CINEMATIC SELVA

Object and nature become part of the land.
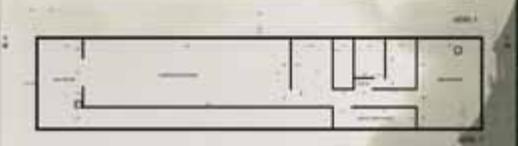
The park has a glass box that contains the nature
the city is the gallery
the cube is a frame like a window that
with nature follows the city.

Nature emerge from the river
becoming in a floating park
where it places the masters gallery.

The park is formed with "pliegues" that generate
a distorsioned topography
with places to rest and enjoy
the gallery and the city.

under water it opens
one of the "pliegue" and
through a big ramp the
people can access the gallery
and the auditorium.

Places serve, landscapes are a reference,
architecture transform the place giving
human landscape emotion.

GALERÍA ADAPTABLE DE ARQUITECTURA - LONDRES   [No25]

MENCIÓN DE HONOR

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Standards-based Content Resources: A Prerequisite for Content Integration and Content Interoperability[*][1]

Christian Galinski**

Objective: to show how standards-based approaches for content standardization, content management, content related services and tools as well as the respective certification systems not only guarantee reliable content integration and content interoperability, but also are of particular benefit to people with special needs in eAccessibility/eInclusion. **Method:** document MoU/MG/05 N0221 "Semantic Interoperability and the need for a coherent policy for a framework of distributed, possibly federated repositories for all kinds of content items on a world-wide scale"[2], which was adopted in 2005, was a first step towards the formulation of global interoperability requirements for structured content. These requirements —based on advanced terminological principles— were taken up in EU-projects such as IN-SAFETY (INfrastructure and SAFETY) and OASIS (Open architecture for Accessible Services Integration and Standardization). **Results:** Content integration and content interoperability are key concepts in connection with the emergence of state-of-the-art distributed and federated databases/repositories of structured content. Given the fact that linguistic content items are increasingly combined with or embedded in non-linguistic content items (and vice versa), a systemic and generic approach to data modelling and content management has become the order of the day. Fulfilling the requirements of capability for multilinguality and multimodality, based on open standards makes software and database design fit for eAccessibility/eInclusion from the outset. It also makes structured content capable for global content integration and content interoperability, because it enhances its potential for being re-used and re-purposed in totally different eApplications. Such content as well as the methods, tools and services applied can be subject to new kinds of certification schemes which also should be based on standards. **Conclusions:** Content must be totally reliable in some applications, e.g. in eAccessibility/ eInclusion. New methods and tools for certification, verification and validation are largely facilitated by standards-based data-models and standardized content, which will have an impact on future ICT-related standards in general. While thus increasing the reliability of data, risk of all sorts and liability will be reduced.

Keywords: international standards, content repositories, standardized structured content, standardized data models, content integration and interoperability, verification, validation, certification, eAccessibility, eInclusion

Objetivo: demostrar que tanto los enfoques basados en estándares para la normalización y la gestión de contenidos y para los servicios y las herramientas relacionados con los contenidos, como sus respectivos sistemas de certificación, no sólo garantizan la integración y la interoperabilidad confiables de contenidos, sino que, además, benefician en particular a las personas con necesidades

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especiales en e-Accesibilidad / e-Inclusión. Método: el documento "Semantic Interoperability and the need for a coherent policy for a framework of distributed, possibly federated repositories for all kinds of content items on a world-wide scale", que se adoptó en 2005, fue un primer paso en la formulación de requisitos globales de interoperabilidad para contenidos estructurados. Dichos requisitos —fundamentados en principios terminológicos— se han adoptado en proyectos de la Unión Europea como IN-SAFETY *(Infrastructure and Safety)* y OASIS *(Open architecture for Accessible Services Integration and Standardization)*. **Resultados:** La integración y la interoperabilidad de contenidos son conceptos clave en relación con la aparición de bases de datos / repositorios de contenidos estructurados. Dado que los ítems de contenido lingüístico se combinan o se insertan cada vez más en ítems de contenido no lingüístico (y viceversa), un enfoque sistémico y genérico de modelación de datos y gestión de contenidos está a la orden del día. Dicho sistema cumple los requisitos para el multilingüismo y está basado en normas abiertas, de manera que, desde el principio, adapta el *software* y el diseño de bases de datos a la e-Accesibilidad / e-Inclusión. Además, hace el contenido estructurado adaptable a la integración e interoperabilidad de contenidos, ya que refuerza su potencial para ser reutilizado y redirigido en e-aplicaciones totalmente distintas. Este contenido, al igual que los métodos, las herramientas y los servicios que se emplean, pueden ser sometidos a nuevos tipos de esquemas de certificación que estén basados en estándares. **Conclusión:** el contenido debe ser totalmente confiable en algunas aplicaciones como e-Accesibilidad / e-Inclusión. Nuevos modelos y herramientas para la certificación, la verificación y la validación son provistos por los modelos de datos basados en estándares y en contenidos normalizados, que influenciarán las futuras normas de ICT *(Integration and Content Interoperability)* en general. Además de aumentar la confiabilidad de los datos, disminuyen los riesgos de todo tipo y la responsabilidad.

Palabras clave: normas internacionales, repositorios de contenidos, contenido estructurado normalizado, modelos de datos estructurados, integración e interoperabilidad de contenidos, verificación, validación, certificación, e-Accessibilidad, e-Inclusión

Objectif: démontrer qu'aussi bien les approches basées sur des standards pour la normalisation et la gestion de contenus, pour les services et les outils en rapport avec les contenus, que leurs systèmes de certification respectifs, ne garantissent pas seulement la fiabilité de l'intégration et de l'interopérabilité de contenus, mais, de plus, bénéficient notamment aux personnes qui ont des nécessités spéciales en e-Accessibilité/e-Inclusion. **Méthode:** le document MoU/MG/05 N0221 «Semantic Interoperability and the need for a coherent policy for a framework of distributed, possibly federated repositories for all kinds of content items on a world-wide scale», adopté en 2005, représente un premier pas dans la formulation de conditions requises globales d'interopérabilité pour des contenus structurés. Ces conditions requises – basées sur des principes terminologiques – ont été adoptées dans des projets de l'UE comme IN-SAFETY (INfrastructure and SAFETY) et OASIS *(Open architecture for Accessible Services Integration and Standardization).* **Résultats:** l'intégration et l'interopérabilité de contenus sont des concepts clefs en ce qui concerne l'apparition de bases de données/réservoir de contenus structurés. Etant donné que les items de contenu linguistique se combinent et s'insèrent toujours davantage à l'intérieur des items de contenu non linguistique (et vice-versa), une approche systémique et générique de modélation de données et de gestion de contenus est à l'ordre du jour. Le système en question remplit les conditions requises pour le multilinguisme et se base sur des normes ouvertes, en sorte que depuis le début, il adapte le software et le design de bases de données à e-Accessibilité/e-Inclusion. De plus, il rend le contenu structuré adaptable à l'intégration et à l'interopérabilité de contenus, renforçant son potentiel afin d'être réutilisé et redirigé en e-applications bien distinctes. Ce contenu, les méthodes, les outils et les services que l'on emploie peuvent être soumis à de nouveaux types de schémas de certification fondés sur des standards. **Conclusion:** le contenu doit être totalement fiable dans quelques applications comme e-Accessibilité/e-Inclusion. De nouveaux modèles et des outils pour la certification, la vérification et la validation sont fournis par les modèles de données basées sur des standards et sur des contenus

normalisés, lesquels influenceront les futures normes de CT en général. En plus d'augmenter la fiabilité des données, ils diminuent tout type de risques, ainsi que la responsabilité légale.

Mots-clés: normes internationales, réservoirs de contenus, contenu structuré normalisé, modèle de données structurées, intégration et interopérabilité de contenus, vérification, validation, certification, e-Accessibilité, e-Inclusion

1. CONTENT IN eACCESSIBILITY/eINCLUSION SYSTEMS

Particularly in the field of eAccessibility/eInclusion the use and re-use of all kinds of content across different technical platforms is a must. On the other hand, strongly heterogeneous content today in reality is more the rule than the exception. Therefore, the consortium of the OASIS Project has conceived a complementary project to formulate a standard which makes ontologies in the field of ambient assisted living (AAL) interoperable. As a matter of fact, many data in eAccessibility/eInclusion are the same as or similar to those in eHealth, for medical devices and in medical informatics. Although the project is focused on AAL, the planned approach of the proposed project is highly generic so that content interoperability aspects of the related fields will be covered.

While in the past the development focus was on tools (i.e. devices, computer hardware and software), it is increasingly recognized today that "communication" ultimately is the most important issue, namely:

— communication between impaired people (directly or through ICT devices),
— communication between impaired people and the tools they use,
— communication between the tools.

This is why standardization of content-related aspects is gaining importance. Therefore, metadata, data models, messages, protocols, conversion of all sorts, multilinguality (incl. cultural diversity), multimodality, design for all (DfA) among others have become the objective of standardization efforts in industry, by specialized organizations, in public institutions as can be gathered from the ISTSB Report (2000).

Ongoing efforts, which are still little coordinated thus leading to a plethora of competing "standards" (which are often even contradicting each other), would — if not better coordinated — lead to a situation, where tools lose usefulness

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for those who most urgently need them: people with special needs. Therefore, recent efforts are focused on aspects related to content and communication of ambient assisted living (AAL), which is widely covering content aspects of eInclusion/eAccessibility, while not neglecting endeavours undertaken in related domains, such as eHealth.

The OASIS project coincides with a new megatrend in standardization, which in the past 60 years had largely shifted from hardware and software in the traditional sense towards methodology standardization. For a number of years, however, the number of standards for services and content is growing exponentially. People with special needs are among those who will benefit most from this development.

eBusiness is leading the field with the standardization of structured content (in ISO: "database standards") and the standardization of the methodology related to such content. In the field of eBusiness it has been recognized that only standardization approaches to structured content and its related services and tools can bring about the intended efficiencies and guarantees for reliability and other benefits.

2. DEFINITIONS

2.1 Content Related Concepts

This contribution focuses on **structured content** at the level of lexical semantics, such as:

— Lexicographical data;
— Terminology and similar kinds of language resources, such as:
  • nomenclatures, taxonomies, typologies etc.,
  • glossaries, vocabularies etc.,
  • terminological phraseology, morphology,
  • graphical symbols and other non-linguistic representations,
  • properties, characteristics, attributes, etc.,
  • proper names, addresses and other items of all kinds of directories;
— Thesauri, classification schemes, keywords and other kinds of documentation languages;

— Encyclopaedic (knowledge) entries, covering among others:
  • knowledge-enriched terminology entries,
  • (explained) proper names and other kinds of data closely related to names;
— Ontologies, topic maps and other kinds of knowledge-structuring systems, which in reality —more often than not— are contradictory, not coherent, not possible to integrate, not reliable, and full of deficits, if needed in applications which support people with special needs. This situation is becoming unacceptable, especially in our aging societies, where more and more people suffer from multiple impairments.

The above-mentioned kinds of structured content in the form of ***language resources***, which are increasingly supplemented by non-verbal representations — here multimodality comes into the picture—, are not the only kinds of structured content which are necessary for efficient communication. Further kinds may be needed, such as:

— Information on services, covering among others:
  • (product) classification and nomenclatures, catalogue data, properties etc. for services,
  • conditions of rendering the respective service,
  • qualification services, for instance, to train skills or improve human qualifications,
— Directory information, such as:
  • address and contact information of institutions/organizations/persons,
  • time-related information: opening hours, availability etc.,
— GPS-related information, such as:
  • position/location,
  • guiding/steering information (incl. information on obstacles etc.).

2.2 Content Management Related Concepts

In order to manage these different types of structured information (today mostly web-based and in distributed form) – so that the best suited "stakeholder" for a given kind of content can ensure the maintenance, updating and versioning as well as quality assurance of the content in a most efficient way –, a number of additional elements are needed with respect to content interoperability, such as:

— ***Metadata*** (or data categories, as they are more precisely called in the field of terminology) and the respective ***metadata registries***;
— ***Identification systems*** for individual pieces of information.

ISO/IEC-JTC 1/SC 32/WG 2 "MetaData" is the Working Group that formulates the methodology standards on metadata and metadata registries (especially the ISO/IEC 11179 MDR series). Within the framework of the MoU/MG there are recommendations to harmonize a multitude of ID-systems for content items, which are a great barrier to the efficient exchange of structured content in a systematic way, including checking processes, like certification and validation etc. In product data management for eBusiness the trend goes in the direction of using ISO 29002-5 as an open, non-proprietary standard as basis for applying an ID-system at the highest level of content granularity.

For the sake of completeness it should be mentioned that the above-cited approaches are increasingly applied also for the preparation and re-use of textual and other unstructured content, e.g. in technical communication, automatic and computer-assisted translation, etc. No wonder that eInclusion/eAccessibility aspects are also discovered and developed here. [CEN CWA 15778:2008]

In this connection, interoperability needs to be seen through the eyes of content – not only through the glasses of content management systems. Then it can be recognized that content interoperability goes beyond the concept of semantic interoperability, as it is generally seen. ***Content interoperability*** is the capability of content items/entities (i.e. structured content at the level of lexical semantics) to be:

— integrated into or combined with other (types of) content items/entities;
— extensively re-used for other purposes (also sub-items/entities to be re-usable);
— searchable, retrievable, recombinable from different points-of-view.

2.3 Standardization Related Concepts

Why is standardization so important in this connection? Only international standards guarantee the most efficient use and re-use of structured content across language boundaries and system platforms. This efficient use and re-

use can only take place if two fundamental principles of content management methodology are realized: *single sourcing* and *resource-sharing*. The above remarks lead to some reflection on the nature of standardization and the benefits of standardization for communication in eInclusion/eAccessibility.

Standardization is an activity for establishing, with regard to *actual or potential problems*, provisions for *common and repeated use*, aimed at the *achievement of the optimum degree of order in a given context*. In particular, the activity consists of the processes of formulating, issuing and implementing standards. Important benefits of standardization are the improvement of the *suitability of products, processes and services for their intended purposes*, *prevention of barriers to trade* and *facilitation of technological cooperation*. (ISO/IEC Guide 2: 2004) Standardization endeavours are governed by highly systemic approaches. In particular, methodology standards aim at generic solutions, which are also applicable in other eApplications.

The preparation of standards is based on *consensus*, which is a *general agreement*, characterized by the *absence of sustained opposition to substantial issues* by any important part of the *concerned interests* and by a *process that involves seeking to take into account the views of all parties* (namely industry, research, public administration, consumers) concerned and to *reconcile any conflicting arguments*. (ISO/IEC Guide 2:2004) Therefore, standards published by standards organizations are called "open standards" in contrast to "industry standards", which usually are proprietary. Huge efforts are undertaken to harmonize existing open standards at national, regional and international levels so that they do not contradict each other. Naturally this is less the case with industry standards.

2.4 Certification Related Concepts

Certification is defined as a *procedure* by which a *third party* gives *written assurance* that a *product*, *process* or *service* conforms to *specified requirements*. [ISO 14050:2006] No doubt services can be certified. Certification involves a number of documented processes, at the end of which there is a documented assessment result.

The fact that data structures and content should be standards-compliant and, if they are, can be certified, is a relatively new conception. This standards compliance needs to be assessed according to *validation/verification criteria,* defined as policy, procedure or requirement used as a reference against which evidence is compared. In this connection, two closely related *systematic, independent and documented processes* are of relevance:

— **Verification** uses *objective evidence* that (*specified) requirements* which define an intended use or application have been met for the sake of the evaluation of assertions against agreed verification criteria. Whenever specified requirements have been met, a verified status is achieved.
— **Validation** uses *objective evidence* to confirm that (*specified) requirements* which define an intended use or application have been met. Whenever all requirements have been met, a validated status is achieved.

There are many ways to *verify* that requirements have been met, such as doing tests, performing demonstrations, carrying out alternative calculations, comparing a new design specification with a proven design specification, or inspecting documents before one issues them. The process of *validation* can be carried out under realistic use conditions or within a simulated use environment. See: http://www.praxiom.com/iso-definition.htm#Quality

The concepts emerged after many years of discussion of standards-based quality management systems and their requirements. In this connection **quality** has been explained in many sources as the *totality of features and characteristics of a product or service* that bear on its *ability to satisfy stated or implied needs*. The quality of data and data-related services and tools has only recently entered the radar of quality assessment and certification approaches. Needless to say that the potential for quality of data and related services and tools is higher than if they are not standards-based. In any case, the need for reliability of some data in eInclusion/eAccessibility applications has to be much higher than that in many other content repositories. The use of standards-based approaches here reduces risks and thus liability in cases of mishaps or accidents.

Quality of something as defined by international standards is a relative concept which:

— can be determined by comparing a set of inherent characteristics with a set of requirements; *If those inherent characteristics meet all requirements, high or excellent quality is achieved. If those characteristics do not meet all requirements, a low or poor level of quality is achieved.*

— therefore, is a question of degree; As a result, the central quality question is: How well does this set of inherent characteristics comply with this set of requirements? In short, the quality of something depends on a set of inherent characteristics and a set of requirements and how well the former complies with the latter.

By linking quality to requirements, ISO 9000 argues that the quality of something cannot be established in a vacuum. Quality is always relative to a set of requirements. See http://www.praxiom.com/iso-definition.htm#Quality

The assessment of quality management systems and services takes place by means of an ***audit***, which is a *systematic, independent and documented process* for obtaining *audit evidence* and evaluating it objectively to determine the extent to which the *audit criteria* are fulfilled. ***Audit criteria*** are a set of policies, procedures or requirements used as a reference against which *audit evidence* is compared. One distinguishes between ***internal audits*** (sometimes called *first-party audits*) and ***external audits*** (including those generally termed *second- and third-party audits*). [ISO 19011] Third-party audits are conducted by external, independent auditing organizations, such as those providing registration or *certification* of conformity to the requirements of ISO 9001 or ISO 14001.

While quality assessment and certification through audits is relatively well developed in industry and services, the verification and validation of structured content and related services and tools is still in its infancy. Factual and physical properties based data can comparatively easily be validated. Other properties, e.g. those relating to "soft" criteria, such as functions, can probably only be validated, if validation is against a limited number of pre-defined values.

2.5 Special Case: Skills Certification in the ICT Field

eCertification (or ICT certification) in Europe can be considered as the set of processes by which an individual gains a credential in a particular ICT skill

or, more generally, in a range of skills. Such credentials are usually granted by recognized bodies, themselves often but not always accredited by some governmental or official organization. In order to attain the qualification, that individual must achieve a declared standard, judged by a formal assessment process. The whole scheme is governed by quality assurance processes, covering both the development and maintenance of the skills standard, and the assessment procedures. See: CWA 00000: 2009 "ICT Certification in Europe" (in print)

CWA 00000: 2009 refers to the following definitions of eCertification:

(1) "Certification often means the awarding of a certificate, or other testimonial, that formally recognizes and records success in the assessment of Knowledge, Skills and/or Competencies, as the final step in the completion of a Qualification. However, it is also used, in particular in relation to ICT Practitioner occupations, to mean the Qualification as a whole. It is important to be aware of these two ("narrow" and "broad") meanings of Certification." [Dixon and Beier in CWA 15515: 2006]
(2) "Certification is the process of formally validating knowledge, know-how and/or skills and competencies acquired by an individual, following a standard assessment procedure. Certificates or diplomas are issued by accredited awarding bodies". [Tissot: 2004 in CWA 00000: 2009]
(3) "In general, ICT professional certifications are seen as a credential – the result of an objective assessment procedure run by an approved third party, in which an individual meets the performance specifications delineated in job profiles which are recognised by industry stakeholders." [CEPIS: 2007; Cedefop: 2006].

— There are three ISO standards related to eCertification, namely:
— ISO/IEC 17024:2003 "Conformity Assessment – General requirements for bodies operating certification of persons"
— ISO/IEC TR 19759:2005 "Software Engineering – Guide to the Software Engineering Body of Knowledge (SWEBOK)"
— ISO/IEC 24773:2008 "Certification of software engineering professionals – Comparison framework"

These standards seem to have relatively little effect on the proliferation of qualification and certification schemes on the market.

While it can be recognized that certification provides value in both the labour and product segments of the ICT market, the report [CEPIS: 2007] describes over 600 often overlapping qualifications from over 60 providers as a "certification jungle", causing confusion to prospective users. The rapid growth in these industry qualifications has been driven by the market over recent years, indeed the market barely existed 15 years ago. They usually relate to a more specific set of skills, including for specific products, and are generally more practical in their approach than traditional academic qualifications.

As these market certifications contrast and co-exist with the historic university-based education system, leading to the phrase "parallel universe", there remains resistance, even hostility, in some academic quarters in some countries, to these certification schemes. They are seen as developing skills not education, and product ability not underlying theory, little more than marketing aids to the commercial interests of the vendors. On the other hand, their global application contrasts with the national or even self-accreditation of most university degrees. [CWA 00000: 2009]

Concerning the skills and qualifications necessary for being familiar with the issues involved in content interoperability available training and studies are not sufficient – even if certified.

3. Implementation case: the EU-Project OASIS

OASIS (Open architecture for Accessible Services Integration and Standardization), an ongoing European large-scale Integrated Project within the 7th Framework Programme, started in January 2008 for a period of four years. OASIS aims at an open and innovative reference architecture, based upon ontologies and semantic services, which will allow plug and play and cost-effective interconnection of existing and new services in all domains required for the independent and autonomous living of the elderly and their Quality of Life enhancement (for this and the following see Bekiaris and Bateman, 2009).

Achieving practical interoperability has to be one component of a general strategy for enabling information from different parts of a single organization or from different organizations to be bound together, to act as a multiplier

for application opportunities. Moreover, in some domains, the requirements of appropriate interoperability are even more important. In the provision and support of environments and services for the ageing population, the consequences of poor quality decisions, increased maintenance costs, and inflexible integration, brought about by inappropriate inferences and inconsistent knowledge, can lead directly to risky situations. For the user affected this is not only unacceptable, but may even be life-threatening.

The OASIS development will provide an open source complementary solution to the direction now being pursued in the Semantic Web approach to ontology design: whereas in the Semantic Web re-usability is pursued across open ontologies, the OASIS solution will show how re-usability can be achieved following the tried and tested results of decades of practical experience in software engineering. Crucially, the open Semantic Web approach entails that small local modules may have global side-effects (for example, by changing class membership); in contrast, the OASIS hyper-ontology will demonstrate how interoperability can be achieved within strict modularity. Side effects in software design are a source of major system instability, development and maintenance costs – avoiding them for ontology design will therefore be a major innovative contribution of considerable benefit.

The above-mentioned DfA Report comprises a review of standards in the field according to:

— Level 1: general requirements for technical aids,
— Level 2: particular requirements for families of technical aids,
— Level 3: Specific requirements for types of technical aids,

referring to standards at international, regional and national levels. The aspect most underrepresented here is communication and content to enable communication, as well as the respective standards. The OASIS Project aims to fill this gap by developing a Common Ontological Framework, which will also be introduced into standardization.

Needless to mention that the open source Common Ontological Framework of the OASIS Project will follow the MoU/MG recommendation of 2005, which

states as basic requirements for the development of fundamental methodology standards concerning content interoperability:

— Multilinguality and cultural diversity,
— Multimodality,
— Accessibility (covering also eInclusion),
— Multi-channel presentations,
   which have to be considered at the earliest stage of software design before implementation [Bekiaris and Bateman, 2009].

4. Summary and Outlook

Content integration – whether in the form of virtual or real data integration – and content interoperability must be based among others on:

— Consistent methodology standards for datamodels and data modelling;
— Coordinated standardization of several kinds of structured content;
— Standardized identification systems for individual pieces of information;
— Standardized transfer protocols and interchange formats;
   in order to be efficient and reliable.

At present, standardization in eBusiness is leading the field with highly generic methodology standards and the implementation of content repositories with standardized structured content. The EU-Project OASIS attempts to combine the results of a number of past projects with best practices in the field of structured content preparation and maintenance as well as with respect to content integration.

In certain cases there is a definite need for certification, validation or verification of data. The respective standardization efforts are still in their infancy. Some kinds of certification, validation or verification can possibly be done through web services. These and other kinds of certification should

— particularly benefit small content and service providers;
— be affordable;

— fit the kind of service, the technical state-of-the-art at the service providers' side and the expectations of the clients.

Coordination and harmonization efforts supported by the EU Commission have a positive effect on the development of technical, organizational and content interoperability standards as well as standards-based content repositories, which will benefit people with special needs.

REFERENCES

Bekiaris, E. D. & Bateman, J.A. (2009). Content Interoperability Standardization. The open Reference Architecture of the OASIS Project with its open source Common Ontological Framework and related tools. China Standardization, Special edition 2009. Beijing 2009, pp. 41-44.

CEPIS (ed.). Survey of Certification Schemes for ICT Professionals across Europe towards Harmonisation (HARMONISE). http://www.cepis-harmonise.org, September 2007, Project of CEPIS Council of European Professional Informatics Societies, final report.

Cedefop (ed.). ICT Skills Certification in Europe. Cedefop Dossier series 13. Luxembourg: Office for Official Publications of the European Communities, 2006.

ICTSB (ed.). Design for All. ICTSB Project Team Final Report (2000) http://www.ictsb.org/Activities/Design_for_All/Documents/ICTSB%20Main%20Report%20.pdf.

MoU/MG:2004 Semantic Interoperability and the need for a coherent policy for a framework of distributed, possibly federated repositories for all kinds of content items on a worldwide scale (MoU/MG/05 N0221 adopted in 2005).

MoU/MG:2004 Statement on eBusiness Standards and Cultural Diversity (MoU/MG/05 N0222 adopted in 2006).

ISO/IEC Guide 2:2004.

ISO 8000 (series). Data quality.

ISO 9000:2005. Quality management systems – Fundamentals and vocabulary.

ISO 9001:2000. Quality management systems – Requirements.

ISO/IEC 11179 (series). Information technology – Metadata registries (MDR).

ISO 14001:2004. Environmental management systems – Requirements with guidance for use.

ISO 14050:2009.Environmental management – Vocabulary.

ISO/IEC 17024:2003. "Conformity Assessment – General requirements for bodies operating certification of persons".

ISO 19011:2002. Guidelines for quality and/or environmental management systems auditing.

ISO/IEC TR 19759:2005. "Software Engineering – Guide to the Software Engineering Body of Knowledge (SWEBOK)".

ISO/IEC TR 20943 (series). Information technology – Procedures for achieving metadata registry content consistency.

ISO/IEC 24773:2008. Certification of software engineering professionals – Comparison framework.

ISO/TS 29002-5:2009. Industrial automation systems and integration – Exchange of characteristic data – Part 5: Identification scheme.

CEN CWA 15778:2008. Document Processing for Accessibility. CEN Workshop Document Processing for Accessibility. WS/DPA: Brussels, 2008.

CEN CWA 15515:2006. European ICT Skills Meta-Framework – State-of-the-art review, clarification of the realities, and recommendations for next steps. CEN Workshop ICT-Skills (IT profiles and curricula). WS/ICT: Brussels, 2006.

CWA 00000: 2009. ICT Certification in Europe. CEN Workshop ICT-Skills (IT profiles and curricula). WS/ICT: Brussels, 2009 (in print).

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