International Standards for HCI

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Over the last 20 years, HCI standards have been developed in the ISO ergonomics, user interface and software engineering committees. Most of the ergonomics standards contain guidelines and recommendations, while some of the user interface and software standards contain precise specifications. The standards in this chapter are described in five categories: context of use and user test methods; software interface, interaction and software quality; hardware interfaces and display terminals; the user centred development process; and the capability of an organisation to be user centred. Problems with the use of HCI standards are discussed.

INTRODUCTION

The last 20 years have seen the development of a wide range of standards related to HCI. The initial work was by the ISO TC 159 Ergonomics committee (see Stewart, 2000b), and most of these standards contain general principles from which appropriate interfaces and procedures can be derived. This makes the standards authoritative statements of good professional practice, but makes it difficult to know whether an interface conforms to the standard. Reed et al (1999) discuss approaches to conformance in these standards.

ISO/IEC JTC1 has established SC35 for User Interfaces, evolving out of work on keyboard layout. This group has produced standards for icons, gestures and cursor control, though these do not appear to have been widely adopted.

More recently usability experts have worked with the ISO/IEC JTC1 SC7 Software Engineering subcommittee to integrate usability into software engineering and software quality standards. This has requires some compromises: for example reconciling different definitions of usability by adopting the new term "quality in use" to represent the ergonomic concept of usability (Bevan, 1999).

It is unfortunate that at a time of increasing expectations of easy access to information via the internet, international standards are expensive and difficult to obtain. This is an inevitable consequence of the way standards bodies are financed. Information on how to obtain standards can be found in Table 4.

TYPES OF STANDARD FOR HCI

Standards related to usability can be categorised as primarily concerned with:

1. The use of the product (effectiveness, efficiency and satisfaction in a particular context of use).

2. The user interface and interaction.

3. The process used to develop the product.

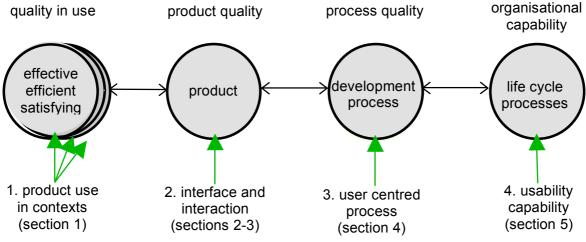4. The capability of an organisation to apply user centred design.

Figure 1: Categories of standard

Figure 1 illustrates the logical relationships: the objective is for the product to be effective, efficient and satisfying when used in the intended contexts. A prerequisite for this is an appropriate interface and interaction. This requires a user centred design process, which to be achieved consistently requires an organisational capability to support user centred design.

DEVELOPMENT OF ISO STANDARDS

International standards for HCI are developed under the auspices of the International Organisation for Standardisation (ISO) and the International Electrotechnical Commission (IEC). ISO and IEC comprise national standards bodies from member states. The technical work takes place in Working Groups of experts, nominated by national standards committees.

The standards are developed over a period of several years, and in the early stages the published documents may change significantly from version to version until consensus is reached. As the standard becomes more mature, from the Committee Draft stage onwards, formal voting takes place by participating national member bodies.

The status of ISO and IEC documents is summarised in the title of the standard, as described in Table 1, and Table 2 shows the main stages of developing an international standard.

Table 1. ISO and IEC document titles

Example	Explanation
ISO 1234 (2004)	ISO standard 1234, published in 2004
ISO 1234-1 (2004)	Part 1 of ISO standard 1234, published in 2004
ISO/IEC 1234 (2004)	Joint ISO/IEC standard 1234, published in 2004
ISO TS 1234 (2004)	An ISO Technical Specification: a normative document that may later be revised and published as a standard.
ISO PAS 1234 (2004)	An ISO Publicly Available Specification: a normative document with less agreement than a TS, that may later be revised and published as a standard.
ISO TR 1234 (2004)	An ISO Technical Report: an informative document containing information of a different kind from that normally published in a normative standard.
ISO *xx* 1234 (2004)	A draft standard of document type *xx* (see below and Table 2)

Table 2. Stages of development of draft ISO documents

Stage	Document type		Description
1	AWI	Approved Work Item	Prior to a working draft
2	WD	Working Draft	Preliminary draft for discussion by working group
3	CD	Committee Draft	Complete draft for vote and technical comment by national bodies
	CD TR or TS	Committee Draft Technical Report/Specification	
4	CDV	Committee Draft for Vote (IEC)	Final draft for vote and editorial comment by national bodies
	DIS	Draft International Standard	
	FCD	Final Committee Draft (JTC1)	
	DTR or DTS	Draft Technical Report/Specification	
5	FDIS	Final Draft International Standard	Intended text for publication for final approval

STANDARDS DESCRIBED IN THIS CHAPTER

Table 3 lists the international standards and technical reports related to HCI that were published or under development in 2005. The documents are divided into two categories: those containing general principles and recommendations, and those with detailed specifications. They are also grouped according to subject matter. All the standards are briefly described below.

Table 3. Standards described in this chapter

Section	Principles and recommendations	Specifications
1.Context and test methods	ISO/IEC 9126-1: Software Engineering - Product quality - Quality model	ISO DIS 20282-1: Ease of operation of everyday products – Context of use and user characteristics
	ISO/IEC TR 9126-4: Software Engineering - Product quality - Quality in use metrics	ISO DTS 20282-2: Ease of operation of everyday products – Test method
	ISO 9241-11: Guidance on Usability	ISO/IEC FCD 35062: Common Industry Format for usability test reports
	ISO/IEC DTR 19764 Guidelines methodology, and reference criteria for cultural and linguistic adaptability in information technology products	Draft Common Industry Format for Usability requirements
2.Software interface and interac-tion	ISO/IEC TR 9126-2: Software Engineering - Product quality – External metrics	ISO/IEC 10741-1: Dialogue interaction - Cursor control for text editing
	ISO/IEC TR 9126-3: Software Engineering - Product quality – Internal metrics	ISO/IEC 11581: Icon symbols and functions
	ISO 9241: Ergonomic requirements for office work with visual display terminals. Parts 10-17	ISO/IEC 18021: Information Technology - User interface for mobile tools
	ISO 14915: Software ergonomics for multimedia user interfaces	ISO/IEC 18035 Icon symbols and functions for controlling multimedia software applications
	ISO TS 16071: Software accessibility	ISO/IEC 18036 Icon symbols and functions for World Wide browser toolbars
	ISO TR 19765 Survey of existing icons and symbols for elderly and disabled persons	ISO WD 24755: Screen icons and symbols for personal, mobile, communications devices
	ISO TR 19766 Design requirements for icons and symbols for elderly and disabled persons	ISO FCD 24738: Icon symbols and functions for multimedia link attributes
	ISO CD 23974: Software ergonomics for World Wide Web user interfaces	ISO/IEC 25000 series: Software Product Quality Requirements and Evaluation
	IEC TR 61997: Guidelines for the user interfaces in multimedia equipment for general purpose use	
3.Hard-ware interface	ISO 11064: Ergonomic design of control centres	ISO 9241: Ergonomic requirements for office work with visual display terminals. Parts 3-9
	ISO/IEC TR 15440 Future keyboards and other associated input devices and related entry methods	ISO 13406: Ergonomic requirements for work with visual displays based on flat panels
		ISO/IEC 14754: Pen-based interfaces - Common gestures for text editing with pen-based systems
4.Develop-ment process	ISO 13407: Human-centred design processes for interactive systems	ISO/IEC 14598: Information Technology - Evaluation of Software Products
	ISO TR 16982: Usability methods supporting human centred design	
5.Usability capability	ISO TR 18529: Human-centred lifecycle process descriptions	
	ISO PAS 18152: A specification for the process assessment of human-system issues	
6.Other related standards	ISO 9241-1: General Introduction	
	ISO 9241-2: Guidance on task requirements	
	ISO 10075-1: Ergonomic principles related to	

	mental workload - General terms and definitions	

APPROACHES TO HCI STANDARDS

HCI standards have been developed over the last 20 years. One function of standards is to impose consistency, and some attempt has been made to do this by ISO/IEC standards for interface components such as icons, PDA scripts and cursor control (see section 2). However, in these areas de facto industry standards have been more influential than ISO, and the ISO standards have not been widely adopted.

The ISO 9241 standards have had more impact (Stewart, 2000b; Stewart & Travis, 2002). Work on ergonomic requirements for VDT workstation hardware and the environment (ISO 9241 parts 3-9, section 3.1) began in 1983, and was soon followed by work on guidelines for the software interface and interaction (parts 10-17, section 2.1). The approach to software in ISO 9241 is based on detailed guidance and principles for design, rather than precise interface specifications, thus permitting design flexibility.

More recently standards and metrics for software quality have been defined by the software engineering community.

The essential user centred design activities needed to produce usable products are described in the ergonomic standard ISO 13407 (section 4). These principles have been refined and extended in a model of usability maturity that can be used to assess the capability of an organisation to carry out user centred design: ISO TR 18529, section 5. Reed et al (1999) and Burmester & Machate (2003) discuss how different types of guidelines can be used to support the user centred development process.

STANDARDS

1. Use in context and test methods

1.1 ISO 9241-11: Guidance on Usability (1998)

This standard (which is part of the ISO 9241 series described in section 2.1) provides the definition of usability that is used in subsequent related ergonomic standards:

> Usability: the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

1.2 ISO/IEC 9126-1: Software Engineering - Product quality - Part 1: Quality model (2001)

Describes six categories of software quality that are relevant during product development including quality in use (similar to the definition of usability in ISO 9241-11), with usability defined more narrowly as ease of use (Bevan, 1999).

1.3 ISO/IEC DTR 19764 Guidelines methodology, and reference criteria for cultural and linguistic adaptability in information technology products (2003)

Defines a methodology and a guided checklist for evaluation of cultural adaptability in software, hardware and other IT products.

1.4   ISO/IEC TR 9126-4: Software Engineering - Product quality - Part 4: Quality in use metrics (2004)

Contains examples of metrics for effectiveness, productivity, safety and satisfaction.

1.5   ISO 20282: Ease of operation of everyday products

Ease of operation is concerned with the usability of the user interface of everyday products.

Part 1: Context of use and user characteristics (DIS: 2004)

Explains how to identify which aspects are relevant in the context of use and describes how to identify the characteristics which cause variance within the intended user population.

Part 2: Test method (CD TS: 2005)

Specifies a test method for measuring the ease of operation of public walk up and use products and of everyday consumer products.

1.6   Common Industry Format

ISO 25062: Common Industry Format for Usability Test Reports (2006)

Specifies a format for documenting summative usability test reports for use in contractual situations, and was originally published as ANSI/NCITS 354 (Bevan et al, 2002).

Draft Common Industry Format for Usability Requirements (2005)

Specifies a format for documenting summative usability requirements to aid communication early in development, and is expected to become an ISO standard.

2. Software interface and interaction

These standards can be used to support user interface development in the following ways:

- To specify details of the appearance and behaviour of the user interface. ISO 14915 and IEC 61997 contain recommendations for multi-media interfaces. More specific guidance can be found for icons in ISO/IEC 11581, PDAs in ISO/IEC 18021 and cursor control in ISO/IEC 10741.
- To provide detailed guidance on the design of user interfaces (ISO 9241 parts 12-17).
- To provide criteria for the evaluation of user interfaces (ISO/IEC 9126 parts 2 and 3).

However the attributes that a product requires for usability depend on the nature of the user, task and environment. ISO 9241-11 can be used to help understand the context in which particular attributes may be required. Usable products can be designed by incorporating product features and attributes known to benefit users in particular contexts of use.

2.1   ISO 9241: Ergonomic requirements for office work with visual display terminals

ISO 9241 parts 10 and 12 to 17 provides requirements and recommendations relating to the attributes the software.

Part 10: Dialogue principles (1996)

Contains general ergonomic principles which apply to the design of dialogues between humans and information systems: suitability for the task, suitability for learning, suitability for individualisation, conformity with user expectations, self descriptiveness, controllability, and error tolerance.

Part 12: Presentation of information (1998)

Includes guidance on ways of representing complex information using alphanumeric and graphical/symbolic codes, screen layout, and design as well as the use of windows.

Part 13: User guidance (1998)

Provides recommendations for the design and evaluation of user guidance attributes of software user interfaces including prompts, feedback, status, on-line help and error management.

Part 14: Menu dialogues (1997)

Provides recommendations for the design of menus used in user-computer dialogues, including menu structure, navigation, option selection and execution, and menu presentation.

Part 15: Command dialogues (1997)

Provides recommendations for the design of command languages used in user-computer dialogues, including command language structure and syntax, command representations, input and output considerations, and feedback and help.

Part 16: Direct manipulation dialogues (1999)

Provides recommendations for the design of direct manipulation dialogues, and includes the manipulation of objects, and the design of metaphors, objects and attributes.

Part 17: Form filling dialogues (1998)

Provides recommendations for the design of form filling dialogues, including form structure and output considerations, input considerations, and form navigation.

2.2   ISO/IEC 9126: Software Engineering - Product quality

ISO/IEC 9126-1 (described in section 1.2) defines usability in terms of understandability, learnability, operability and attractiveness. Parts 2 and 3 include examples of metrics for these characteristics.

Part 2: External metrics (2003)

Describes metrics that can be used to specify or evaluate the behaviour of the software when operated by the user.

Part 3: Internal metrics (2003)

Describes metrics that can be used to create requirements that that describe static properties of the interface that can be evaluated by inspection without operating the software.

2.3   Icon symbols and functions

ISO/IEC 11581 Icon symbols and functions

Part 1: Icons - General (2000)

This part contains a framework for the development and design of icons, including general requirements and recommendations applicable to all icons.

Part 2: Object icons (2000)

Part 3: Pointer icons (2000)

Part 4: Control icons (CD: 1999)

Part 5: Tool icons (2004)

Part 6: Action icons (1999)

ISO/IEC 18035 Icon symbols and functions for controlling multimedia software applications (2003)

Describes user interaction with and the appearance of multimedia control icons on the screen.

ISO/IEC 18036 Icon symbols and functions for World Wide browser toolbars (2003)

Describes user interaction with and the appearance of World Wide Web toolbar icons on the screen.

ISO WD 24755: Screen icons and symbols for personal, mobile, communications devices (2005)

Defines a set of display screen icons for personal mobile communication devices.

ISO FCD 24738: Icon symbols and functions for multimedia link attributes (2004)

Describes user interaction with and the appearance of link attribute icons on the screen.

ISO CD TR 19765 Survey of existing icons and symbols for elderly and disabled persons (2003)

Contains examples of icons for features and facilities used by people with disabilities.

ISO CD TR 19766 Design requirements for icons and symbols for elderly and disabled persons (2005)

2.4   ISO 14915: Software ergonomics for multimedia user interfaces

Part 1: Design principles and framework (2002)

This part provides as an overall introduction to the standard.

Part 2: Multimedia control and navigation (2003)

This part provides recommendations for navigation structures and aids, media controls, basic controls, media control guidelines for dynamic media and controls and navigation involving multiple media.

Part 3: Media selection and combination (2002)

This part provides general guidelines for media selection and combination, media selection for information types, media combination and integration and directing users' attention.

Part 4: Domain specific multimedia interfaces (AWI)

This part is intended to cover computer based training, computer supported co-operative work, kiosk systems, on-line help and testing and evaluation.

2.5   IEC TR 61997: Guidelines for the user interfaces in multimedia equipment for general purpose use (2001)

Gives general principles and detailed design guidance for media selection, and for mechanical, graphical and auditory user interfaces.

2.6   ISO CD 9241-151: Software ergonomics for World Wide Web user interfaces (2004)

Provides recommendations and guidelines for the design of web user interfaces.

2.7   ISO/IEC 18021: Information Technology - User Interface for mobile tools for management of database communications in a client-server model (2002)

This standard contains user interface specifications for PDAs with a data interchange capability with corresponding servers.

2.8   ISO/IEC 10741-1: Dialogue interaction - Cursor control for text editing (1995)

This standard specifies how the cursor should move on the screen in response to the use of cursor control keys.

3. Hardware interface

3.1   ISO 9241: Ergonomic requirements for office work with visual display terminals

Parts 3 to 9 contain hardware design requirements and guidance.

Part 3: Visual display requirements (1992)

Specifies the ergonomics requirements for display screens that ensure that they can be read comfortably, safely and efficiently to perform office tasks.

Part 4: Keyboard requirements (1998)

Specifies the ergonomics design characteristics of an alphanumeric keyboard that may be used comfortably, safely and efficiently to perform office tasks. Keyboard layouts are dealt with separately in various parts of ISO/IEC 9995: Information Processing - Keyboard Layouts for Text and Office Systems (1994).

Part 5: Workstation layout and postural requirements (1998)

Specifies the ergonomics requirements for a workplace that will allow the user to adopt a comfortable and efficient posture.

Part 6: Guidance on the work environment (1999)

Provides guidance on the working environment (including lighting, noise, temperature, vibration and electromagnetic fields) that will provide the user with comfortable, safe and productive working conditions.

Part 7: Requirements for display with reflections (1998)

Specifies methods of measurement of glare and reflections from the surface of display screens to ensure that anti-reflection treatments do not detract from image quality.

Part 8: Requirements for displayed colours (1997)

Specifies the requirements for multicolour displays.

Part 9: Requirements for non-keyboard input devices (2000)

Specifies the ergonomics requirements for non-keyboard input devices that may be used in conjunction with a visual display terminal.

3.2 ISO 13406: Ergonomic requirements for work with visual displays based on flat panels

Part 1: Introduction (1999)

Part 2: Ergonomic requirements for flat panel displays (2001)

3.3 ISO/IEC 14754: Pen-based interfaces - Common gestures for text editing with pen-based systems (1999)

3.4 ISO/IEC TR 15440 Future keyboards and other associated input devices and related entry methods (2005)

3.5 ISO 11064: Ergonomic design of control centres

This eight part standard contain ergonomic principles, recommendations and guidelines.

Part 1: Principles for the design of control centers (2000)

Part 2: Principles of control suite arrangement (2000)

Part 3: Control room layout (1999)

Part 4: Workstation layout and dimensions (2004)

Part 5: Human-system interfaces (FCD: 2002)

Part 6: Environmental requirements for control rooms (2005)

Part 7: Principles for the evaluation of control centers (FDIS: 2005)

Part 8: Ergonomic requirements for specific applications (WD: 2000)

4. The Development Process

ISO 13407 explains the activities required for user centred design, and ISO 16982 outlines the types of methods that can be used. ISO/IEC 14598 give a general framework for the evaluation of software products using the model in ISO/IEC 9126-1.

ISO 13407: Human-centred design processes for interactive systems (1999)

ISO TR 16982: Usability methods supporting human centred design (2002)

ISO/IEC 14598: Information Technology - Evaluation of Software Products (1998-2000)

5. Usability capability of the organisation

The usability maturity model in ISO TR 18529 contains a structured set of processes derived from ISO 13407 and a survey of good practice. It can be used to assess the extent to which an organisation is capable of carrying out user-centred design (Earthy et al, 2001). ISO PAS 18152 extends this to the assessment of the maturity of an organisation in performing the processes that make a system usable, healthy and safe.

ISO TR 18529: Ergonomics of human-system interaction - Human-centred lifecycle process descriptions (2000)

ISO PAS 18152: Ergonomics of human-system interaction – A specification for the process assessment of human-system issues (2003)

6. Other related standards

ISO 9241-2: Part 2:Guidance on task requirements (1992)

ISO 10075: Ergonomic principles related to mental workload –

Part 1: General terms and definitions (1994)

Part 2: Design principles (1996)

Part 3: Principles and requirements concerning methods for measuring and assessing mental workload (2004)

ISO TS 16071: Guidance on accessibility for human-computer interfaces (2003)

Provides recommendations for the design of systems and software that will enable users with disabilities greater accessibility to computer systems (see Gulliksen and Harker, 2004).

ISO CD 9241-20: Accessibility guideline for information communication equipment and services: General guidelines (2005)

WHERE TO OBTAIN INTERNATIONAL STANDARDS

ISO standards have to be purchased. They can be obtained directly from ISO, or from a national standards body (Table 4).

Table 4. Sources of standards and further information

Information	URL
Published ISO standards, and the status of standards under development.	www.iso.org/iso/en/ Standards_Search.StandardsQueryForm
ISO national member bodies	www.iso.ch/addresse/membodies.html
NSSN: A National Resource for Global Standards	www.nssn.org

FUTURE OF HCI STANDARDS

Now that the fundamental principles have been defined, the ergonomics and software quality standards groups are consolidating the wide range of standards into more organised collections. Some of the new series are already Approved Work Items (AWI), CDs or DIS.

ISO 9241: Ergonomics of human-system interaction

ISO 9241 is in the process of being extended with the new parts shown below.

Part 20: Accessibility guidelines for information communication equipment and services (DIS: 2006)

Software

Part 100: Introduction to Software Ergonomics

Part 110: Dialogue principles (2006, revision of ISO 9241-10)

Parts 111-139 reserved for revision and extensions to existing parts 12-17

Parts 140-149 Window interfaces, including parts of ISO 14915

Part 151: Software ergonomics for World Wide Web user interfaces (CD: 2006)

Part 171: Guidance on software accessibility (CD: 2006)

Process

Parts 200-219 will include the business case for HCD, terminology, and guidance for managers (a revision of ISO 13407).

Parts 220-229 will include ISO TR 18529 and ISO PAS 18152

Parts 230-239 are for methods, and will include ISO TR 16982

Parts 240-249 are for evaluation

Ergonomic requirements and measurement techniques for electronic visual displays

Part 300: Introduction to requirements and measurement techniques for electronic visual displays (DIS: 2006)

Part 302: Terminology for electronic visual displays (DIS: 206)

Part 303: Requirements for electronic visual displays (DIS: 2006)

Part 304: User performance test method (CD: 2005)

Part 305: Optical laboratory test methods for electronic visual displays (DIS: 2005)

Part 306: Field assessment methods for electronic visual displays (DIS 2006)

Part 307: Analysis and compliance test methods for electronic visual displays (DIS: 2006)

Physical Input devices

Part 400: Guiding principles, introduction and general design requirements (DIS: 2006)

Part 410: Design criteria for products (DIS: 2006)

Part 420: Ergonomic selection procedures

Part 500: Workplaces: reserved for revision of ISO 9241-5

Part 600: Environment: reserved for revision of ISO 9241-6

Part 700: Special application domains

Part 710: Control Centre reserved for revision of ISO 11064

Part 900: Tactile and haptic interactions

ISO/IEC 25000 series: Software Product Quality Requirements and Evaluation (SQuaRE)

The ISO/IEC 25000 series of standards will replace and extend ISO/IEC 9126, ISO/IEC 14598 and the Common Industry Format.

ISO/IEC 25000: Guide to SquaRE (2005)

ISO/IEC AWI 25001: Evaluation planning and management (ISO/IEC 14598-2)

ISO/IEC AWI 25010: Quality model (ISO/IEC 9126-1)

ISO/IEC CD 25012: Data quality model

ISO/IEC FCD 25020: Quality measurement reference model and guide (2005)

ISO/IEC DTR 25021: Quality measurement primitives (2005)

ISO/IEC AWI 25022: Measurement of internal quality (ISO/IEC 9126-3)

ISO/IEC AWI 25023: Measurement of external quality (ISO/IEC 9126-2)

ISO/IEC AWI 25024: Measurement of quality in use (ISO/IEC 9126-4)

ISO/IEC FCD 25030: Quality requirements (2005)

ISO/IEC AWI 25040: Evaluation reference model and guide (ISO/IEC 14598-1)

ISO/IEC AWI 25041: Evaluation modules (ISO/IEC 14598-6)

ISO/IEC AWI 25042: Evaluation process for developers (ISO/IEC 14598-3)

ISO/IEC AWI 25043: Evaluation process for acquirers (ISO/IEC 14598-4)

ISO/IEC AWI 25044: Evaluation process for evaluators (ISO/IEC 14598-5)

ISO/IEC FCD 25051: Requirements for quality of Commercial Off-The-Shelf (COTS) software product and instructions for testing (previously ISO/IEC 12119) (2005)

ISO/IEC 25062: Common Industry Format for usability test reports (previously ANSI/NCITS 354) (2006)

CONCLUSIONS

The majority of effort in ergonomics standards has gone into developing conditional guidelines (Reed et al, 1999), following the pioneering work of Smith & Mosier (1986). Parts 12 to 17 of ISO 9241 contain a daunting 82 pages of guidelines. These documents provide an authoritative source of reference, but designers without usability experience have great difficulty applying these types of guidelines (de Souza & Bevan, 1990; Thovtrup & Nielsen, 1991). Several checklists have been prepared to help assess conformance of software to the

main principles in ISO 9241 (Gediga et al., 1999; Oppermann & Reiterer , 1997; Prümper 1999).

In the US there is continuing tension between producing national standards that meet the needs of the large US market, or contributing to the development of international standards. Having originally participated in the development of ISO 9241, the HFES decided to put subsequent effort into a national version: HFES-100 and HFES-200 (see Reed et al, 1999).

Standards are more widely accepted in Europe than the USA, partly for cultural reasons, and partly to achieve harmonisation across EU countries. Many international standards (including ISO 9241) have been adopted as European standards. The EU Supplier's Directive (European Union, 2004) requires that the technical specifications used for public procurement must be in terms of any relevant European standards. Ergonomic standards such as ISO 9241 can also be used to support adherence to European regulations for the health and safety of display screens (European Union, 1990; Bevan, 1991; Stewart, 2000a).

Stewart & Travis (2002) differentiate between standards which are formal documents published by standards making bodies and developed through a consensus and voting procedure, and published guideline that depend on the credibility of their authors. This gives standards authority, but it is not clear how many of the standards listed in this chapter are widely used. One weakness of most of the HCI standards is that they have been discussed round a table rather than being developed in a user centred way, testing prototypes during development. The US Common Industry Format is an exception, undergoing trials during its evolution outside ISO. There are ISO procedures to support this, and ISO 20282 is being issued initially as a Technical Specification so that trials can be organised before it is confirmed as a standard. This is an approach that should be encouraged in future.

Another potential weakness of international standards is that the development process is slow, and the content depends on the voluntary effort of appropriate experts. Ad hoc groups can move more quickly, and when appropriately funded can produce superior results, as with the US National Cancer Institute web design guidelines (Koyani et al, 2003), which as a consequence may remain more authoritative than the forthcoming ISO 9241-151 (Bevan, 2005).

Following trends in software engineering standards, the greatest benefits may be obtained from HCI standards that define the development process and the capability to apply that process (sections 4 and 5). ISO 13407 provides an important foundation (Earthy et al, 2001) and the usability maturity of an organisation can be assessed using ISO TR 18529 or ISO PAS 18152, following the procedure in the Software Process Assessment standard ISO TR 15504-2 (Sherwood Jones & Earthy, 2003).

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TERMS AND DEFINITIONS

Usability: The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use. [ISO 9241-11]

Context of use: The users, tasks, equipment (hardware, software and materials), and the physical and social environments in which a product is used. [ISO 9241-11]

Prototype: Representation of all or part of a product or system that, although limited in some way, can be used for evaluation. [ISO 13407]

Task: The activities required to achieve a goal. [ISO 9241-11]

User: Individual interacting with the system. [ISO 9241-10]

Interaction: Bi-directional information exchange between users and equipment. [IEC 61997]

User interface: The control and information giving elements of a product and the sequence of interactions that enable the user to use it for its intended purpose. [ISO DIS 20282-1]