

# **SCHEMAS**

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**Forum for Metadata Schema Implementers**

**STANDARDS FRAMEWORK REPORT #2**

**D 33**

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<rdf:RDF xml:lang="en"
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  xmlns:smes="http://www.schemas-forum.org/registry/schemas/SCHEMAS/1.0/smes#"
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<dc:creator> Makx Dekkers </dc:creator>
<dc:creator> Christian Eijert </dc:creator>
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</rdf:RDF>
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## 1. Introduction

The SCHEMAS project is a forum for metadata schema implementers. It is especially trying to reach those implementers who are involved in the European Commission's IST programme or in national initiatives within Europe. Implementers in the context of SCHEMAS are pictured as institutions/companies who plan to publish on the Web or who plan to provide information services at a high level of access quality.

SCHEMAS is developing a knowledge base and information services. An important component of the knowledge base is the Standards Framework. The Standards Framework focuses specifically on initiatives for defining or ratifying particular web-oriented metadata schemas as recognised standards. The emphasis here will not only be on standardisation efforts within traditional standards organisations (e.g. the International Organization for Standardization ISO) but also on non-traditional, Internet-based initiatives (e.g. Dublin Core). This present report contains the second version of the Standards Framework.

In the SCHEMAS project we understand metadata as a broad term covering many types of "structured data about data". This can range from traditional resources such as library catalogues, subject indexes, book reviews and abstracts, to new forms of technical and descriptive data for Web resources like digital signatures, digitised map co-ordinates and online mail order catalogues. Because of the broad diversity of potential applications of metadata, the needs for metadata can best be met by a multiplicity of separate but functionally focused metadata packages that are called schemas.

A wide variety of standardisation initiatives have been or are being undertaken, both within formal standardisation organisations and within other organisations and both at a general level and at a more domain specific level. Standardisation of metadata is a diverse area and the activities are spread over the different application areas and domains of metadata schemas.

The Standards Framework is aimed at mapping this wide diversity of metadata standardisation to application areas and to provide information to implementers about what is going on, what they could use and where they can find information about how to use certain standards.

This second Standards Framework used the results of the first Standards Framework and the feedback of the workshops to evaluate to which extent the standardisation activities have progressed and/or developed. It provides also an insight into some new activities, which have been identified during the research.

## 2. Methodology

To identify the current metadata standardisation activities we have started by looking at the first Standards Framework report (D32) issued in September 2000 and have taken into account the most important parts of that document. In addition, the contributions of the different SCHEMAS workshops were considered to be useful. In this document (D33), 22 standards activities were considered most important for the

purposes of SCHEMAS. In this report, the following categories of standards are described:

- Models, which intend to define an architecture for resources and associated metadata
- Basic standards, which provide mechanisms that other standards can use
- Cross-domain standards, which are intended to be used for describing materials from multiple domains
- Domain-specific standards, which are designed to describe specific material in one particular domain, or to describe materials from a very specific perspective

The following domains are covered in this document:

- Publishing
- Audio-visual
- Cultural heritage
- Education
- Research
- Government, geospatial and environment

The desk research focused on mainly 4 areas:

- Description of the standardisation activity
- Goal of the standardisation activity
- Future plans of the standardisation activity
- Relationships between the different standardisation activities

However, this research (based on exploring the Web sites of the different standardisation activities) did not always lead to useful results. We have then drawn up an overview containing the name of the initiative, name and co-ordinates of the contact person, the institutions responsible for the initiative and the URL of the Web site where the activity is described.

Since we were in need of in-depth information about those standardisation initiatives, we have chosen the survey method using a questionnaire that was sent to the contact person of the activity. The questions focused, of course, mainly on the 4 major topics we wanted to cover. The results are contained in this document and will also be made available through the SCHEMAS Web site and registry.

Through an e-mail message we have asked the correspondents to fill in the questionnaire and send it back. Not all of the correspondents have replied to our questionnaire.

The descriptions of the standardisation activities in chapter 5 are therefore primarily based on the text on the Web sites referenced plus additional comments from the contact person.

### 3. Scope

The metadata standardisation initiatives that are analysed in this Standards Framework Report are summarised in the table below.

Category	Short name	Full Name
<b>Models</b>		
	IFLA FRBR model	Functional Requirements for Bibliographic Records
	CIDOC CRM	CIDOC Conceptual Reference Model
	<indec>	Interoperability of data in e-commerce systems
	OAIS	Reference Model for an Open Archival Information System
<b>Basic</b>		
	ISO 11179	Data management and Interchange
	RDF	Resource Description Framework
<b>Cross-domain</b>		
	Dublin Core	Dublin Core Metadata Initiative
<b>Domain-specific</b>		
<i>Publishing</i>		
	ONIX	Online Information eXchange
	DOI	Digital Object Identifier
	EBX	Electronic book exchange
<i>Audio-visual</i>		
	MPEG	Moving Pictures Expert Group: Digital Audio-visual Framework
	SMPTE	Society of Motion Picture and Television Engineers
<i>Cultural Heritage</i>		
	MARC 21	Machine Readable Cataloguing
	EAD	Encoded Archival Description
	SPECTRUM	UK Museum Documentation Standard
<i>Education</i>		
	IMS	Instructional Management System
	IEEE/LOM	Learning Object Metadata
<i>Research, academic</i>		
	CERIF	Common European Research Information Format
	TEI	Text Encoding Initiative
<i>Government, geospatial, environment</i>		
	FGDC	Federal Geographic Data Committee
	GILS	Global Information Locator Service
	GELOS	Global Environmental Locator System Standard Element Set

This report analyses these 22 metadata standardisation initiatives. Although this is a limited number, we believe it will provide a good insight into what is currently happening.

## 4. Description of the results

### 4.1 Grouping of results

The general domains (e.g. non-specific domains) were produced first, before presenting the other initiatives (e.g. specific domains). We have categorised the 22 standardisation initiatives into the following categories:

#### **Models**

The models are not standardisation activities as such; rather more they describe models for metadata management. IFLA, CIDOC, <indec> and OAIS belong to this category.

#### **Basic standards**

The category of basic standards contains standardisation activities that provide the groundwork for other standards. ISO 11179 and, RDF are part of this basic category.

#### **Cross-domain standards**

As the only cross-domain standard, Dublin Core is the only representative in this category.

#### **Domain-specific standards**

##### *Publishing*

This domain covers the music/video/book and multimedia distribution, the music recording industry, scientific journals, news agencies, newspapers and copyright management. ONIX, DOI and EBX have been categorised under publishing.

##### *Audio-visual*

The audio-visual category includes the film industry, the broadcast production and archiving as well as the multimedia production. It deals with large amounts of information of which only a portion is textual. In addition, the means by which this content is distributed varies greatly, i.e. terrestrial broadcast, Internet and, CD and DVDROM. MPEG-7 and SMPTE are in this group.

##### *Cultural heritage*

Standards for use by libraries, library services, archives, museums and museum portals have been grouped under this heading: MARC21, EAD, SPECTRUM.

##### *Education*

Initiatives active in the field of interactive courseware, life-long learning, distance learning, curricula and, schools in general can be found in this category. The IMS project and IEEE LOM were grouped in this domain.

### *Research and academic*

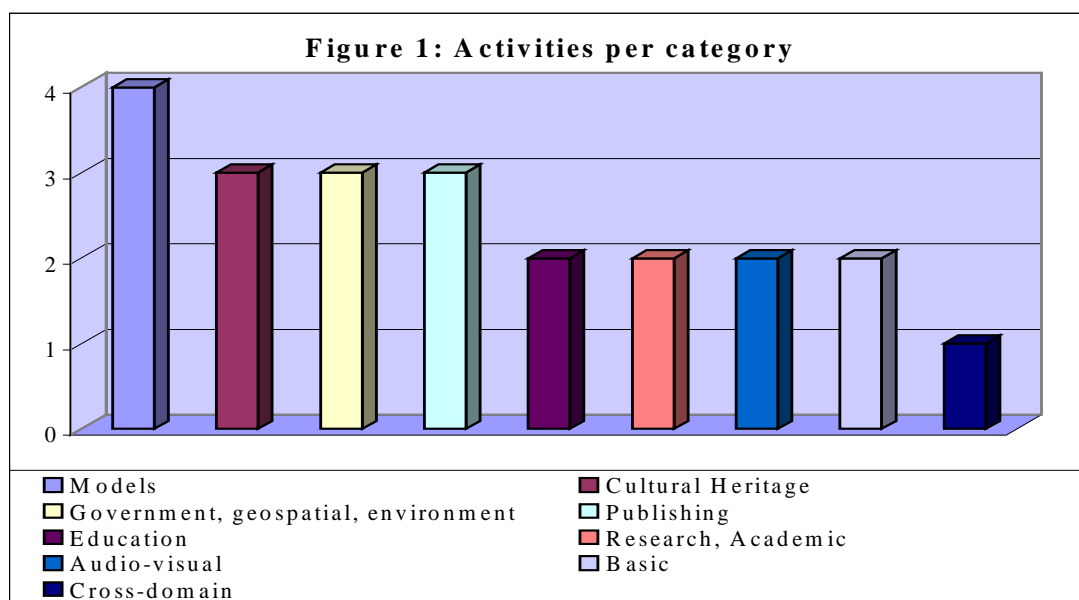
This domain includes non-commercial laboratories, corporate research, and professional societies. CERIF and TEI have been included under this heading.

### *Government, geospatial and environment*

This domain includes all kinds of standards related to public services. GILS addresses governmental publication issues and was thus put in this domain. An important sector of public information is geospatial information. FGDC is an important standard in this field. Also environmental information is addressed under this title. GELOS covers the environment category.

## **4.2 Graphical representation**

Graphically the categorisation into domains can be pictured as follows:



## **5. Results**

For each domain some standardisation activities considered to be relevant and/or fitting into the framework of the SCHEMAS project could be identified. The following standardisation initiatives have been analysed in detail and the results have been produced hereafter.

### **Models**

#### ***IFLA FRBR MODEL***

In 1998, the IFLA Study Group on the Functional Requirements for Bibliographic Records (FRBR) published its Final Report. The Standing Committee of the IFLA Section on Cataloguing agreed that the International Standard Bibliographic

Description (ISBD) Review Group should initiate a full-scale review of IFLA's "family of ISBDs" to ensure conformity between the provisions of the ISBDs and those of FRBR - in particular, to achieve consistency with FRBR's data requirements for the "basic level national bibliographic record".

The FRBR study had two primary objectives. The first was to provide a clearly defined, structured framework for relating the data that are recorded in bibliographic records to the needs of the users of those records. The second objective was to recommend a basic level of functionality for records created by national bibliographic agencies.

The study endeavoured to be comprehensive in terms of the variety of materials that were covered. Data associated with persons, corporate bodies, titles, and subjects were analysed only to the extent that they function as headings or index entries for the records describing bibliographic entities. The FRBR study did not analyse those additional data associated with persons, corporate bodies, works, and subjects that are typically recorded only in authority records. Such analysis is currently in progress within IFLA under the Working Group on Functional Requirements for Authority Numbers and Records (FRANAR). The data included in the study pertain to textual, music, cartographic, audio-visual, graphic and three-dimensional materials; they cover the full range of physical media described in bibliographic records (paper, film, magnetic tape, optical storage media, etc.); they cover all formats (books, sheets, discs, cassettes, cartridges, etc.); and they reflect all modes of recording information (analogue, acoustic, electric, digital, optical, etc.).

Finally, the FRBR study assumed that the data included in bibliographic records produced for national bibliographies and library catalogues are used by a wide range of users: readers, students, researchers, library staff, publishers, distribution agents, retailers, information brokers, administrators of intellectual property rights, etc. The study takes into account the wide variety of applications, both within and outside a library setting, in which the data in bibliographic records are used: collections development, acquisitions, cataloguing, the production of finding aids and bibliographies, inventory management, preservation, circulation, interlibrary loan, reference, and information retrieval.

URL: <http://www.ifla.org/VII/s13/frbr/frbr1.htm>

Contact: Barbara Tillett, [btil@loc](mailto:btil@loc).

### ***CIDOC CRM MODEL***

The "CIDOC object-oriented Reference Model" (CRM), was developed by the ICOM/CIDOC Documentation Standards Group. It represents an 'ontology' for cultural heritage information, i.e. it describes in a formal language the explicit and implicit concepts and relations relevant to the documentation of cultural heritage. The primary role of the CRM is to serve as a basis for mediation of cultural heritage information and thereby provide the semantic 'glue' needed to transform today's disparate, localised information sources into a coherent and valuable global resource.

Version 3.0 of the reference model was released in March 2001. ([http://cidoc.ics.forth.gr/docs/crm\\_version\\_3.0.rtf](http://cidoc.ics.forth.gr/docs/crm_version_3.0.rtf)). In 2000, work has been carried out

to represent the Reference Model in RDF and to map the Dublin Core Metadata Element Set to the Reference Model.

The CRM is an extensible model, and CIDOC sees a continuous need to elaborate new areas, but also to keep the model in line with the inevitable changes and progress of conceptualisation for information integration. Besides that, it is expected that there will be a lot of applied problems, like tools, guides for best practice, etc, that will benefit from a central forum for harmonisation.

Under this consideration, CIDOC has decided in Ottawa, August 2000 to initiate the CRM Special Interest Group. It is a working group under the patronage of CIDOC, which is not restricted to CIDOC members and is thought to attract funding to carry out and promote its objectives. The Group comes together in the interest to complete and to promote the CIDOC CRM as a solution for semantic interoperability of museum information with other related information systems as an ISO standard. Its work will have two equally important aspects: the work on the CIDOC CRM in form of discussing, testing, and proposing changes and additions; and the work on the promotion, education, communication of the model in the community and to appropriate technology providers.

URL: <http://cidoc.ics.forth.gr/>

Contact: Martin Doerr, [martin@ics.forth.gr](mailto:martin@ics.forth.gr)

*<indecs> (Interoperability of data in e-commerce systems)*

This project was established at the end of 1998, with support from the European Commission's INFO2000 Programme. The Commission evaluated the project as having been very successful when it came to an end in March 2000. The intellectual property rights created during the project are now owned by <indecs><sup>TM</sup> Framework Ltd., a not-for-profit company established by the partners in the <indecs> project.

From a perspective that metadata is generated in diverse ways by diverse players in the value chain, the project aimed to propose mechanisms for interoperability of metadata developed in different context that would permit automated e-commerce in intellectual property in a network environment.

The <indecs> model is based on three statements that describe the major relationships between people (creators and right holders on one side and users on the other), stuff (any resource that is created and can be used), and deals (contracts and other agreements governing the use of the resources):

- People make stuff
- People use stuff
- People make deals about the stuff.

The <indecs> project has proposed a framework, described in detail in the final project documents, within which such interoperability could be achieved.

URL: <http://www.indecs.org/>

Contact: Mark Bide, [mark@markbide.co.uk](mailto:mark@markbide.co.uk)

### *OAIS (Reference Model for an Open Archival Information System)*

The OAIS Reference Model attempts to provide a framework for the understanding of the archival concepts needed for the long-term preservation of digital information. OAIS is an ISO initiative co-ordinated by the Consultative Committee for Space Data Systems (CCSDS). The draft standard (May 1999) defines a high-level reference model for an OAIS, which is defined as an organisation of people and systems “that has accepted the responsibility to preserve information and make it available for a designated community”. The OAIS model defines a range of functions that are applicable to any archive - whether digital or not. These functions include ingest, archival storage, data management, administration, and access. Amongst other things, the OAIS model aims to provide a common framework that can be used to help understand archival challenges and especially those that relate to digital information.

The reference model is not only concerned with metadata and does not attempt to propose any new metadata standard. Instead, it outlines a taxonomy of ‘Archival Information Object Classes’ that defines the information types deemed necessary for the understanding of digital content over an indefinite period of time. This taxonomy has been used by some digital library projects (e.g. the Cedars and NEDLIB projects) to form the basis of a preservation metadata specification. Once it has been accepted as an ISO standard, the OAIS Model is likely to inform the development of digital preservation initiatives (including preservation metadata) in a wide range of organisation types. For example, the OCLC/RLG Working Group on Preservation Metadata has already expressed a great interest in the OAIS model, and reviewed its terminology in its 2001 White Paper.

URL: [http://ssdoo.gsfc.nasa.gov/nost/isoas/ref\\_model.html](http://ssdoo.gsfc.nasa.gov/nost/isoas/ref_model.html)

Contact: Don Sawyer, [sawyer@ncf.gsfc.nasa.gov](mailto:sawyer@ncf.gsfc.nasa.gov)

#### **Basic**

##### *ISO 11179*

ISO/IEC 11179 (Information technology -- Specification and standardization of data elements) is a family of standards for formally expressing the semantics of data elements in a consistent manner. It consists of 6 parts:

ISO/IEC 11179-1:1999 -- Part 1: Framework for the specification and standardization of data elements

ISO/IEC 11179-2:2000 -- Part 2: Classification for data elements

ISO/IEC 11179-3:1994 -- Part 3: Basic attributes of data elements

ISO/IEC 11179-4:1995 -- Part 4: Rules and guidelines for the formulation of data definitions

ISO/IEC 11179-5:1995 -- Part 5: Naming and identification principles for data elements

ISO/IEC 11179-6:1997 -- Part 6: Registration of data elements

The purpose of this set of standards is to give concrete guidance on the formulation and maintenance of discrete data element descriptions and semantic content (metadata) that can be used to formulate data elements in a consistent, standard manner. It also provides guidance for establishing a data element registry.

URL: <http://www.sdct.itl.nist.gov/~ftp/L8/11179/>

Contact: Douglas D. Mann, [mannd@battelle.org](mailto:mannd@battelle.org)

### ***RDF (Resource Description Framework)***

The Resource Description Framework (RDF) integrates a variety of web-based metadata activities including sitemaps, content ratings, stream channel definitions, search engine data collection (web crawling), digital library collections, and distributed authoring, using XML as an interchange syntax. It is developed by the W3 Consortium and offers interoperability between applications that exchange machine-understandable information on the web by providing an infrastructure to support metadata activities.

Following the release of the RDF Model and Syntax Recommendation there have been significant efforts in a variety of communities to put machine-readable metadata into the Web. The Dublin Core Metadata Initiative, the <indec> rights management vocabulary, XMLnews, PRISM, and the RDF Site Summary work are examples of communities who are adopting RDF/XML to publish their data on the Web.

RDF is now part of W3C's Semantic Web Activity which aims to continue the work of the RDF Interest Group, to undertake revisions to the RDF Model and Syntax Recommendation, complete work on the RDF Schema specification, to co-ordinate with W3C initiatives focussed on defining semantics for supporting Web technologies (such as P3P, CC/PP, XML Protocol, WAI, and other infrastructure for remote services), to co-ordinate with selected non-W3C initiatives and individual activities working on Semantic Web technologies (e.g. DCMI, DAML, OIL, and SHOE), and to perform advanced development to design and develop supporting XML and RDF technologies.

URL: <http://www.w3.org/RDF/>

Contact: Eric Miller, [em@w3.org](mailto:em@w3.org)

### **Cross-domain**

#### ***Dublin Core***

The Dublin Core Metadata Initiative (DCMI) maintains two specifications: the Dublin Core Metadata Element Set and a formally recommended list of Dublin Core Qualifiers. The Core consists of 15 elements with commonly understood semantics that are intended to support cross-domain discovery of electronic resources. The Qualifiers add specificity to the 15 base elements.

An increasing number of activities use Dublin Core metadata as a description format, which is exemplified by many national governments that use or propose to use the

Dublin Core as the basis for their government information strategies (e.g. Australia, Canada, the UK, Ireland, Denmark).

In early 2001, the DCMI has formulated a mission statement for its activities in the future:

The mission of the DCMI is to make it easier to find resources using the Internet through the following activities:

1. Developing metadata standards for discovery across domains
2. Defining frameworks for the interoperation of metadata sets
3. Facilitating the development of community or disciplinary specific metadata sets that are consistent with items 1 and 2

The DCMI is a consensus-building organisation that has relationships with many standards activities. It has strong relationships with the RDF activities in W3C and develops formal and informal liaisons with GILS, IEEE/LOM, IMS, MARC, MPEG-7 and others.

URL: <http://dublincore.org/>

Contact: Stu Weibel, [weibel@oclc.org](mailto:weibel@oclc.org)

### **Domain-specific**

#### **a) Publishing**

##### ***ONIX (Online Information eXchange)***

ONIX is the international standard for representing and communicating book industry product information in electronic form, incorporating the core content, which has been specified in national initiatives such as BIC Basic and AAP's ONIX Version 1. ONIX stands for Online Information eXchange and is a subset of the EPICS data dictionary. It refers to a standard format that publishers can use to distribute electronic information about their books to wholesale, e-tail and retail booksellers, other publishers, and anyone else involved in the sale of books.

The goal is to standardise the transmitting of product information so that wholesalers, retailers and others in the supply chain will all be able to accept information that is transferred electronically in ONIX International format. EDItEUR maintains the EPICS/ONIX family of standards under the direction of an international steering group.

The standard allows for a publisher to use either of two standards – Level 1 or Level 2. Level 1 contains all the information in Level 2. Standard data elements in Level 1 are targeted to publishers who have not established an in-house database of product information. Level 2 is targeted for those publishers who feel that Level 1 data elements are not adequate.

Future issues to be addressed include adding standards for electronic books, video and incorporating concepts of digital rights. In addition, processes for certifying that transmitted data is valid and correct are being developed. ONIX will continue to evolve as needs are identified.

URL: <http://www.editeur.org/onix.html>

Contact: Brian Green, [brian@bic.org.uk](mailto:brian@bic.org.uk)

### ***DOI (Digital Object Identifier)***

The Digital Object Identifier (DOI) is a system for persistently identifying and managing intellectual property in the digital environment. Developed by IDF, the International DOI Foundation, it provides a framework for managing intellectual content, for linking customers with content suppliers, for facilitating electronic commerce, and enabling automated copyright management for all types of media.

A Digital Object Identifier is a means of persistently identifying a piece of intellectual property (a creation) on a digital network. On digital networks, all intellectual property is simply a string of bits; a DOI can apply to any form of intellectual property in any digital environment. It is different from commonly used pointers to material such as the URL (Uniform Resource Locator, the usual means of referring to World Wide Web material) because it identifies an object, not the place where the object is located. Using the DOI makes managing intellectual property in a networked environment much easier and more convenient, and allows the construction of automated services and transactions for E-commerce.

The DOI system itself, while under the supervision of the Foundation, is designed as an open standard to which anyone can gain access under well-defined rules. The technology to support the DOI is based on the Handle System, devised and currently operated by the Corporation for National Research Initiatives (CNRI), an organisation closely associated with the technical infrastructure of the Internet, and a partner of IDF. The descriptive system used with DOI's interoperable metadata is based on the principles from the <indecs> framework. While the Foundation determines the rules of the system; users of the DOI system enjoy complete autonomy within that established framework.

URL: <http://www.doi.org/>

Contact: Norman Paskin, [n.paskin@doi.org](mailto:n.paskin@doi.org)

### ***EBX (Electronic Book eXchange)***

The Electronic Book Exchange (EBX) Working Group is an organisation of companies, organisations, and individuals developing a standard for protecting copyright in electronic books and for distributing electronic books among publishers, distributors, retailers, libraries, and consumers. The draft EBX specification accommodates a variety of content formats for electronic books, including Open eBook Publication Structure and Adobe® Portable Document Format (PDF).

The EBX Working Group operates under the auspices of BISG, the Book Industry Study Group, and develops open, freely available, and commercially viable standards

for the secure transmission of electronic books (e-books) among rights holders, intermediaries, and users. EBX addresses such issues as the purchase, sale, lending, giving, printing, subscribing, and licensing of electronic books.

Independent of content format, EBX strives to embrace levels of usability, internationalisation, authentication, accountability, auditing, and robust security sufficient to satisfy all participants in the value chain. Through cooperation with other standards efforts, EBX aims to facilitate the growth of e-book markets.

EBX co-operates with the Open eBook Forum and has relations with ONIX through the Book Industry Study Group.

URL: <http://www.ebxwg.org/>

Contact: Bob Mathews, [rom@adobe.com](mailto:rom@adobe.com)

## **b) Audio-visual**

### ***MPEG (Moving Pictures Expert Group)***

The MPEG-7 standard, formally called “Multimedia Content Description Interface”, aims to provide a rich set of standardized tools to describe multimedia content. Both human users and automatic systems that process audiovisual information are within the scope of MPEG-7. The MPEG-7 standard will be subdivided into seven parts:

1. Systems: architecture of the standard, tools to support multiplexing of description, synchronization issues, transmission mechanisms, file format, etc.; also tools related to managing and protecting intellectual property.
2. A Description Definition Language (DDL),
3. Visual: Visual elements
4. Audio: Audio elements
5. Multimedia Descriptions Schemes: elements that are generic, i.e. neither purely visual nor purely audio.
6. Reference Software: software implementation of relevant parts of the MPEG-7 Standard.
7. Conformance: Guidelines and procedures for testing conformance of MPEG-7 implementations.

The Moving Picture Coding Experts Group is a working group of ISO/IEC (ISO/IEC JTC1/SC 29/WG 11 Coding of Moving Pictures and Audio). MPEG-7 is not aimed at any one application in particular; rather, the elements that MPEG-7 standardises will support as broad a range of applications as possible. MPEG-7 application domains include audiovisual archives (for storage and retrieval of audiovisual databases, broadcasting (for media selection and distribution), Web-based services (‘push and pull’), teleshopping, education, and biomedical services (such as surveillance). It concerns all types of multimedia: audio and speech; moving video, still pictures, graphics, and 3D models; and information on how objects are combined in scenes.

MPEG-7 is an official ISO-standard with industrial and political support and is related to other standardization activities, such as XML, SMPTE, and Dublin Core.

URL: <http://www.csel.it/mpeg/>

Contact: Rob Koenen, [rkoenen@intertrust.com](mailto:rkoenen@intertrust.com)

### ***SMPTE***

The Society of Motion Picture and Television Engineers (SMPTE) is an industry-led society for the motion picture and television industries. SMPTE is devoted to advancing theory and application in motion imaging, including film, television, video, computer imaging, and telecommunications. In collaboration with the European Broadcasting Union (EBU), it has set up a task force for harmonised standards for the exchange of programme materials as bit of streams. The industry relies on SMPTE to generate standards, engineering guidelines, and recommended practices to be followed by perspective field professionals.

The objectives of this activity are to develop and harmonize standards for the exchange of programme material; and to support global interoperability by defining and structuring metadata tags in a way that enables the interchange of SMPTE metadata with metadata from different sources and originated by other bodies. The Metadata Dictionary is a dictionary of 'audiovisual descriptors' for the production environment, which covers the entire production chain: pre-production, post-production, acquisition, distribution, broadcasting, storage and archiving of digital audiovisual material. The SMPTE Metadata Dictionary picks up on the work of the EBU-SMPTE Taskforce for Harmonized Standards for the Exchange of Programme Material as Bitstreams that completed its Final Report in 1998. The Dictionary provides flexibility in capturing metadata and exchanging it among applications through a standardized hierarchy of Universal Labels for the metadata elements, grouped in classes. Metadata Classes are collections of metadata elements with common characteristics or attributes. Additional Classes are provided for user-defined metadata. The Dictionary also contains information on the required format of metadata values and the allowable range of values. The Dictionary consists of Structure and Content, which must be used together as a pair – neither must be used in isolation.

URL: <http://www.smpte.org/>

Contact: Fred Motts, [fmotts@smpte.org](mailto:fmotts@smpte.org)

### **c) Cultural Heritage**

#### ***MARC 21***

MARC (MAchine-Readable Cataloguing) comprises a set of standards for storing and exchanging bibliographic records and related information in machine-readable form. MARC was developed primarily to meet the needs of libraries for a convenient way of storing and exchanging bibliographic records. However, MARC has proved sufficiently flexible to meet the needs of the book industry and other sectors of the information community who find it advantageous to use a common format.

MARC21 has developed standard formats for bibliographic information, classification numbers and non-bibliographic resources. The MARC21 Formats initiative comprises 11 standardisation activities that can be subdivided into 5 record formats (Bibliographic, Authority, Holdings, Classification, Community Information) and 6 code lists (Languages, Geographic Areas, Countries, Organisations, Relators, Sources).

The standards are maintained by the Library of Congress Network Development and MARC Standards Office with the American Library Association's Machine-Readable Bibliographic Information Committee. There are many thousands of implementations around the world.

In the future, increasing liaisons with other standards bodies will be sought and work is foreseen to provide mappings between MARC21 and other metadata formats (e.g. Dublin Core).

URL: <http://www.loc.gov/marc/>

Contact: Rebecca Guenther, [rgue@loc.gov](mailto:rgue@loc.gov)

### ***EAD (Encoded Archival Description)***

The EAD Document Type Definition (DTD) is a standard for encoding archival finding aids using the Standard Generalised Mark-up Language (SGML). Development of the EAD DTD began with a project initiated by the library of the University of California in Berkeley in 1993. The requirements for the encoding standard included the following criteria: 1) ability to present extensive and interrelated descriptive information found in archival finding aids, 2) ability to preserve the hierarchical relationships existing between levels of description, 3) ability to represent descriptive information that is inherited by one hierarchical level from another, 4) ability to move within a hierarchical informational structure, and 5) support for element-specific indexing and retrieval.

The EAD DTD contains three high-level elements: the <eadheader>, <frontmatter>, and <archdesc>. The <eadheader> is used to document the archival description or finding aid, while the <frontmatter> is used to supply publishing information such as a title page, and other prefatory text. The <archdesc> contains the archival description itself, and thus constitutes the core of the EAD.

EAD provides a means to create machine-readable versions of traditional archival description, which in turn provides the archival community with the opportunity to experience and understand new technologies.

The Tag Library version 1.0 for EAD was published in 1998, followed in 1999 by the Application Guidelines for Version 1.0. (<http://lcweb.loc.gov/ead/ag/>)

Future activities will focus on two concrete activities: 1) revision and publication of EAD Version 1.0 application guidelines and 2) support of an EAD Roundtable. The former will supplement the Version 1.0 tag library and provide additional guidance and explication of EAD-its purpose, structure, and implementation. The latter will be a mechanism for disseminating information and sharing tips, tools, and techniques for applying EAD.

The standard is maintained in the Network Development and MARC Standards Office of the Library of Congress (LC) in partnership with the Society of American Archivists.

URL: <http://lcweb.loc.gov/ead/>

Contact: Library of Congress Network Development and MARC Standards Office, [ndmso@loc.gov](mailto:ndmso@loc.gov)

### ***SPECTRUM***

**SPECTRUM:** The UK Museum Documentation Standard represents a common understanding of good practice for museum documentation, established in partnership with the museum community. It contains procedures for documenting objects and the processes they undergo, as well as identifying and describing the information, which needs to be recorded to support the procedures.

**SPECTRUM** contains all those functions that are common to most museums, to a level required by most practitioners. **SPECTRUM** gathers together the procedures and information needs common to a number of activities and shows how they work together. It also provides an external context to help fit **SPECTRUM** to different institutions. For example the section Documentation issues for collections management policies identifies points where they may need to make a decision about what to do in a particular procedure, depending on the environment in which the particular institution operates.

The **SPECTRUM** development programme includes the development of an XML DTD for **SPECTRUM** along with supporting vocabularies; a test bed being carried out by the Consortium for the Computer Interchange of Museum Information (CIMI); **SPECTRUM** Knowledge, a set of procedures and guidelines for knowledge management in museums.

URL: <http://www.mda.org.uk/spectrum.htm>

Contact: Matthew Stiff, [matthew@mda.org.uk](mailto:matthew@mda.org.uk)

#### **d) Education**

##### ***IMS***

IMS Global Learning Consortium, Inc. (IMS) is developing and promoting open specifications for facilitating online distributed learning activities such as locating and using educational content, tracking learner progress, reporting learner performance, and exchanging student records between administrative systems.

IMS has two key goals:

- Defining the technical specifications for interoperability of applications and services in distributed learning and,
- Supporting the incorporation of the IMS specifications into products and services worldwide.

IMS endeavours to promote the widespread adoption of specifications that will allow distributed learning environments and content from multiple authors to work together (in technical parlance, “interoperate”).

The Final Version 1.1 of the IMS Content Packaging Specification (<http://www.imsproject.org/content/packaging/contentpackagingspecification.html>) was released to the public in April 2001.

URL: <http://www.imsproject.org/>

Contact: Kevin Riley, [kriley@eloki.fsnet.co.uk](mailto:kriley@eloki.fsnet.co.uk)

### ***IEEE LOM (Learning Object Metadata)***

The purpose of this Draft Standard for Learning Object Metadata (LOM) is to facilitate search, evaluation, acquisition, and use of learning objects, for instance by learners or instructors. The purpose is also to facilitate the sharing and exchange of learning objects, by enabling the development of catalogues and inventories while taking into account the diversity of cultural and lingual contexts in which the learning objects and their metadata will be exploited.

By specifying a common conceptual data schema, this standard ensures that bindings of Learning Object Metadata will have a high degree of semantic interoperability. As a result, transformations between bindings will be straightforward.

The intent of this standard is to specify a base schema, which can be used to build on as practice develops, for instance in order to facilitate automatic, adaptive scheduling of learning objects by software agents.

The work has its origins in both the Ariadne and IMS projects, and also builds on metadata work done by the Dublin Core group.

Data elements describe a learning object and are grouped into categories. The Base Scheme consists of nine such categories: General; Lifecycle; Meta-metadata; Technical; Educational; Rights; Relation; Annotation; Classification.

Collectively, these categories form the Base Scheme. The last category, Classification, enables an end user to classify a learning object according to arbitrary classification structures. As any classification can be referenced, this category provides for a simple extension mechanism.

Vocabularies are defined for some data elements. A vocabulary is a recommended list of appropriate values. Other values, not present in the list, may be used as well. However, metadata that rely on the recommended values will have the highest degree of semantic interoperability, i.e. the likelihood that such metadata will be understood by other end users is highest.

Besides the data elements that are specifically geared towards the domain of education, LOM also includes a rich set of data elements in the other categories. The core specification is now in version 6.1, which is currently under ballot. The ballot period closes on April 13th 2001. If the document is accepted, then draft 6 will become the version 1 of the ‘official’ LOM document, which will then upgrade from a

specification to a standard. If the document is not accepted, then a ‘ballot resolution’ process is entered, in which all comments received during ballot will be addressed. As that process comes to an end, the specification would then be re-balloted. This process can be repeated until the document is accepted. At that moment, it becomes version 1 of the standard, and LOM enters the maintenance phase.

URL: <http://ltsc.ieee.org/wg12/>

Contact: Wayne Hodgins, [wayne.hodgins@autodesk.com](mailto:wayne.hodgins@autodesk.com)

#### **e) Research, academic**

##### ***CERIF (Common European Research Information Format)***

CERIF (Common European Research Information Format) is a common language that fosters the diffusion of information across Europe. It is developing a standard format for the Research sector within Europe and, contains a set of guidelines for developing record formats meant for everyone dealing with research information systems. This “common interface” must not only address the content (what must be exchanged) but also the format of such information (how it should be presented). This information must be presented in a uniform way, at least at summary level. Classification should be consistent for all the research information sources. Subject indexing is required and a controlled terminology should have the same meaning in all languages.

CERIF has suffered from lack of resources. There are however several implementations of CERIF 2000 with mostly project info. The pilot project ERGO (European Research Gateways Online) brings together several resources from around Europe. CORDIS will also implement CERIF 2000.

Further developments are dependent on resources being available. In any case, recommendations given by W3C will be followed rather than inventing new things.

URL: <http://www.cordis.lu/cerif/>

Contact: Bernd Niessen, [bernd.niessen@cec.eu.int](mailto:bernd.niessen@cec.eu.int)

##### ***TEI (Text Encoding Initiative)***

The TEI (Text Encoding Initiative) is an international research effort established in 1987, intended to produce a community-based standard for encoding and interchange of texts. It is an international and interdisciplinary standard that helps libraries, museums, publishers, and individual scholars represent all kinds of literary and linguistic texts for online research and teaching, using an encoding scheme that is maximally expressive and minimally obsolescent.

In May 1999, a revised reprint of the Guidelines for Electronic Text Encoding and Interchange has been published by The Association for Computers and the Humanities (ACH), the Association for Computational Linguistics (ACL) and the Association for Literary and Linguistic Computing (ALLC). (<http://www.tei-c.org/Guidelines/index.htm>)

In December 2000, the TEI Consortium (TEI-C) has been established to maintain, and further develop the use of the TEI standard.

URL: <http://www.tei-c.org/>

Contact: Lou Burnard, [lou.burnard@computing-services.oxford.ac.uk](mailto:lou.burnard@computing-services.oxford.ac.uk)

#### **f) Government, geospatial, environment**

##### ***FGDC CSDGM (Content Standard for Digital Geospatial Metadata)***

The US Federal Geographic Data Committee co-ordinates the development of the National Spatial Data Infrastructure (NSDI). The NSDI encompasses policies, standards, and procedures for organisations to co-operatively produce and share geographic data. The 16 federal agencies that make up the FGDC are developing the NSDI in co-operation with organisations from state, local and tribal governments, the academic community, and the private sector.

The metadata initiative deals with metadata describing the content, quality, condition, and other characteristics of data. The Federal Geographic Data Committee approved the Content Standard for Digital Geospatial Metadata in June 1998.

The objectives of the standard are to provide a common set of terminology and definitions for the documentation of digital geospatial data. The standard establishes the names of data elements and compound elements (groups of data elements) to be used for these purposes, the definitions of these compound elements and data elements, and information about the values that are to be provided for the data elements.

Currently, extensions to Content Standard for Digital Geospatial Metadata for metadata describing geospatial data obtained from remote sensing is open for public review until 31 August 2001.

URL: <http://www.fgdc.gov/metadata/metadata.html>

Contact: Doug Nebert, [ddnebert@usgs.gov](mailto:ddnebert@usgs.gov)

##### ***GILS (Global Information Locator Service)***

GILS is an open standard for searching basic information descriptions. As part of how an organisation manages information content, these “locator records” give users inside and outside the organisation a simple way to find information. Such descriptions may be inserted into Web documents with tools like TagGen, generated from databases with tools like MetaStar and Microsoft Access; or edited by cataloguers and just stored as documents.

Based on the ISO 23950 search standard, GILS requires servers to handle nine concepts for searching: Title, Originator, Distributor, Record Source, controlled and uncontrolled Subject Terms, Date Last Modified, Any (i.e., “full-text”), and Local Number. The search profile also supports searching on geographic co-ordinates. The semantics of the GILS search concepts are registered in the ISO Basic Semantic Registry.

Several information communities use the search interoperability of GILS without further specification, but some have added extensions for their particular needs. A common approach is to add Usage Guidelines to specify rules about the information content shared across an information community. For example, a Usage Guideline may specify organizational responsibilities, how frequently the metadata should be updated, or whether a particular metadata element is mandatory or needs to be coded in a certain way.

URL: <http://www.gils.net/>

Contact: Eliot Christian, [echristi@usgs.gov](mailto:echristi@usgs.gov)

### ***GELOS (Global Environmental Locator Service)***

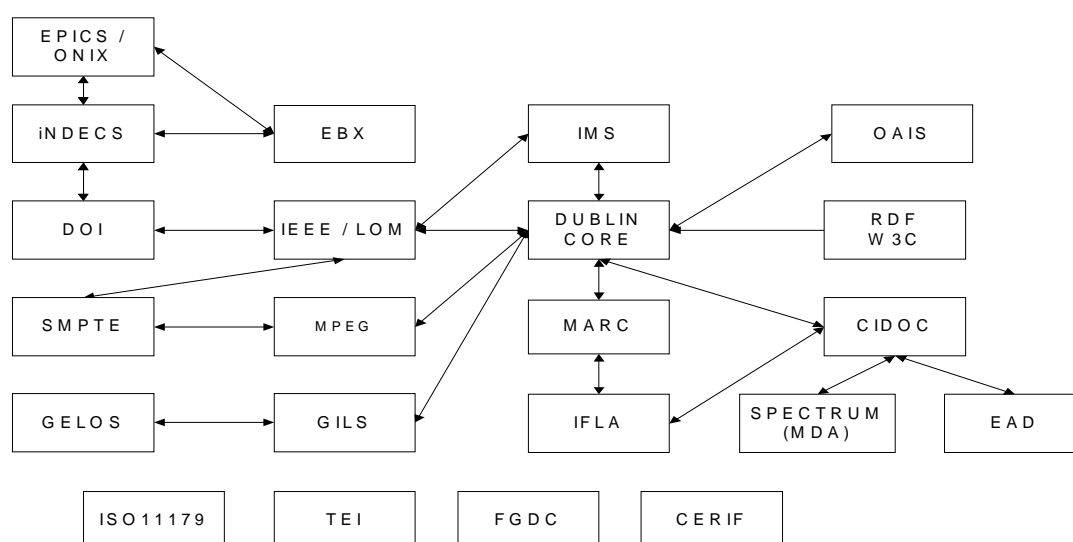
GELOS is an element set for environmental information resources. It is an implementation of GILS and maintained by the European Environmental Agency. Although it appears to be widely used in the environmental community, no additional information could be gathered as the web page does not work (April 2001).

URL: <http://www.gelos.org/>

Contact: Stefan Jensen, [stefan.jensen@numis.niedersachsen.de](mailto:stefan.jensen@numis.niedersachsen.de)

## **6. Interrelationships**

The diagram below shows the interrelationship between some of the initiatives, as far as it could be traced from the answers to the email enquiry and the desk research.



## 7. Glossary

Term/acronym	Full name	URL
<indec>	Interoperability of data in e-commerce systems	<a href="http://www.indec.org/">http://www.indec.org/</a>
AAP	Association of American Publishers	<a href="http://www.publishers.org/">http://www.publishers.org/</a>
ACH	Association for Computers and Humanities	<a href="http://www.ach.org/">http://www.ach.org/</a>
ACL	Association for Computational Linguistics	<a href="http://www.aclweb.org/">http://www.aclweb.org/</a>
ALA	American Library Association	<a href="http://www.ala.org/">http://www.ala.org/</a>
ALLC	Association for Literary and Linguistic Computing	<a href="http://www.allc.org/">http://www.allc.org/</a>
Ariadne	Alliance of Remote Instructional Authoring and Distribution Networks for Europe	<a href="http://ariadne.unil.ch/">http://ariadne.unil.ch/</a>
BIC	Book Industry Communication	<a href="http://www.bic.org.uk/">http://www.bic.org.uk/</a>
BISG	Book Industry Study Group	<a href="http://www.bisg.org/">http://www.bisg.org/</a>
BSR	Basic Semantics Register	<a href="http://forum.afnor.fr/afnor/WORK/AFNOR/GPN2/TC154WG1/">http://forum.afnor.fr/afnor/WORK/AFNOR/GPN2/TC154WG1/</a>
CC/PP	Composite Capability/Preference Profiles	<a href="http://www.w3.org/TR/NOTE-CCPP/">http://www.w3.org/TR/NOTE-CCPP/</a>
CCSDS	Consultative Committee for Space Data Systems	<a href="http://www.ccsds.org/">http://www.ccsds.org/</a>
Cedars	CURL examples in digital archives	<a href="http://www.leeds.ac.uk/cedars/">http://www.leeds.ac.uk/cedars/</a>
CERIF	Common European Research Initiative Format	<a href="http://www.cordis.lu/cerif/">http://www.cordis.lu/cerif/</a>
CIDOC	International Committee for Documentation of the International Council of Museums	<a href="http://www.cidoc.icom.org/">http://www.cidoc.icom.org/</a>
CIMI	Computer Interchange of Museum Information	<a href="http://www.cimi.org/">http://www.cimi.org/</a>
CNRI	Corporation for National Research Initiatives	<a href="http://www.cnri.reston.va.us/">http://www.cnri.reston.va.us/</a>
CORDIS	Community Research & Development Information Systems	<a href="http://www.cordis.lu/">http://www.cordis.lu/</a>
DAML	DARPA Agent Markup Language	<a href="http://www.daml.org/">http://www.daml.org/</a>
DCMI	Dublin Core Metadata Initiative	<a href="http://dublincore.org/">http://dublincore.org/</a>
DDL	Data Definition Language	
DOI	Digital Object Identifier	<a href="http://www.doi.org/">http://www.doi.org/</a>
DTD	Document Type Definition	

Term/acronym	Full name	URL
Dublin Core	Dublin Core Metadata Initiative	<a href="http://dublincore.org/">http://dublincore.org/</a>
EAD	Encoded Archival Description	<a href="http://www.locweb.loc.gov/ead/">http://www.locweb.loc.gov/ead/</a>
EBU	European Broadcasting Union	<a href="http://www.ebu.ch/">http://www.ebu.ch/</a>
EBX	Electronic Book Exchange	<a href="http://www.ebxwg.org/">http://www.ebxwg.org/</a>
EDItEUR	European Group for Electronic Commerce in the Book and Serials Sector	<a href="http://www.editeur.org/">http://www.editeur.org/</a>
EEA	European Environmental Agency	<a href="http://www.eea.eu.int/">http://www.eea.eu.int/</a>
EPICS	EDItEUR Product Information Communication Standards	<a href="http://www.editeur.org/epics.html">http://www.editeur.org/epics.html</a>
ERGO	European Research Gateways Online	<a href="http://www.cordis.lu/ergo/">http://www.cordis.lu/ergo/</a>
FGDC	Federal Geographic Data Committee	<a href="http://www.fgdc.gov/">http://www.fgdc.gov/</a>
FRANAR	Functional Requirements for Authority Numbers and Records	<a href="http://www.ifla.org/VI/3/annual/ann99.htm#2">http://www.ifla.org/VI/3/annual/ann99.htm#2</a>
FRBR	Functional Requirements for Bibliographic Records	<a href="http://www.ifla.org/VII/s13/frbr/frbr.htm">http://www.ifla.org/VII/s13/frbr/frbr.htm</a>
GELoS	Global Environmental Locator System	<a href="http://www.gelos.org/">http://www.gelos.org/</a>
GILS	Global Information Locator Service	<a href="http://www.gils.net/">http://www.gils.net/</a>
Handle System	A general-purpose global name service enabling secure name resolution over the Internet	<a href="http://www.handle.net">http://www.handle.net</a>
ICOM	International Council of Museums	<a href="http://www.icom.org/">http://www.icom.org/</a>
IDF	International DOI Foundation	<a href="http://www.doi.org/">http://www.doi.org/</a>
IEC	International Electrotechnical Commission	<a href="http://www.iec.ch/">http://www.iec.ch/</a>
IEEE LOM	Learning Object Metadata	<a href="http://www.ltsc.ieee.org/wg12/">http://www.ltsc.ieee.org/wg12/</a>
IFLA		<a href="http://www.ifla.org/">http://www.ifla.org/</a>
IMS	Instructional Management System	<a href="http://www.imsproject.org/">http://www.imsproject.org/</a>
INFO2000	Information Society Programme of the European Commission	<a href="http://europa.eu.int/information_society/programmes/evaluation/pdf/report1info2000_en.pdf">http://europa.eu.int/information_society/programmes/evaluation/pdf/report1info2000_en.pdf</a>
ISBD	International Standard Bibliographic Description	<a href="http://www.ifla.org/VII/s13/pubs/isbd.htm">http://www.ifla.org/VII/s13/pubs/isbd.htm</a>
ISO	International Standards Organisation	<a href="http://www.iso.ch/">http://www.iso.ch/</a>

Term/acronym	Full name	URL
IST	Information Society Technologies Programme	<a href="http://www.cordis.lu/ist/">http://www.cordis.lu/ist/</a>
LC	Library of Congress	<a href="http://www.loc.gov/">http://www.loc.gov/</a>
Library of Congress Network Development and MARC Standards Office		<a href="http://www.loc.gov/marc/ndmsso.html">http://www.loc.gov/marc/ndmsso.html</a>
MARC21	Machine Readable Cataloguing	<a href="http://www.loc.gov/marc/">http://www.loc.gov/marc/</a>
MPEG-7	Moving Picture Expert Group: Digital Audio-visual Framework	<a href="http://www.cselt.it/mpeg/">http://www.cselt.it/mpeg/</a> <a href="http://www.mpeg-7.com/">http://www.mpeg-7.com/</a>
NEDLIB	Networked European Deposit Library	<a href="http://www.kb.nl/coop/nedlib/">http://www.kb.nl/coop/nedlib/</a>
NSDI	National Spatial Data Infrastructure	<a href="http://www.fgdc.gov/nsdi/">http://www.fgdc.gov/nsdi/</a>
OAIS	Open Archival Information System	<a href="http://www.ccsds.org/documents/pdf/CCSDS-650.0-R-1.pdf">http://www.ccsds.org/documents/pdf/CCSDS-650.0-R-1.pdf</a>
OCLC	Online Computer Library Center	<a href="http://www.oclc.org/">http://www.oclc.org/</a>
OCLC/RLG Working Group on Preservation Metadata		<a href="http://www.oclc.org/digitalpreservation/wgmetadata.htm">http://www.oclc.org/digitalpreservation/wgmetadata.htm</a>
OeBF	Open eBook Forum	<a href="http://www.openebook.org/">http://www.openebook.org/</a>
OIL	Ontology Inference Layer	<a href="http://www.ontoknowledge.org/oil/">http://www.ontoknowledge.org/oil/</a>
ONIX	Online information eXchange	<a href="http://www.editeur.org/onix.html">http://www.editeur.org/onix.html</a>
P3P	Platform for Privacy Preferences	<a href="http://www.w3.org/P3P/">http://www.w3.org/P3P/</a>
PDF	Adobe Portable Document Format	<a href="http://www.adobe.com/products/acrobat/adobepdf.html">http://www.adobe.com/products/acrobat/adobepdf.html</a>
PRISM	Publishing Requirements for Industry Standard Metadata	<a href="http://www.prismstandard.org/">http://www.prismstandard.org/</a>
RDF	Resource Description Framework	<a href="http://www.w3.org/RDF/">http://www.w3.org/RDF/</a>
RLG	Research Libraries Group	<a href="http://www.rlg.org/">http://www.rlg.org/</a>
RSS	RDF Site Summary	<a href="http://purl.org/rss/">http://purl.org/rss/</a>
SAA	Society of American Archivists	<a href="http://www.archivists.org/">http://www.archivists.org/</a>
SCHEMAS	Forum for Metadata Schema Designers	<a href="http://www.schemas-forum.org/">http://www.schemas-forum.org/</a>
SGML	Standardized General Markup Language	<a href="http://www.w3.org/Markup/SGML/">http://www.w3.org/Markup/SGML/</a>
SHOE	Simple HTML Ontology Extension	<a href="http://www.cs.umd.edu/projects/plus/SHOE/">http://www.cs.umd.edu/projects/plus/SHOE/</a>

<b>Term/acronym</b>	<b>Full name</b>	<b>URL</b>
SMPTE	Society of Motion Picture and Television Engineers	<a href="http://www.smpte.org/">http://www.smpte.org/</a>
SPECTRUM	The UK Museum Documentation Standard	<a href="http://www.mda.org.uk/spectrum.htm">http://www.mda.org.uk/spectrum.htm</a>
TEI	Text Encoding Initiative	<a href="http://www.tei-c.org/">http://www.tei-c.org/</a>
URL	Uniform Resource Locator	<a href="http://www.w3.org/Addressing/">http://www.w3.org/Addressing/</a>
W3C	World Wide Web Consortium	<a href="http://www.w3.org/">http://www.w3.org/</a>
WAI	Web Accessibility Initiative	<a href="http://www.w3.org/WAI/">http://www.w3.org/WAI/</a>
XML	Extensible Mark-up Language	<a href="http://www.w3.org/XML/">http://www.w3.org/XML/</a>
XMLnews		<a href="http://www.xmlnews.org/">http://www.xmlnews.org/</a>