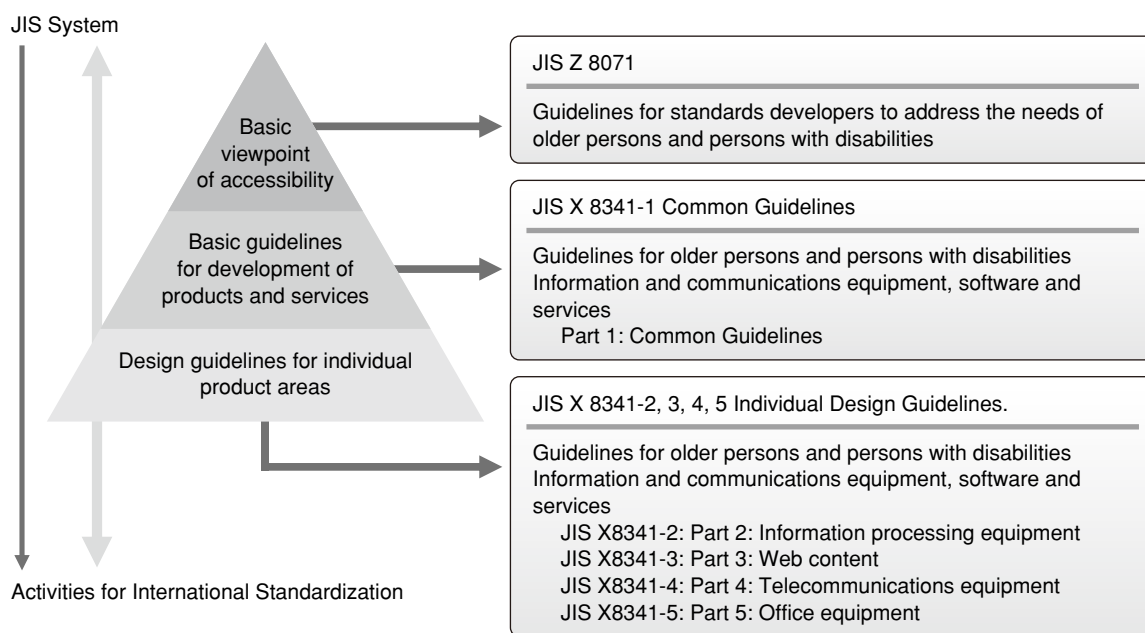


Figure 2
Structure of JIS.

ing JIS X 8341-3, because there was no domestic organization dedicated to Web contents.

Five years after the establishment of JIS Z 8071 as a basis for these standards in 2003, each standard is currently under detailed review by the respective organizations for expected revision in the near future.

2.3 Domestic actions for international standardization²⁾

ISO/IEC Guide 71 was established based on the Japanese proposal. Also for JIS, proposals on specific design guidelines were submitted positively to establish an international standardization. The proposals for international standardization were promoted by four working groups (WG1 to 4) in INSTAC as well as by each industry association responsible for integrating these guidelines in JIS.

The current status of international standardization is described in the following paragraphs:

1) JIS X 8341-1 Common Guide

INSTAC WG1 (X8341-1 International Standardization Promotion Group) played the main role in introducing the contents to the USA and European countries while filing the proposals with ISO. As a consequence, it was issued as ISO9241-20 in March 2008.

2) JIS X 8341-2 Information processing equipment

The draft was developed by the Accessibility Committee of Personal Information Technology Board in JEITA. However, after the abolition of this committee in FY2007, specific international standardization approaches have been addressed mainly by INSTAC WG4 (X8341-2 International Standardization Promotion Group). Upon proposing the guidelines to ISO/IEC JTC1/SC35 (User Interface), the proposal was approved under the premise that the applicable scope should be limited to computer hardware. Since then, revision work has been ongoing under the management of Japan as a project editor.

3) X8341-3 Web content

INSTAC WG2 (X8341-3 International Standardization Promotion Group) proposed to W3C/WAI the prospect recommendations on Web Content Accessibility Guidelines 2.0 (WCAG2.0), followed by an announcement in April 2008. After implementation tests, the recommendations were issued in December 2008.

4) X8341-4 Telecommunications Equipment

CIAJ made a proposal to ITU-T SG16 and it was adopted as a recommendation (F.790) in January 2007. Thus, the international standardization activities were completed.

5) X8341-5 Office equipment

JBMA made proposal for ISO/IEC JTC1/SC28 (Office Equipment). The proposal was approved as ISO/IEC10779 and issued in June 2008.

6) ISO/TC159 (Ergonomics)

The Japan Ergonomics Society has made active commitments and the integration of HCD processes is currently being examined. Ergonomic data and the revision draft of guidelines for applying ISO/IEC Guide 71 to products and services, addressing the needs of elderly persons and persons with disabilities, were approved in October 2007. Now, proofreading work is being done for publication in the near future. In November, AGAD (Advisory Group for Accessibility Design) was launched and Mr. Ken Sagawa from Advanced Industrial Science and Technology (AIST) was elected as chairperson.

In ISO/IEC/JTC1, which is the domain of information, Japan proposed to summarize the activities of Accessibility Group (SWG-A) as a report before the upcoming completion of its activities which started in 2005. The report is expected to be issued in 2009.

Besides the above-mentioned efforts, various activities for international standardization are in progress. As part of an initiative to reinforce the presence of Asian countries, joint drafts for international standards are proposed together with China and South Korea, based on five standards on designs addressing the needs of elderly

persons and persons with disabilities (JIS S0011, S0013, S0014, S0021, S0031) aiming for adoption in ISO/TC159 and TC122.

3. Trends in Europe and the United States

3.1 Trends in the United States

Regulatory requirements under laws and ordinances are a distinctive characteristic of the United States. Based on the ADA (Americans with Disabilities Act) established in 1990, an accessibility guideline was established in 1998 under §255 of the Telecommunication Act (also called as FCC §255 as it was chartered in the Federal Committee of Communication). In the same year, §508 of the Rehabilitation Act was reformed. These three acts serve as a basis for assuring accessibility in the United States. The Rehabilitation Act §508 requires the US Federal Government to guarantee people with disabilities the rights to access information about development, procurement and maintenance of electronic information technology, unless that puts an excessive burden on the government.

The review of technical standards based on the Rehabilitation Act §508 and FCC §255 has been promoted since September 2006 by the Telecommunications and Electronic and Technology Advisory Committee (TEITAC) in the US Access Board. The report³⁾ including recommendations for the Access Board was submitted more than six months behind schedule in April 2008 (it was planned to be submitted in September 2007). TEITAC is comprised of multinational members not only from the United States but also from various countries including Australia, Canada and European countries. Dr. Hajime Yamada (Toyo University, chairperson of the aforementioned INSTAC) participated in the TEITAC as a Japanese representative. Several proposals from Japan were integrated in this report including: 1) Every technical provision should indicate its source information such as reference documents that it is based on; 2) A spe-

cial report should be attached concerning the difference between the Rehabilitation Act §508 and FCC §255; 3) Test availability of a technical provision as well as its correlation with other technical provisions should be clearly indicated in notes. Taking the period necessary for approvals in the Federal Government and Congress into account, the planned enforcement and issuance of the revision are estimated to take place after 2010 and are behind schedule.

3.2 Trends in Europe⁴⁾

The main trend in European countries is to have provisions based on international standards and/or de facto standards centered on ISO. This recent trend promotes mandatory compliance to the guaranteed information accessibility in the area of public procurements. Within this initiative, the organizations concerned are trying to establish a third-party accreditation body and the audit items to be verified. The European Committee assigned these to the three standardization bodies in the EU (European Committee for Standardization [CEN], Comité Européen de Normalisation Electrotechnique [CENELEC], European Telecommunications Standards Institute [ETSI]) as an EU directive (Mandate 376). These works are to be carried out in two stages. In the first stage, CEN and CENELEC will promote a study on the desirable accreditation system for the accessibility requirements. Meanwhile, ETSI will promote a survey on the current status of international, district and national standards related to this issue. Although the planned start was in December 2006, there was a significant delay in starting the work because of the delayed timing of assignment contracts. The assignment contract with ETSI was entered into in June 2007 followed by the closure of the contract with CEN. The work by the standardization bodies in the first stage was completed in October 2008, while there are plans to devote one year for developing European standards in the second stage.

4. Actions of the Japanese government

After “correction of the digital divide” to ensure every citizen can enjoy benefits of using IT was determined as an across-the-board target in March 2001, within the framework of the “e-Japan Priority Policy Program”, the cabinet approved “The Basic Policies for Economic and Fiscal Management and Structural Reform in 2004 (Basic Policies 2004)” in June 2004. Further, the Japanese government announced its initiative to achieve “u-Japan Concept” to realize an IT-based society that allows active involvement by elderly persons and persons with disabilities. In these programs, the achievement of “universal” as well as “ubiquitous” is described as the priority issue to be addressed.

In December 2005, the Ministry of Internal Affairs and Communications (MIC) announced the report from the Workshop on Assurance of Web Accessibility in Public Area. In its section “Public Site Operation Model for Everyone”, local authorities are requested to review and address the needs regarding accessibility areas including user evaluation in order to realize public Websites that are accessible by all citizens. Detailed procedures for revising public Websites are also described. The contents include not only considerations to be reflected in the Website development process but also in the mechanism of operating a PDCA cycle to continuously improve accessibility.

In January 2006, Japan designated “a society without a digital divide” as one of the targets for the future within the framework of the new IT reformation strategy “Reforming Japan using IT” by the IT Strategy Headquarters.

In September 2007, the Japanese government signed the “Convention on the Rights of Persons with Disabilities”⁵⁾ adopted by the United Nations in December 2006. Currently, the government is taking further steps toward its ratification. Having been signed by more than 100 countries already, ratification of this convention is expected

to promote reformation of regulatory systems and mandatory social security programs. Also, it is expected to have some effects on the related regulatory systems and the trends of standardization because this convention asks its participants to ensure equal and complete participation of people with disabilities in society including those in female and children groups.

5. International UD conference and other trends

The first international-class conference on universal design in Japan was held in 2002 in Yokohama.⁶⁾ Thereafter, an agreement was entered into with a US universal design promotion body, called Adaptive Environments, to hold an international conference in Japan every four years. The second international conference in Japan was held in November 2006 in Kyoto (**Figure 3**).⁷⁾ With further sophistication of the conference program, this round was participated in by 29 countries and districts—twice the number of participants in the first round (14 700 people in total). The next round is planned to be held in 2010 in Hamamatsu.

In addition to the great awareness in the USA and European countries, HCD is attracting public attention also in Asian countries outside Japan. Besides the aforementioned joint approach by Japan and South Korea for international standardization, the Chinese government has



Figure 3
The 2nd International Conference for Universal Design in Kyoto 2006.

promoted a series of rehabilitation programs over the last 20 years targeted at more than 80 million Chinese citizens with disabilities including those with physical and mental disabilities. While the living environment of Chinese people with disabilities has been improved year by year, people's expectation for information and communication technologies is high. In July 2007, an international conference called "HCI International 2007" was held in Beijing, where interaction between people and computers was the main subject.

In India, where the IT industry has shown drastic development in recent years, a UD promotion body named "Design for All Institute India" was established with participation mainly by Indian education institutes. This organization has been issuing information on this area on a continuous basis since 2006.

Meanwhile, in Japan, advanced approaches are observed also in the private sector including efforts for international standardization. However, to enhance its presence in the international arena, Japan needs to pay increased attention to the trends in these two countries that together occupy almost 40 percent of the world's population. It is considered essential for Japan to establish a collaborative relationship proactively with China and India, instead of just observing their trends as an Asian partner.

6. Conclusion

This paper introduced the trends of HCD-related standardization, summarized them, and gave the current status of the issues in various parts of the world.

While HCD and UD tend to be considered as concepts for elderly people and people with disabilities in many cases, their core concept is one of the most important management concepts for industries just like the environmental issue which has been attracting increased attention recently. HCD is a process that understands the diversity of customers and provides products and services with excellent operability suitable for each use by

customers. The outputs in this respect will lead to further growth of markets and business opportunities.

However, regarding the frameworks as global standards, considerable difficulties may need to be overcome and time may be needed to achieve an international consensus supported by adequate discussions, because of the drastic changes in the industry environments and the involvement of each regional situation and the intention of inducing national interests. The Fujitsu Group has some important challenges to overcome including the expansion of communication channels with customers, study on implementation methodology and the development of a mechanism to feedback customers' opinions to the planning and development divisions.

The Fujitsu Group is committed to making further efforts also in future to promote across-the-group activities for improvement of customer satisfaction by sharing the value between the manufacturing and sales functions.

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