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ISO/IEC DIS 20016-1

Information technology for learning, education and training — Language accessibility and human interface equivalencies (HIEs) in e-learning applications —

Part 1: Framework and reference model for semantic interoperability

Technologies de l'information pour l'apprentissage, l'éducation et la formation — Accessibilité au langage et équivalences d'interface humaines (HIEs) dans les application d'apprentissage électronique —

Partie 1: Cadre et modèle de référence pour l'interopérabilité sémantique

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Foreword

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This document was prepared by ISO/IEC JTC1 SC36 .

This edition cancels and replaces the 2014 edition (ISO/IEC 20016-1), which has been technically revised.

The main changes compared to the previous edition are as follows:

"The missing text here will be inserted at the DIS ballot stage"

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1) ***Changes in ISO/IEC JTC1 Directives since 2014***

NOTE Since the 1st edition of ISO/IEC 20016-1 was published in 2014, ISO CS has made a number of significant changes to the "presentation" requirements of its standards. This was done via changes to ISO/IEC JTC1 Directives, Part 2 (2021 edition).

The implementation in the Part 2 Directives e**do not change the technical contents** of ISO/IEC 20016-1:

1) In addition, this 1st WD for the 2nd edition already also incorporates a number of minor revisions (e.g. minor edits, spelling, etc.) which represent work completed of this nature into 2020 (prior to COVID-19).

2) This having been said, it is noted that the primary focus of the work, by participating ISO/IEC JTC1/SC36 experts, on the 2nd edition of ISO/IEC 20016-1 is that of identifying the need for changes, additions, etc. of a technical nature to the 1st edition of this standard.

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Introduction

0.1 PURPOSE AND OVERVIEW

In an "Access for All" (AfA) approach, a key missing component in the development of ITLET standards, in support of culture, language, and individual needs is one which focuses on the (intended) meaning and use of the contents of the *recorded information* being interchanged among, on the one hand, (1) an individual as a learner, and, on the other, (2) other Persons in an ITLET context. This requires the assurance of the development and availability of contents, (e.g., as Human Interface Equivalents (HIEs), in any ITLET application which support individual accessibility requirements in the form of language accessibility.

The primary purpose of this multipart standard is to ensure that "individual accessibility" rights are supported from a "content" and semantic interoperability requirements perspective, both:

1) within the IT system(s) of an organization, and/or public administration; and,

2) Open-edi interchanges of the IT system(s) of that organization and/or public administrations with any individual.

It is also recognized that there already exist international standards (ISO, ISO/IEC and/or ITU) which need to be integrated and/or taken into account in the development of this Part of ISO/IEC 20016 "*Framework and Reference Model*"

Further, it is recognized that localization requirements of a cultural adaptability and multilingual requirements nature need to be capable of being supported in this multipart standard.

In addition, this standard is based on the principle of maximizing use of applicable / relevant international standards.

The *UN Convention of the Rights of Persons with Disabilities* (2006) provides a unifying basis for legal and regulatory requirements of jurisdictional domains as external constraints pertaining to language accessibility and the provision of human interface equivalents in support of semantic interoperability.

A primary purpose of ISO/IEC 20016-1 Framework and Reference Model is to make organizations and public administrations aware, that where they are content providers to develop content, (e.g., as sets of recorded information (SRIs)) for use by individuals that such SRIs meet applicable language accessibility requirements from an individual accessibility requirements needs perspective, i.e., as applicable in that jurisdictional domain doing so through the parallel development of required human interface equivalents for these SRIs.

As such, the development of any SRI requires the assurance of the development and availability of its contents in any learning, education and training (LET) application in a manner that supports individual accessibility requirements. This requires the development and preparation in a non-temporal manner of all the HIEs (from both content and presentation perspectives) as are required in the accordance with the requirements of individual accessibility the applicable jurisdictional domain (at whatever level) for use in a LET context.

The language(s) used in a learning, education and training (LET) context is determined by four key factors; namely:

1) the language of the learner (apart from the learner wanting to learn another language);

2) the language of instruction (LOI);

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3) the needs of the learner with disabilities and anyone in a disabling context (this includes providing the semantics of the contents in the form of a Human Interface Equivalents (HIEs) and doing so in a systematic and IT-facilitated manner)[1];

4) the fact that the language of instruction (LOI), and thus the development of LET related products and services is often governed by: (a) general rules governing the use of an official language (or de facto language) of the jurisdictional domain in which the LET activity takes place; (b) a particular law or regulation of a jurisdictional domain which pertains to the use of a language for LET purposes, i.e., as a "legally recognized language (LRL)".

Jurisdictional domains have also instituted policies or legislation that require the ability to provide access to education in one or more languages and to do so increasingly in support of cultural diversity within a single country as a jurisdictional domain. Examples include: (1) Gaelic and Welsh in addition to English in the UK; (2) aboriginal and native languages in addition to English and/or French in Canada; and (3) multiple official languages in the states of South Africa, India, Nigeria and many other countries. In addition, the EU as a jurisdictional domain has multilingual Human Interface Equivalency requirements within itself as a single (supra) jurisdictional domain.

This multipart standard recognizes that jurisdictional domains have also instituted policies, legislation, regulations, etc., that require LET provides to (1) have the ability from both ICT and content semantic perspectives to provide learning, education, and/or training in one or more languages; and, (2) to do so in support of not only its cultural diversity but more importantly in support of any "LET language (LET-L). This work integrates regulatory requirements from both "accessibility" and "language" requirements of jurisdictional domains.

In addition to the three strategic directions of ISO/IEC JTC1 standards development work, i.e., (1) portability, (2) interoperability, and, (3) cultural adaptability, this standard also adds individual accessibility[2] requirements (as stated in the "*UN Convention on the Rights of Persons with Disabilities*). {See Annex Annex A} As such, linguistic adaptability and use of language are of importance.

The ISO/IEC 20016 multipart standard, and in particular ISO/IEC 20016-1 *Framework and Reference Model for Semantic Interoperability*, has been developed and structured in a manner to be able to support and facilitate legal and regulatory requirements governing the application and use of ITLET standards and solutions.

0.2 BENEFITS TO IMPLEMENTERS OF THIS MULTIPART ISO/IEC 20016 STANDARD

There are several benefits from taking an integrated approach: First, this standard provides for a systematic, cost-efficient and effective approach to the creation of robust, (re-)useable and accessible contents components for individual users, i.e., human interface equivalents (HIEs) at any level of granularity from that of simple (atomic) data element to that of a "book" or a law or regulation, the contents of a whole Website, etc. Without this standards development work, it will be very difficult to achieve workable solutions to providing language accessibility alternatives to individuals in their use of information technologies (IT) in support of learning, education, and training (LET) as provided by organizations and public administrations.

Second, this multipart standard will provide cost savings to those organizations and public administrations, individual users and LET providers of LET-based products and services, ("LET providers"). In addition, it will

[1] There already exist both different forms of written representations of a language as well as in the form of symbols, glyphs, oral, pictorial, etc. We also have other forms of recorded information of a language including audio, visual, transforms, (e.g., Braille, etc.).

[2] While "individual accessibility" here is a right of individuals in support of any individual being informed, provided recorded information at a level of unambiguity to be able to support "decision-taking" and/or commitment-making", the more generic requirement here in support of the same among individuals, organizations and/or public administrations is that of "semantic interoperability".

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provide the benefits of semantic interoperability, re-usability and accessibility (access) for all (AfA). It will do so from a multilingual requirements[3] perspective and in support of cultural adaptability and diversity.

Third, having a common IT-facilitated approach will: (1) benefit individual users world-wide (doing so in respect and support of cultural diversity); (b) ensure that requirements of jurisdictional domains (at whatever level) can be supported in a very cost-effective and efficient manner; and, (2) also benefit LET providers of LET focused products.

Fourth, essential to interoperability are elements for making e-learning accessible to all. Without this work, solutions to providing language accessibility alternatives in the use of information technologies in support of learning, education, training (LET): (1) will not be integrated across IT platforms and organizations; (2) will be unnecessarily re-invented in every organization and public administration involving added large costs; (3) will exacerbate current lack of interoperability; (4) lead to waste of potential accessibility gains for individuals unable to identify and access e-learning systems and content in their language of use; and, (5) increase loss of usability and re-usability gains and benefits for everyone.

The present (and potential) world of use of IT systems in support of LET is gradually establishing networks and cooperative approaches which include multiple jurisdictional domains, implement accessibility alternatives, etc. Here and elsewhere, there is a requirement for metadata to support the ability to specify language accessibility and human interface equivalency in the provision of content and services. As such, this ISO/IEC 20016 multipart standard serves to further enable this developmental process.

The concept of semantic collaboration space (SCS), introduced in Clause 7 below, with respect to language accessibility and human interface equivalents (HIE) aspects of semantic interoperability requirements is directed at supporting the implementation of the *UN Convention on the Rights of Persons with Disabilities* in an ITLET context.

However, this multipart ISO/IEC 20016 standard, while developed in an ITLET context, like the multipart ISO/IEC 24751 standard, has many aspects which are not ITLET specific. The ISO/IEC 24751 multipart standard is being used by many Persons, (organizations and public administrations), for implementation in domains which are not ITLET specific. This ISO/IEC 20016-1 *Framework and Reference Model for Semantic Interoperability* standard supports a similar “Access for All” (AfA) approach.

0.3 PRIMARY SOURCES OF REQUIREMENTS

The evolution of information communication technologies has created the ability to be able to support any and all language accessibility and provide human interface equivalents (HIEs) representations for any set of recorded information (SRI) in support of:

1) individual accessibility requirements; and,

2) to do so at whatever level of unambiguity and granularity required.

There are therefore no information or communication technology (ICT) barriers to the ability to support individual accessibility requirements for sets of recorded information (SRIs) within the IT systems of organizations and public administrations.

[3] Multilingual communications (whatever the supporting IT platform used including the Internet) is already supported by existing technologies. Many ISO/IEC and ISO standards already exist (or are under development) whose contents can and will be used as building blocks for the integration of this new LET standard.

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The primary source of requirements governing the development of this multipart standard and in particular underline this Part of ISO/IEC 20016 is the "*UN Convention on the rights of persons*[4] *with disabilities*".[5]

This UN Convention represents a common (global) high level integration of applicable laws and regulations of UN member states as jurisdictional domains who are signatories to this UN Convention. It is understood that the actual implementation and use of this Part of ISO/IEC 20016 "*Framework and Reference Model*" and subsequent Parts 2+) in any jurisdictional domain will be conditioned by the applicable laws and regulations of that jurisdictional domain.

Figure 1 provides an integrated view of these requirements[6].

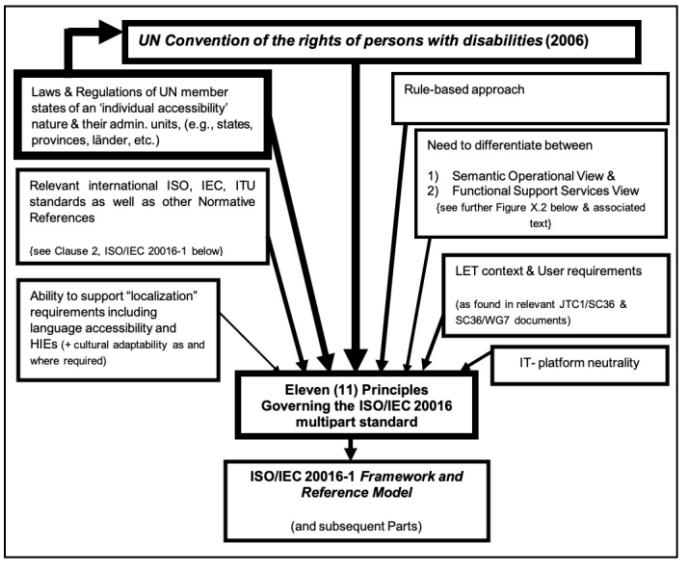


Figure 1 — Sources of requirements and focus/orientation of ISO/IEC 20016

The development of ISO/IEC 20016-1 integrates these sources of requirements and serves as the basis for the eleven (11) principles provided in Clause 6 below.

0.4 KEY CONCEPT OF "INDIVIDUAL ACCESSIBILITY"

A key unifying concept of this *Framework and Reference Model* is that of "individual accessibility".

"Individual accessibility" is a right of an individual (which is modelled as an "external constraint". Closely related rights here of an individual include "consumer protection" and "privacy protection". Collectively, these rights of individuals are known as "public policy' requirements. {See further below Clause 8 "*Public policy requirements of jurisdictional domains*"}

0.5 HOLISTIC APPROACH

This *Framework and Reference Model* for ISO/IEC 20016 takes a holistic approach (based on the fundamental principles and assumptions as stated in Clause 6 below). In addition, it is based on a key, if not primary, requirement of the "*UN Convention of persons with disabilities"*, which is that individuals be provided with

[4] *The majority of JTC1/SC36 P-members if not ISO/IEC JTC1 members are either already signatories of this UN Convention (or have already put in place national legislation of an equivalent nature). {See further ISO/IEC 24751-1:2007 Annex C (informative) "Accessibility policies and legislation/Politiques et legislation en matières d'accessibilité" [1]}*

[5] It is understood and this standard is based on the assumption that "person" here = an "individual" (and not an "organization" or "public administration", i.e., a legal or artificial person).

[6] The arrangement of the 'boxes' in illustrative Figure 1 is as follows:

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unambiguous semantics of the recorded information at the level required for informed consent for the making of decisions, and/or in the making of commitments, i.e., an *individual* with disabilities has the same and equal rights as any other individual. In support of these universal rights of an individual, {See further (normative) Annex B below}, this multipart ISO/IEC 20016 standard in ISO/IEC 20016-1 "*Framework and Reference Model*" differentiates between those aspects which are:

1) content related, i.e., the provision of recorded information at a level of unambiguity required for the purpose and use of such recorded information from a language accessibility and Human Interface equivalent(s) (HIEs) perspective. One can label this as the "Semantic Operational View" (SOV). The SOV focuses on standards which address perspectives and requirements limited to those aspects regarding the provision of recorded information as unambiguous semantics to individuals so that they are fully informed, able to make decisions, able to make commitments; and,

2) non-content related, i.e., the provision of functional support services of an ICT nature capable of supporting any individual accessibility requirement in support of those of a language accessibility and HIE nature with respect to the provision and presentation of such existing contents, i.e. sets of recorded information, capable of being made available at the human interface level through as any combination of ICTS. One can label this as the "Functional Accessibility Services View" (FASV). Many of the standardization requirements of this nature are already being addressed via the multipart ISO/IEC 24751 standard.

Here it is noted that the need to: (1) ensure unambiguity in the provision of recorded information in order for any Person to be able to participate in a commitment exchange of whatever nature, (commonly known as a "business transaction" or in an ITLET context as a "learning transaction"); and, (2) differentiate these requirements from those of the supporting ITC infrastructures and services, has been already recognized as a fundamental principle in the development of the "Open-edi" family of international standards. Here the common framework or reference model supported by the ISO, IEC, ITU, ISO/IEC JTC1, UN/EDIFACT (as well as other organizations such as OASIS) is that of the ISO/IEC 14662 "*Open-edi Reference Model*" - (a freely available ISO.IEC standard, first introduced in 1997 and one which has basically remained unchanged and now is in its 3rd 2010 edition. {See further below Annex L}

The approach to need to differentiate between:

1) the content-related and associated operational view; and,

2) the non-content related functional support services view

is based on the ISO/IEC 14662 *Open-edi Reference Model* (a widely used and freely available ISO/IEC standard new in its 3rd edition. {See further Annex L below for a summary overview of the *Open-edi Reference Model*.

Adopting the Open-edi Reference Model in an ITLET context in support of individual accessibility requirements yields the following Figure 2.

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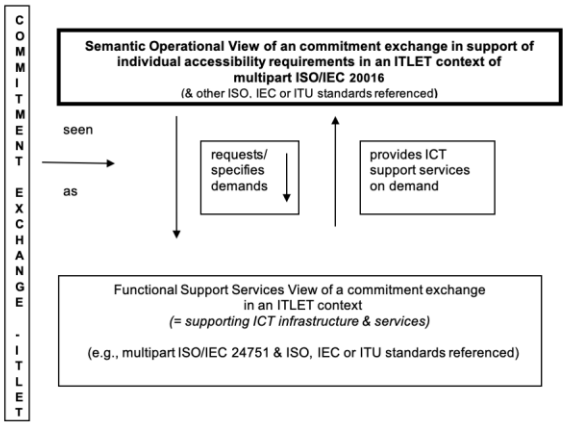


Figure 2 — Commitment exchange involving an 'individual' in a (potential) commitment exchange with an organization or a public administration in an ITLET context

The focus of the development of ISO/IEC 20016 is on the development of the "Semantic Operational View*[7] *in an 'individual accessibility' requirements context, i.e., with "individual accessibility" as a set of external constraints.

Figure 3 provides an overview of key components for ISO/IEC 20016-1 "individual accessibility "*Framework and Reference Model*". The key components of this *Framework and Reference Model* include:

1) the sources of requirements (as summarized in Clause 0.3 above and associated Figure 1)

2) the individual accessibility model (IAM) {See further Annex D (normative) and Figure D-3}

3) Semantic interoperability levels (SIEL) {See further Clause 7 and Table 1}

4) semantic collaboration space (SCS) {See further Clause 9 and Figure 6}

5) Human interface equivalency model (HIEM) {See further Clause 12 and Figure 9}

6) degrees of linguistic equivalence {See Clause 11 and Table 4}

The overall context of the "sources of requirements" {See Figure 1 above} and the application of the "Open-edi Reference Model", as adapted in an ITLET context {See Figure 2 above}, provides an integrated approach in support of semantic interoperability of individual accessibility requirements. This integrated support view is presented in an illustrative manner in Figure 3 below.

[7] ***The multipart ISO/IEC 24751 standard focuses on the "("non-content") functional support services view as do other existing or under development ISO/IEC, ISO, IEC or ITU international standards.***

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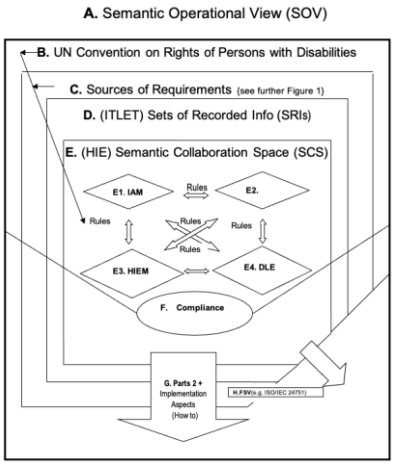


Figure 3 — Overview of key elements for ISO/IEC 20016-1 "individual accessibility" *Framework and Reference Model for Semantic Interoperability*

With respect to Figure 3 above, the informative notes are provided for each of the elements (and sub-elements) in the following table.

Table 1 —

Category	Explaination
A. Semantic Operational View	The context is all recorded information*[a], individual accessibility language ", and HIEs*
B. *UN Convention on Rights of Persons with Disabilities*	This international convention to which all of JTC1/SC36 P-members are signatories is the basis for the Framework and Reference Model which states that all individuals have the right to informed consent.
C. Sources of Requirements	These sources are illustrated further in more detail in Figure 1 above. Included here in no particular order (in addition to the overarching *UN Convention*) are: 1) laws and regulations of UN member states of an individual accessibility nature (on the whole these are harmonized with the *UN Convention*) 2) laws and regulations of UN member states of an educational ad/or language nature 3) relevant international standards 4) localization requirements 5) LET content and user requirements 6) rules (necessary for IT implementation) 7) ISO/IEC 20016-1 principles These represent external constraints which will apply to the use of the SRIs and the negotiation process

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Category	Explaination
	which takes place in the Semantic Collaboration Space (SCS)*
D. (ITLET) Sets of Recorded Information (SRIs)*	Represented here are all the possible SRIs that are used in an ITLET context to which the ISO/IEC 20016-1 *Framework and Reference Model* applies.
E. (HIE) Semantic Collaboration Space (SCS)*	This is the space where the negotiation on requirements for semantic unambiguity and language equivalency takes place, (e.g., through the use or development of HIEs). Where there are no external constraints, (e.g., two parties are engaged in an activity as they agree to use whatever language they choose, and use whatever learning resources can required), the negotiation process is open and the levels of semantic interoperability are at the discretion of each of the participants. However, where external constraints apply, four (4) sets of rules and tools apply. They interwork as a series of decisions which will ensure that any SRI will be ISO/IEC 20016-1 and UN Convention compliant. The four (4) components of the (HIE) Semantic Collaboration Space SCS are: 1) Individual Accessibility Model (IAM) 2) Semantic Interoperability Equivalence Level (SIEL)* 3) Human Interface Equivalence Model (HIEM) 4) Degrees of Linguistic Equivalence Levels Bi-directional rules apply to each of these components. Each of the components represents a decision process. There is no order to the use of these components, however there are more efficient ways to go about making the decisions than others depending on the nature of the SRIs.
E.1 IAM (Individual Accessibility Model)	The individual accessibility model (IAM) is an adaptation and use of the Open-edi Business Transaction Model (BTM) as follows: {see also Annex Annex K below}: 1) "Person" becomes "individual" who has rights as individuals as external constraints, the most universal of these are those of a "public policy" nature. IN ISO/IEC 20016-1 the focus is on "individual accessibility"; 2) "data" becomes "SRI" (set(s) of recorded information) used in an ITLET context; 3) "process" becomes SCS (semantic collaboration space);

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Category	Explaination
	4) the primary types of public policy which apply, i.e., as a right of an individual are: a) individual accessibility b) consumer protection c) privacy protection d) (other) human rights
E.2 Semantic Interoperability Equivalence Level (SIEL)*	This component represents the types of goal of the semantic collaboration space which applies to the SRI(s). The choices here are: 1) not applicable 2) information 3) decision-taking 4) commitment-making
E.3 HIEM (Human Interface Equivalency Model)	Associated with the SIEL is the nature of the SRIs(S) used in a SCS. A systematic approach (at the primitive level is provided in the form of the Human Interface Equivalency Model (HIEM). At the primitive level it consists of the intersection of two axes namely: (1) "predefined" <-> "undefined"; and, (2) "structured <-> unstructured contents of a SRI. This results in four sub-types: 1) "A" – Structured and predefined 2) "B" – Unstructured and predefined 3) "C" – Structured and undefined 4) "D" – Unstructured and undefined.
E.4 DLE (Degrees of Linguistic Equivalence)	This component works at the textual content level and allows one to choose what type of HIE equivalency level is required based on the previous decisions, (e.g., based on the goal of the SCS and resulting SIEL level applicable of the text would be required at the official language level. This component allows for 5 choices where: — exact equivalence — inexact equivalence — partial equivalence — single-to-multiple equivalence — non-equivalence.

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Category	Explaination
F. Compliance	Once the decisions and rules have been applied to the SRI in the negotiated SCS, the result is UN Convention (including applicable laws and regulations of jurisdictional domains) and ISO/IEC 20016-1 compliancy.
G. Parts 2+ Implementation Aspects (How to)	Once the compliancy has been established, what is outside the scope of this Framework and Reference Model is the "HOW" the HIEs are developed and what tools are used to achieve the required SIEL for each HIE and language accessibility for each SRI. Tools include coded domains, machine translation, natural language processing, conversion tools, etc. The choice of tools is largely dependent on the interworking of the SIEL, the HIEM, and the linguistic equivalency levels and rules.
H. FSV, (e.g. ISO/IEC 24751)	The decisions made on the semantic operational view level including collaboration on the agreed goal of the commitment exchange results in a set of requirements or demands on the Functional Services View. The FSV in turn provides ICT support services on demand. The multipart ISO/IEC 24751 standard not only serves as an example of FSV-type of standard, but also does so in an ITLET context.
[a] indicates that the term/concept is defined in the standard, Clause 3.	

0.6 USE OF "JURISDICTIONAL DOMAIN", JURISDICTION, COUNTRY[8]

Multiple definitions are currently in use for "jurisdiction". Some have legal status and others do not. Further, it is a common practice to equate "jurisdiction" with "country". Yet, at the time, it is also a common practice to refer to "provinces", "states", "länder", "cantons, "territories", "municipalities", etc., as jurisdictions. In addition, several UN member states can combine to form a "jurisdiction", (e.g., the European Union, NAFTA, etc.).

In summary, "jurisdiction" is commonly used with many different meanings in various contexts. Finally, there are differing "legal" definitions of "jurisdiction". In this standard:

— the use of "jurisdictional domain" represents its use as a defined term; and,

— the use of "jurisdiction(s)" and/or country(ies) represent their use in generic contexts.

Most often in this document "jurisdictional domain" is used as it represents the primary source of external constraints pertaining to use of language and especially as a source of rights of individuals including "individual accessibility" rights.

0.7 USE OF "Person", "INDIVIDUAL, "ORGANIZATION", "PUBLIC ADMINISTRATION" AND "person"

It is important to differentiate an "individual" from the other two sub-types of Person, namely that of an "organization" and a "public administration". There are several reasons why this is necessary. These include:

[8] **For more detailed information on this and related matters pertaining to "jurisdictional domain", see ISO/IEC 15944-5:2008 (E)** ***Information Technology - Business Operational View - Part 5: Identification and referencing of requirements of jurisdictional domains as sources of external constraints.*** **This is a freely available ISO/IEC standard.**

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a) the fact that in UN conventions, charters, treaties, etc., as well as in the laws and regulations of jurisdictional domains, the word "person" is often used without explicitly specifying whether here "person" applies only to a human being, a natural person, etc., i.e., as an "individual," but also other types of persons recognized in law, i.e., legal persons such as organizations and public administrations[9].

For example, the human right of "freedom of expression" which is stated in the UN Charter as well as the Constitution (and/or Charter of Human Rights) and of most jurisdictional domains was written and was intended to be a right of human beings (natural persons) only. However, in some jurisdictional domains, corporations have been allowed to claim the right of "freedom of expression" since they are also "Persons" i.e., "legal persons" (or artificial), with the result that "freedom of expression" rights are applied to "advertising".

As such, this multipart standard is based on the premise that human rights apply only to "individuals" and not to "organizations" or "public organizations".

b) the need to ensure that public policy requirements of jurisdictional domains {see further Clause 6 below} which are created and intended for human beings continue to pertain to human beings only, i.e., "individual";

c) for the first 20-30 years, the use of ICT was restricted to organizations and public administrations. The advent of the Internet and the World-Wide Web (WWW) has resulted in "individuals" becoming full participants in the use of ICT.

Consequently, many, if not most of the ISO/IEC JTC1 standards, as well as other ICT based standards of ISO, IEC and ITU (and others) do not distinguish whether or not the real end user is: (a) another IT system; or, (b) a Person, i.e., an entity able to make a commitment; and then whether that entity making a commitment is doing so on behalf of itself, i.e., as an "individual", or on behalf of an organization, i.e., as an organization Person.

To address these and related requirements, the additional concept and term of "Person" was introduced and defined[10] in such a way that it is capable of having the potential legal and regulatory constraints applied to it, i.e., as "external constraints"[11]. In the context of this standard, these include:

— external constraints of a public policy[12] nature in general and of an "individual accessibility" nature in particular as legal rights of an individual; and,

— external constraints of a public policy nature in general and of an individual accessibility nature in particular, which apply to organizations or public administrations as legal obligations to be complied with when providing goods and services to any individual.

In summary, there are three broad categories of a Person as a player in any process involving the making of a decision; and/or the making of a "commitment" namely: (1) the Person as "individual"; (2) the Person as "organization"; and, (3) the Person as "public administration". There are also three basic (or primitive) roles of Persons in business transactions, i.e., the making of a commitment of whatever nature, namely "buyer", "seller", and "regulator".

[9] The "*UN Convention on the Rights of Persons with Disabilities*" does not explicitly state or define what a "Person" is. From its purpose and context, one deduces that these are "natural persons" only and not "legal persons", (e.g., not organizations or public administrations). In an ICT environment (or the virtual world) one needs to be very explicit here.

[10] See further Clause 6.2 "*Rules Governing the Person component*" in ISO/IEC 15944-1:2011 (3rd ed.) titled *"Information technology – Business operational view – Part 1: Operational Aspects of Open-edi for implementation*". [The multipart ISO/IEC 15944 eBusiness standard, as well as the ISO/IEC 14662 *Open-edi Reference Model* standard, are "publicly available" ISO standards, see http://standards.iso.org/ittf/PubliclyAvailableStandards/index.html].

[11] See further *below Annex Annex C (Normative) Individual Accessibility Model (IAM)*

[12] See further Clause 8 below which covers external constraints of a public policy nature which pertain to, i.e., are rights, of an individual, (e.g., consumer protection, privacy protection, individual accessibility, etc.), as well as any other "human right".

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The reader of this standard should understand that:

— the use of Person with a capital "P" represents Person as a defined term, i.e., as the entity that carries the legal responsibility for making commitment(s);

— "individual", "organization" and "public administration" are defined terms representing the three common sub-types of "Person"; and,

— the words "person(s)" and/or "party(ies)" are used in their generic contexts independent of roles of "Person" as defined in the ISO/IEC 14662 and ISO/IEC 15944-1 standards. A "party" to any decision making process, a commitment making process (including any kind of business transaction) has the properties and behaviours of a "Person".

0.8 IMPORTANCE OF DEFINITIONS AND TERMS[13]

The ISO/IEC Directives Part 2 provide for "Terms and definitions" as a "Technical normative element", necessary for the understanding of certain terms used in the document. A primary reason for having "Terms and definitions" in a standard is because one cannot assume that there exists a common understanding, worldwide, for a specific concept. And even if one assumes that such an understanding exists, then having such a common definition in Clause 3 serves to formally and explicitly affirm (re-affirm) such a common understanding, i.e., ensure that all parties concerned share this common understanding as stated through the text of the definitions in Clause 3.

A primary objective of the ISO/IEC 20016-1 standard on Human Interface Equivalents (HIEs) is the need:

1) to have clear, unambiguous and explicitly stated definitions for the concepts introduced or used;

2) to appreciate and understand that one needs to be careful in the choice of the "label" i.e., term, to be associated with a concept; and,

3) to understand that (1) and (2) are essential to language accessibility and the creation and provision of human interface equivalents (HIEs) of the semantics of the content of what is intended to be communicated.

If one looks at any UN Convention, Treaty, Covenant, any law or regulation of a jurisdictional domain, an international standard, etc., one will find that their first two chapters, clauses or sections are: (1) "purpose" or "scope", and, (2) "definitions". From an academic and scientific LET perspective, the introduction of a new concept, its definition, what it "is" (or meant to be understood as), how and where it fits or is to be used, etc., is the focus of many papers, presentations etc.

Similarly, a key element of this Part of the multipart ISO/IEC 20016 standard (which involves multiple and quite different sectors, disciplines, etc.), is to ensure that key concepts in support of "inclusive design" objectives are clearly defined (and explained).

Definitions of concepts form the foundation of research, even more so in a multidisciplinary network context. As such, it is important that definitions be explicit, unambiguous, and precise with respect to the semantics conveyed.

This is important because the "definition" and associated label, i.e., "term", of a concept not only:

1) serves as the basis for a "common understanding" of all parties involved; but also,

[13] See further, the document titled *"Importance of Definitions for Concepts",* (2008-05-20) SC36/WG7 N0129.

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2) serves as the basis for (a) any other (non-involved) individual to be able to understand the meaning and use of a concept as per its definition; and, (b) a common bridge between ICT-based and ICT-neutral approaches.

At times, in order to ensure that the concept being defined is not confused with other related concepts, i.e., via word, label, or term, used to denote the concept, it is necessary to introduce, i.e., invent or "coin", a new term as the label for that concept. The key purpose here is not to have multiple different meanings associated with a single label or term. Not only does this cause confusion in the use of a single language but causes even more difficulties in the development of multiple HIEs in various languages let alone the ability to support language accessibility requirements.

0.9 STANDARD BASED ON RULES AND GUIDELINES

This standard is intended to be used within and outside of the ISO, IEC, and ITU communities by diverse sets of users having different perspectives and needs.

ISO states that a new standard is a:

"documented agreement containing technical specifications or other precise criteria to be used consistently as rules, guidelines, or definitions of characteristics to ensure that materials, products, processes and services are fit for their purpose".

This standard focuses on "other precise criteria to be used consistently as rules, guidelines or definitions of characteristics, to ensure that products, processes and services are fit for their purpose", i.e., from an operational and user perspective by individuals and in compliance with applicable external constraints.

This means that this standard is based on rules which are predefined and mutually agreed to. {See further 6.2.6 below}

0.10 SIZE OF DOCUMENT AND ROLE OF "ISO/IEC 20016-1 *FRAMEWORK AND REFERENCE MODEL FOR SEMANTIC INTEROPERABILITY*"

While in an ITLET context, ISO/IEC 20016-1 may seem to be voluminous, it is noted that there are many ISO/IEC JTC1 (and ISO or IEC) standards which are over 1,000 pages in size. The purpose of this "Part of ISO/IEC 20016 *"Framework and Reference Model for Semantic Interoperability"* is exactly that, to provide an overall "*Framework and Reference Model*" in an ITLET context to identify the requirements and context for implementation of these requirements in subsequent Parts of this multipart standard.

It is also recognized that (many) users and implementers of this multipart ISO/IEC 20016 may not be familiar with ISO, IEC, and/or ITU international standards, i.e., they may well be first time users of ISO/IEC standards. The two primary reasons here are that (1) this ISO/IEC 20016 multipart standard focuses on the operational view while many ISO, IEC, and/or ITU standards focus on the functional support services view, i.e., only the "C & T" aspects in an ICT context and not the "I" (=content) aspects; and, (2) that for many organizations and public administrations the need and requirement to include and support public policy requirements, i.e., those of an individual accessibility nature, in addition to consumer protection, and privacy protection requirements, is rather new. As such, ISO/IEC 20016-1 needs to be as self-contained and self-explanatory as possible.

In order that subsequent Parts 2+ of this multipart standard can be as "short" as possible, it is necessary for them to be able to use and reference normative and informative Clauses and Annexes of this Part of ISO/IEC 20016 document.

0.11 ORGANIZATION AND DESCRIPTION OF DOCUMENT

This document provides the concepts, rules and constructs in the form of a framework and reference model required for addressing semantic interoperability requirements in language accessibility and HIE context

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including those required to support external constraints of jurisdictional domains in support of individual accessibility requirements.

Following the standard Clauses 1, 2, 3, and 4 (and their sub-clauses), and Clause 5 (Conformance), this document begins Clause 6 with an overview of the key aspects of the "*Framework and Reference Model for Semantic Interoperability"*.

Clause 6 identifiers the fundamental principles governing individual accessibility requirements and does so in an ITLET and commitment exchange context. This Clause 6 not only provides the principles applicable to this Part of ISO/IEC 20016 "*Framework and Reference Model*" but also for other subsequent Parts of this multipart standard.

The purpose of Clause 7 is two-fold; namely: (1) to introduce the concept of semantic interoperability (in an ITLET context), and; (2) to support it through the construct of levels of semantic equivalency.

The purpose of Clause 8 is to place the Clause 6 individual accessibility requirements (identified as "Fundamental Principles) in the context of other generic public policy requirements of a similar nature. These include consumer protection, privacy protection and other similar rights of an individual.

Clause 9 focuses on placing individual accessibility rights of an individual (as identified in Clause 6) in the context of the use of the "collaboration space" modelling construct. "Collaboration space" is where the development of information exchange, decision-taking, and commitment-making takes place between an individual and participating Persons, (e.g., as parties to a commitment exchange. The goal of the use of semantic collaboration space is directly linked to being able to determine the level of semantic equivalency in support of individual accessibility requirements.

Use of language(s) in jurisdictional domains and external constraint requirements to support the same are presented and summarized in Clause 10. The key concepts include "official language", "de facto language", "legally recognized language (LRL)", (grammatical) language gender codes, and declared semantic equivalent (DSE)".

Clause 11 introduces the constructs of levels and degrees of linguistic equivalency. It does so based on best practices of translation theory and its application as well as ISO standards which already address language accessibility requirements in a generic manner.

The Human Interface Equivalency Model (HIEM) is introduced in Clause 12 along with its four basic Quadrants. Its purpose is to facilitate the categorization of a HIE requirement (based on application of Clause 9) and facilitate the preparation of required equivalent HIEs.

The purpose of Clause 13 is to introduce a "template" based approach to be used in Parts 2+ users and implementers of the multipart ISO/IEC 20016 standard.

Clause 14 provides the rules governing the structure, management and addition of new Parts of this multipart standard. As Parts 2+ of ISO/IEC 20016 are developed, this may well lead to changes in Clause 14.

Finally, annexes are provided for elaboration of points raised in the main normative text.

Annex A (normative) is a consolidated list of the definitions of key concepts and their associated terms used in ISO/IEC 20016-1 in ISO English and ISO French.

Annex B (normative) identifies and summarizes key requirements of the *UN Convention on the rights of persons with disabilities* which app to ISO/IEC 20016.

Annex C (normative) and Annex G (informative) provide added text and figures in support of Clause 11 on language equivalency.

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Annex E (normative) presents default conventions for the unambiguous identification and interworking of codes representing countries (including their administrative sub-divisions), their languages and their currencies.

Annex F (normative) provides an elaboration on the Open-edi construct of classes of constraints doing so in an ITLET context.

Informative Annex H and I provide practical examples of the use of coded domains as HIEs of a HIEM Quadrant "A" nature, while Annex I provides a coded domain example in support of the need to use (grammatical) gender codes in support of semantic interoperability.

Annex K (informative) provides "notes" on the use of the template provided in Clause 13 for use in the development of Parts 2+ of ISO/IEC 20016.

The purpose of Annex L (informative) is to elaborate on Clauses 0.5, 7 and 9 with respect to the Open-edi Reference Model to this standard as well as applying the construct of "collaboration space" in an ITLET and individual accessibility requirements context, i.e., as semantic collaboration space.

Although ISO/IEC 20016-1, as a "*Framework and Reference Model*" is not intended to address implementation aspects, Annex L provides considerations and examples of implementation of ISO/IEC 20016. (This is the role and purpose of Parts 2+ of this multipart standard),

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Information technology for learning, education and training — Language accessibility and human interface equivalencies (HIEs) in e-learning applications —

Part 1:
Framework and reference model for semantic interoperability

1 SCOPE

The Scope clause is a mandatory element of the text.For rules on the drafting of the Scope, refer to the ISO/IEC Directives, Part 2:2018, Clause 14.

1.1 STATEMENT OF SCOPE - MULTIPART STANDARD

This standard states the principles, rules and metadata elements for specifying language accessibility and Human Interface Equivalents (HIEs) in e-learning environments. It is structured to be able to support the requirements of applicable jurisdictional domains and in particular that of the *UN Convention on the Rights of Persons with Disabilities.*

Many jurisdictional domains have enacted legislation[14], regulations or policies that require equal access to education or information.

Like the ISO/IEC 24751-1"Framework" standard, this standard is intended to support and meet the needs of learners with disabilities in a disability context. While focused on e-learning environments, this standard, like ISO/IEC 24751, identifies and supports generic individual accessibility requirements.

The primary difference between the two "AccessForAll" ISO/IEC 24751 and ISO/IEC 20016 multipart standards is that the former focuses on the functional services view (FSV) perspective and the latter on the content operational support (COS) perspective of learners with disabilities including multilingual requirements, decision-taking and commitment-making. As such, these two sets of standards interwork to support generic individual accessibility requirements.

This multipart standard also supports individual needs and preferences related to language and culture (which are generic in nature and apply irrespective of individual accessibility requirements).

ISO/IEC 20016-1 focuses on the fundamental, i.e., primitive requirements, and does so from four key perspectives; namely:

1) the need to be able to support rights and needs of individuals especially those with disabilities to specify their needs and preferences from a "human language" perspective including equal access to recorded information especially in e-learning;

2) support the requirement for individuals with disabilities - of their individual autonomy and independence, including the freedom to make their own choices. **This includes being provided with unambiguous semantics of the recorded information at the level required for informed consent and the making of decisions which involve the making of a commitment(s).**

[14] Such legislation, and pursuant regulations, exists in jurisdictional domains at various levels of jurisdictional domains, (e.g., at the country level, state, province, or länder level, and even at the "supranational regulatory governance" level such as the European Union).

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3) the need to be able to support external constraints of jurisdictional domains as they apply to official, (or "de factor") or "legally recognized languages (LRL)"[15]; and,

4) the need to take a systematic approach and focus on the fundamental, i.e., most primitive, requirements first.

1.2 SCOPE OF THIS PART OF ISO/IEC 20016 "FRAMEWORK AND REFERENCE MODEL FOR SEMANTIC INTEROPERABILITY"

The scope of this Part of ISO/IEC 20016 is to provide a framework and reference model[16] in support of the implementation of the *UN Convention on the Rights of Persons with Disabilities* and related public policy requirements and to do so in an ITLET focused context[17].

As such, ISO/IEC 20016-1 provides the key concepts and their definitions, as well as the overall approach to addressing semantic interoperability requirements.

The primary purpose of ISO/IEC 20016-1 is four-fold:

1) serving as a framework and reference model for semantic interoperability in support of language accessibility requirements, doing so in a systematic and structured manner, in order to support and facilitate the incorporation of legal and regulatory requirements in ITLET applications. The common global legal/regulatory requirement here is that of the *UN Convention on the Rights of Persons with Disabilities* provides a unifying and common basis for requirements of an external constraints nature for those UN jurisdictional domains which are signatories to this UN Convention[18].

2) incorporating and integrating applicable aspects of existing international standards deemed very relevant to this multipart ISO/IEC 20016 standard; namely those which focus on:

    a) the making of decisions and commitments by an individual based on the individual being fully informed, i.e., in support of minimizing ambiguity in semantic interoperability

    b) semantic aspects from a linguistic and/or translation theory and practical perspective

1) to provide for a systematic approach to the development and presentation of Parts 2+ of this multipart ISO/IEC 20016; and,

2) to provide an initial template for use by organizations and public administrations.

1.3 EXCLUSIONS

1.3.1 Physical aspects of individual accessibility

This multipart ISO/IEC 20016 standard focuses on individual accessibility from a content perspective. Therefore, the primary focus is that of semantic aspects of individuals with (or without) disabilities to be informed to be able at the appropriate level of semantic interoperability the content provided, i.e., decision-taking or commitment-making (= commitment exchange) independent of any physical aspects (including

[15] For the definition of "legally recognized language" (LRL), see*Clause* below. See also further below Clause 10 "*Rules governing language and language accessibility*".

[16] This ISO/IEC 20016 multipart standard focuses on semantic interoperability aspects from a *language accessibility and HIE perspective.* It is possible that other *Framework and Reference Models* will be developed in the form of international ISO standards in support of other aspects of this *UN Convention*.

[17] See further below Annex B which identifies which Clauses of this *UN Convention* are of particular relevance to ISO/IEC 20016.

[18] The *UN Vienna Convention on the Law of Treaties* (1969) provides rules governing the legally binding nature of the UN member state.

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interface) support of a commitment exchange. Any other related physical aspect of a "user preference" nature, (e.g., ISO/IEC 24751) and/or user interface resource, i.e., JTC1/SC35 standard is "excluded" from the scope of this multipart standard.

Therefore, this multipart ISO/IEC 20016 standard, which focuses on content-related ICT aspects as well as specific ICT dependent functional services, does so in a manner which is neutral to "physical" aspects of supporting individual accessibility requirements of individuals in access and use of ICT dependent elements. The multipart ISO/IEC 24751 standard is directed at providing requirements for ICT to be able to provide support, at the functional services level.

1.3.2 Person: individuals, organizations, and public administrations

This Part of ISO/IEC 20016 does not define how to deal with types and roles of Persons and two of its three sub-types; namely, organization, public administration. (The third is "individual"). Other standards exist or are under development that address these and related issues.[19]

This standard focuses on individuals, their (legal) rights, their needs and preferences from an individualized accessibility perspective with respect to language accessibility and HIEs in support of availability of the content and independent of technical aspects of "inclusive design", "universal design", etc.

1.3.3 Artificial languages: Programming languages, Mark-up languages, etc

ISO/IEC 20016-1 includes clauses which focus on external constraints of jurisdictional domains which pertain to the use of a "natural language" or a "special language" for use in the provision of human interface equivalents in the semantics of the recorded information interchanged of organizations and public administrations with individuals.

With respect to the use of language(s) to provide Human Interface Equivalent semantics, the following are excluded from the scope of the ISO/IEC 20016-1; namely:

— artificial languages;

— programming languages;

— hypertext languages;

— indexing languages[20]; and,

— mark-up languages[21].

However, mark-up languages such as SGML, XML, etc., may be used in Annexes as part of examples of HIEs.

[19] See further ISO/IEC 15944-1:2011 *Information technology – Business Operational View – Part 1: Operational Aspects of Open-edi for implementation; and its, Part 5: Identification and referencing of requirements of jurisdictional domains as sources of external constraints*. Both are "publicly available" standards at http://standards.iso.org/ittf/PubliclyAvailableStandards/index.html

[20] There may be requirements of a jurisdictional domain for the use of an "indexing language" as a specified and predefined terminology, a controlled vocabulary, etc. If this is the case they can be handled as a type of Quadrant A in the HIEM model. {See further below Clause 12} However, on the whole "indexing languages" are outside the scope of this Part of ISO/IEC 20016.

[21] This Part of ISO/IEC 20016 is independent of, but facilitates its mapping to any mark-up languages which may be used as a syntax for its implementation, (e.g., SGML, HTML, XML, RELAX-NG, ebXML, DSSL, etc.).

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1.3.4 Non-recorded information

This standard applies only to information or data which is recorded, i.e., recorded information, irrespective of the form, media, digital or non-digital, in electronic or non-electronic form, etc.

Information or data which is not recorded such as human conversations, i.e., communication of information among humans in any form of which no record is kept, is excluded from this standard. This is because non-recorded information cannot be processed and used in IT systems, (e.g., as HIEs).

1.3.5 Determining the individual's capability(ies) to communicate in a language(s)

The primary purpose of this standard is to provide methodologies, tools, etc., to facilitate the development and maintenance of Human Interface Equivalents (HIEs) of recorded information communicated to/among individuals with a focus on maximizing the unambiguity in the semantics being communicated especially where these support individual accessibility rights and the making of commitments.

It is outside the scope of this standard to evaluate or determine the capability or competency of an individual with respect to a particular natural or special language including any "accessibility language" of the set(s) of recorded information (SRIs) being communicated.

1.3.6 Universal design and related Functional Services View (FSV) aspects

"Universal design" as defined by the *UN Convention of the Rights of Disabled Persons* focuses on the "mechanical aspects" of IT systems, akin to the "Functional Services View (FSV): of the ISO/IEC 14662 *Open-edi reference Model*. This multipart ISO/IEC 20016 standard focuses on the semantics, i.e., meaning, of the recorded information interchanged among two or more Persons (including individuals, or organization Persons, as part of an organization or public administration). As such, the development of this Part of ISO/IEC 20016 (and future Parts) of ISO/IEC 20016 assumes that requirements of a FSV nature are already covered in existing ISO/IEC, IEC and ITU standards or those under development[22]. Should any gap here of a FSV nature be identified, then this would serve as the basis for a new standards development project.

1.3.7 General aspects of culture and environment

General aspects of culture and environment are excluded from this multipart standard. The focus of this standard is language accessibility and human interface equivalents in a commitment exchange context. In addition, specific other "rights" identified in the UN Convention such as "privacy" are being addressed in ISO standards as well as in an ITLET context through the JTC1/SC36 ISO/IEC 29187 standard.

1.4 ASPECTS NOT CURRENTLY ADDRESSED IN THE 1ST EDITION

Recommend that there be a single statement on aspects not currently addressed with the detailed information being moved into a new Annex Y?

1.4.1 Introduction - Focus and scope of 1st edition of ISO/IEC 20016-1

This is a multipart ISO/IEC standard for which the focus of this 1st edition of ISO/IEC 20016-1 is directed at addressing the most essential, i.e., primitive, aspects only.

It is recognized that there are and will be:

1) additional aspects to be addressed; and,

[22] For example, the multipart ISO/IEC 24751 standard which focuses on specifying user preferences is independent of contents, i.e., semantics of the recorded information being interchanged. As such, it provides a functional services view (FSV).

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