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1. Introduction

This document D3.1 was defined as following in the “Application form for the full proposal” of the E-Quality project:

D3.1 Report on general information on quality process including a General Quality Process Chart (GQPC) and guidelines.

The literature about quality in e-learning and quality in general is very abundant and there is not necessarily general agreement on the definitions and concepts used in these fields. In order to allow the future course attendants to quickly integrate the idea of quality in e-learning, there is a need for a document summarizing the state-of-the-art in quality management in e-learning for higher education.

The first part of this document reviews a certain number of quality tools and processes. These tools, should they be norms, guidelines, accreditations, previous project outputs or reference practices, are considered from the perspective of their application in e-learning in higher education. The document takes a top-down approach starting with general considerations on quality and quality in higher education before focusing especially on e-learning in higher education.

2. Scope of the document

This document is targeted first at the internal partners of the project. It is a review of the reference projects and tools, which we want to use as a basis for our work. It is introductory to the field of quality in e-learning. For this reason, newcomers to the project should use it to get up to speed.

This document is finally targeted to the course attendants. It acts as their introduction to the concepts of quality in general and quality in e-learning in particular. For these reasons, the document focuses on very practical methods and tools instead of general considerations on quality. The document is not intended as research work but mainly as a review of the state-of-the-art in the quality field. The document is to be updated continuously during the project with the input of the partners' reference tools and results.



3. General introduction to open and distance learning

The form of online training has varied since the 1990's when it was thought to ultimately replace classroom-based learning, and at the time of the internet bubble, when the results didn't live up to the promises: early online learning programs were badly designed and delivered [FT05]. Today online learning has been given a second lease of life in which the earlier mistakes tend to be corrected: the goal is now for a consensus and a norm to emerge, for the resources and material to be pooled and reusable, and for the best practices to be shared and adopted by all.

The Fundamental aspect of Distance Learning resides in the use of modern technologies such as Web-based learning environments, mobile phones, and videoconferencing, to allow the students to take a course without being physically present in the classroom. This opposes traditional face-to-face education, as we know it in the classroom-based environment. The concept is not new and essentially involves transposing distance teaching via snail mail to the new information technologies.

The idea of Open Learning is somewhat wider since it implies a large flexibility for the student; firstly in terms of the location of the student and media of content delivery: in this sense, distance learning is a part of open learning. Flexibility also refers to time-management, pace of learning, and learning style (more theoretical vs. more based on case studies, more individual vs. more participative). Not all styles will fit all purposes: constant interactivity could impair the student's time management flexibility. In the same way, one should not overlook the positive aspects of face-to-face teaching in terms of student motivation, the development of certain soft skills, and the opportunity for the student to break from the routine and appreciate the commitment of the staff. Thus, some courses may not be taught entirely at distance but require a form of Blended Learning, that is a mix of traditional face-to-face events interspersed with the student using ODL material.

Thus every ODL course will vary in the amount of distance vs. face-to-face, interactivity vs. self-studying it contains. It will also differ from other courses by the quality of the presentation of the material and the quality of student support at all stages of the learning process. While finding the right mix of the first two criteria may be a question of individual preferences, the quality of the material and the support is what marks the difference and brings added value to e-learning compared to self-teaching (i.e. teaching oneself a subject with the raw documentation available on a subject). Before enrolling in a potentially expensive course, the student has the right to be informed of the structure of the course as well as to be assured of the quality of the material and the support. This assurance can be given through an accreditation but such accreditation is still to be defined and accepted in Europe. Quality is not a new concept but, as it stems from industry, it has to be adapted to the specific contexts of higher education and distance higher education.



4. General introduction to the concepts of quality

4.1 Introduction to quality

In norm ISO 8402, quality is defined as “the totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs”.

The origin of the concerns and work on quality goes back to the beginning of the 20th century, in the sector of industrial production. It is based on statistical methods applied to metrology, specifically developed to guarantee the minimum difference between theoretical measurements (in the design of a piece of metal to machine for instance) and real measurements of the produced pieces.

It is thus natural to find, among the founding fathers of quality, engineers and statisticians like W. Edwards DEMING (1900-1993) or Armand V. FEIGENBAUM (1920-).

This period, in which quality applied to checking the products leaving a production line to reduce the risks of nonconformity of the produced parts, then shifted to a notion of quality within the organization of the company, mainly in terms of quality by management. The concept of Total Quality Management is based on concepts and applications developed by DEMING and Joseph M. JURAN (1912-) who declared in 1945: “It is most important that top management be quality-minded. In the absence of sincere manifestation of interest at the top, little will happen below.” Quality is thus addressed to companies, which integrate the satisfaction of their customers into their project and their “vision” of development, as a key factor in fighting against competition, developing customer loyalty and attracting new customers. This corresponds to the historical evolution of quality towards the management of quality and the importance given to the processes – a central term of quality nowadays - within the organization of the company.

Finally, Philip B. CROSBY (1926-2001) must be mentioned. Called “the guru of Quality Management”, he was the Quality Director within the Group ITT and opened an important consultancy firm in 1979. His work focused on the evolution of organizations in terms of effectiveness, reliability and “profitability”, while concentrating on the role and implication of the leaders. He wrote a bestseller “Quality is free” (1979) in which he introduced the “Cost of obtaining quality (COQ)” dealing, in fact, with the cost of non-quality. This aspect is important, as the quality step is often reproached for its high cost - in particular human cost – due to the mobilization of human resources for writing core documents (process charts, procedures, quality handbooks etc), to underpin briefings of the staff and especially of the executives. It is clear that no quality step can be made without investment but it is interesting to get the management team to think about the cost of non-quality in areas like loss of customers, negative image, over-cost related to the requested handling of refunding, or replacement of defective material etc.

4.2 The ISO norm

4.2.1 Introduction

The quality approach relies here on the concept of norm and standard, unlike other models such as TQM (Total Quality Management) that concentrate on organization management. Created in 1947, the ISO (International Organization for Standardization) is a network of national institutes of standardization¹, according to the principle of one member per country, of which the Central Secretariat, located in Geneva, ensures the overall coordination.

The ISO’s main activity was, for a long time, the development of technical standards to bring solutions to problems of production and distribution. Nowadays, its work program ranges from standards for traditional activities, such as agriculture and construction, through mechanical engineering, manufacturing and distribution, to transport, medical devices, information and communication

¹ To date 149 countries are represented.



technology developments, and to standards for services. The ISO standards objective is to make transparent the requirements that products must meet on world markets, as well as conformity assessment mechanisms for checking that these products measure up to standards. They also allow easier and more equitable exchanges between countries. Another outcome is that suppliers from developed and developing countries alike can compete on an equal basis on markets everywhere.

The ISO standards provide governments with a technical basis for legislation in regard to health, safety and environment. They are also used to protect the consumers and users of products and services – and to try to make their life simpler.

4.2.2 The ISO 9000 family²

The ISO 9000 family is the international reference for companies as regards the certification of their quality management systems. Certification, according to these standards, recognizes the effectiveness of an organization and allows it to guarantee the confidence and satisfaction of its customers. The ISO 9000 family was created in 1987 to harmonize and rationalize relationships between clients and suppliers. It was first updated in 1994; this version focused on the quality assurance of products from their design to their installation at the customer's place of residence, and was primarily addressed to industrialists. It was criticized mainly for generating administrative heaviness and lots of paperwork. In 2000, a major revision of the ISO 9000 standards was implemented. It is this last version that is presented here. In addition to industries it deals with services - and thus concerns us directly. It is centred on customers' requirements and satisfaction, rather than the conformity of a final product to pre-established rules. Its stated objective is the increase in customer satisfaction.

These two versions are usually presented as ISO 9000:1994 and ISO 9000:2000. The ISO 9000 family is - essentially - associated with the ISO 14000 family, in "environmental management"³. In 2005, standards ISO 9000 and ISO 14000 were implemented in more than 7,609,000 organizations throughout 154 countries.

The companies that respect ISO standards can ask for official recognition. This certification is obtained - for a three-year period - after an audit carried out by a certification body. The certification is a quality label, which guarantees the company's customers that the standard for which the certification was obtained, is met. The two principal standards of this series are:

- the ISO 9001 standard, concerning the requirements for quality management systems and targets refers to external customers only;
- the ISO 9004 standard is expressed more in terms of recommendations, and targets the 5 quality stakeholders i.e. in addition to the external customers, the suppliers, employees, shareholders and society as a whole (including environmental aspects).

4.2.3 The ISO 9001:2000 standard

Let us examine the principals of ISO 9001:2000 standards in more detail, relying on certification audits. These principles are shown below in Figure 4-1.

² This paragraph is partly based on documents and training from the Kompétis Company of Group XL <http://www.kompétis.com>

³ "environmental management" means what the organization does to:

- minimize harmful effects on the environment caused by its activities
- achieve continual improvement of its environmental performance.

(cf. official ISO Website, see above)

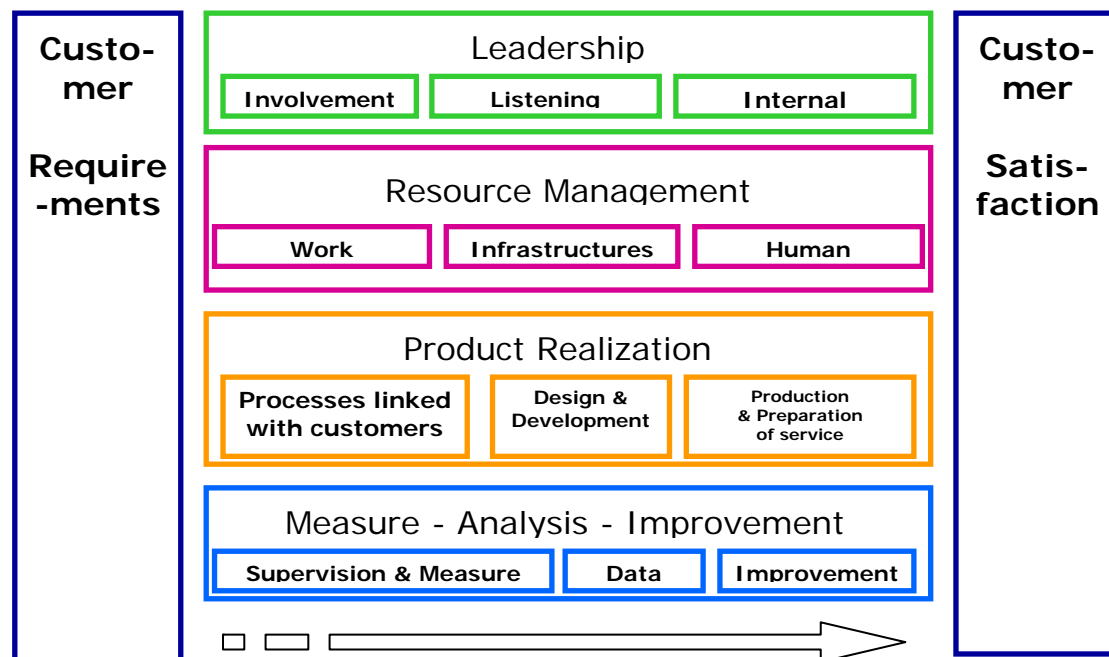


Figure 4-1: The ISO9001 Model diagram

The principles that establish this new version specifically include:

- **Customer focus:** the organizations must understand their customers' present and future needs, to meet their requirements and even exceed their expectations.
- **Leadership:** the managers' role is fundamental in the success of the quality step, especially to implicate all the staff. The leaders must involve the staff, in order to reach the objectives and realize the ambitions of the company; key factors for this principle are to clearly set out its policy, objectives, commitment, the means to implement, the responsibilities for each of these, to communicate within the organization, to evaluate, measure, and reward.
- **Involvement of people:** at all levels, people must understand that they are the essence of the organization; their full involvement is needed to achieve its success; innovation and creativity are encouraged as well as participation in the continuous improvement of the results.
- **Process approach:** this ensures greater efficiency in resource management with a clear definition of activities and related resources, lowering costs and shortening cycle times; it also includes risk management.
- **Continual improvement:** this is a permanent axis of progress; each member of the staff contributes to it and takes a part of responsibility. Quality is no longer a static and fixed system but bases its legitimacy and action on concrete results in continual improvement.
- **Measure the increase of customer satisfaction:** this guarantees reaching the final objective, which is to increase this satisfaction.

4.2.4 Example of an implementation of ISO in e-Learning: The CNAM-LR

CNAM-LR stands for "Centre National des Art et Métiers, Languedoc-Rousillon": it is an institute of applied research and teaching for professionals. It received an ISO 9001 certification in December 2004 for its whole set of academic teaching, basic professional training and specialized professional training. The following is a summary of an interview with L. Abault, quality manager and A. Brethon, regional director, published in the CNAM-LR brochure [CNAM].

The decision to start the certification process came after some issues were fed back by both the students and the staff. By consensus, a quality management professional was summoned to explain the benefits



of quality management and all actors contributed to the setting up of a quality management process. A consulting firm was used to help run the process in practice.

The students were placed at the centre of the process and considered as the "clients" according to ISO terminology, like other industrial clients. The students' feedback on training was carefully considered. Student-client satisfaction was evaluated at several points in time: at the beginning of training through an entry survey, at the end of the course through an evaluation form, and finally through a request for comments. All this information was screened and compiled by the quality manager to be transmitted to the director.

The role of the quality manager is to maintain a constant focus on a common objective of quality. He builds an overall quality process distinct from administrative divisions.

The ISO 9001 certification is valid for 3 years. Although it is not mandatory for the CNAM-LR, it is nevertheless both recognition of the efforts invested in quality management and a commercial and competitive asset. In the case of the CNAM-LR, a yearly internal quality assessment is performed in order to prepare for the renewal of the certification at the end of the period. Quality management is a constant effort to convert both the people and the process to the practice of quality in a proactive manner.

In the case of the CNAM-LR, the steps toward quality management can generate positive externalities: better satisfaction of our clients of course but also better internal organization and a shared objective for the staff. Partnership with a similar institution can provide an exchange of means and good practices.

4.3 The EFQM Model

4.3.1 Introduction

The EFQM (European Foundation for Quality Management) was founded in 1988 by 14 leading European businesses, and aims at helping European businesses in implementing a form of Total Quality Management (TQM). The TQM was born in the post-war Japanese industry; it is at the origin of the whole management chain concept, meaning every level to be implicated in quality management [TQM]. This model has been a framework for numerous other models around the world such as the Malcolm Baldrige Model [MBM] in the US, the Deming Prize [DEMING] in Japan, and the EFQM in Europe.

The first EFQM model was created in 1991 and later reviewed in 1999, to "promote world-class approaches to the management of European organizations that would lead to sustainable excellence and success" [EFQM]. The model, named "EFQM Excellence Model", is structured along 9 criteria.

The 8 concepts at the basis of the model are named "EFQM Fundamental Concepts of Excellence".

The EFQM model is currently used by thousands of public and private organizations as a self-assessment framework.

4.3.2 The EFQM Fundamental Concepts of Excellence

These are high-level concepts underpinning the model. At the top of the model implementation criteria, they underline the relevance of implementing quality from a business perspective.



Results Orientation

Excellence is achieving results that delight all the organization's stakeholders.

Customer Focus

Excellence is creating sustainable customer value.

Leadership and Constancy of Purpose

Excellence is visionary and inspirational leadership, coupled with constancy of purpose.

Management by Processes and Facts

Excellence is managing the organization through a set of interdependent and interrelated systems, processes and facts.

People Development and Involvement

Excellence is maximizing the contribution of employees through their development and involvement.

Continuous Learning, Innovation and Improvement

Excellence is challenging the status quo and effecting change by utilizing learning to create innovation and improvement opportunities.

Partnership Development

Excellence is developing and maintaining value-adding partnerships.

Corporate Social Responsibility

Excellence is exceeding the minimum regulatory framework in which the organization operates, and striving to understand and respond to the expectations of their stakeholders in society.

4.3.3 The EFQM Excellence model

This assessment of an "Excellent" organization, i.e. an organization that follows the Excellence Model is made along 9 criteria represented in the following EFQM diagram:

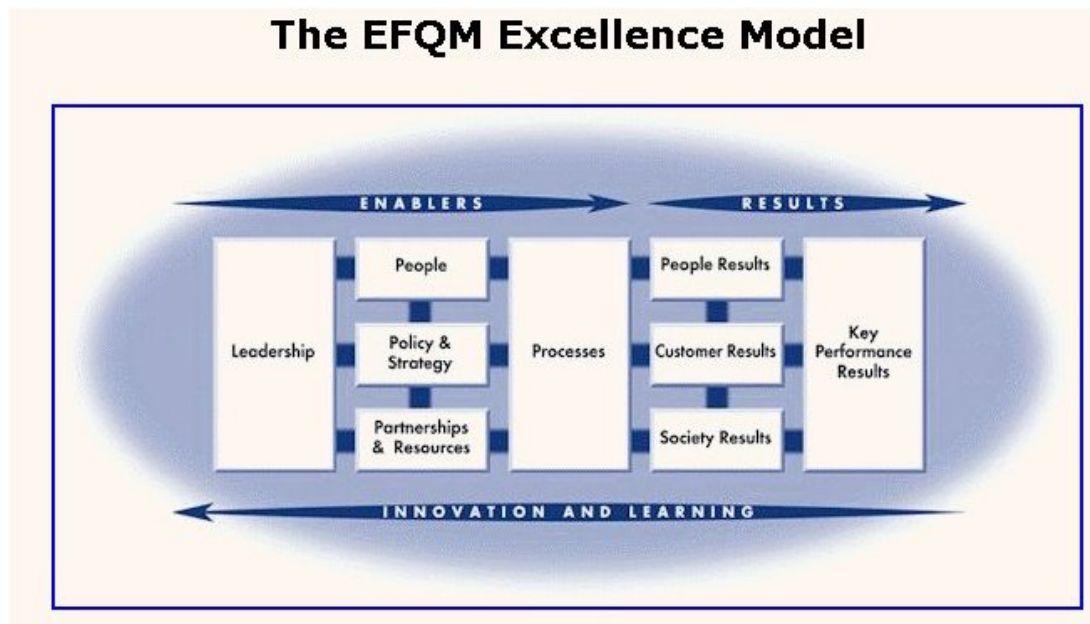


Figure 4-2 EFQM Model diagram [EFQM]

Leadership: Excellent leaders develop and facilitate the achievement of the mission and vision. They develop organizational values and systems required for sustainable success and implement these *via* their actions and behaviours. During periods of change, they retain a constancy of purpose. When required, such leaders are able to change direction of the organization and inspire others to follow.

Policy and Strategy: Excellent organizations implement their mission and vision by developing a stakeholder-focused strategy that takes the market and the sector in which it operates into account. Policies, plans, objectives and processes are developed and deployed to deliver the strategy.

People: Excellent organizations manage, develop and release the full potential of their people at individual, team-based and organizational levels. They promote fairness and equality, and involve and empower their people. They care for, communicate, reward and recognize, in a way that motivates staff and builds commitment to using their skills and knowledge for the benefit of the organization.

Partnerships and Resources: Excellent organizations plan to manage external partnerships, suppliers and internal resources in order to support their policy and strategy and the effective operation of the processes. During planning and whilst managing partnerships and resources, they balance the current and future needs of the organization, the community, and the environment.

Processes: Excellent organizations design, manage and improve processes in order to fully satisfy and generate increasing value for customers and other stakeholders.

Customer Results: Excellent organizations comprehensively measure and achieve outstanding results with respect to their customers.

People Results: Excellent organizations comprehensively measure and achieve outstanding results with respect to their people.

Society Results: Excellent organizations comprehensively measure and achieve outstanding results with respect to the society.

Key Performance Results: Excellent organizations comprehensively measure and achieve outstanding results with respect to the key element of their policy and strategy.

The arrow at the bottom, from right to left, underlines the fact that the model relies on continuous improvement of the processes (through innovation) and of the competencies (through learning).

5. Quality in Higher Education

Quality in Higher Education is such a broad subject that it could not be addressed upfront with implementation guidelines valid throughout Europe. Instead of getting stalled with this approach, the relevant authorities focused on giving a political framework to quality assessment [PERELLON03] and identified five decisions facing the authorities:

1. Will the assessment result have direct financial implications for the institution?
2. Which bodies will be in charge of this assessment, and how will they interact?
3. What is the target, or the *focus*, as defined in section 5.2.1, of this assessment?
4. What types of instruments or methods are to be used?
5. What is to be done with the results, should they be made public or not?

The relevant authorities or their subsidiaries have given the following answers.

5.1 The European political guidelines

In its council recommendation [98/561/EC] of September 1998, the Council of European Union recommended establishing transparent quality assessment and quality assurance in the field of higher education. The aim was to improve the quality of higher education while taking into account the national conditions, the European dimension and the international competitive conditions. Quality assessment and assurance was to be based on the following principles:

1. The bodies responsible for quality assessment and quality assurance must be independent.
2. The evaluation procedures must be related to the way the institutions see themselves.
3. The assessment must include internal parts (self-assessment) and external parts (experts' appraisals).
4. Results must be published.

The stakeholders in higher education were encouraged to exchange knowledge and information while the European Commission was requested to present a report on the development of quality assessment in the member states every three years.

In 1998, the ministers responsible for higher education in France, Italy, Germany and the United Kingdom signed the Sorbonne Declaration [SORBON98]. One year later, on June 19 1999, the Bologna Declaration was signed by 29 countries. The declaration is cited and explained in [BOLOGN99]. Both documents initiated the process of creating a unified higher education area in Europe with a quality assurance dimension using comparable criteria and methods throughout Europe.

The follow-up meeting took place in Prague in 2001. In their communiqué [PRAGUE01], the European ministers of Higher Education reaffirmed the importance of a common quality and accreditation mechanism, while respecting the specificities of each country and each institution. They encouraged the creation of a common framework of reference for quality assurance and the dissemination of best practices. They put the European Network for Quality Assurance in higher education (ENQA) in charge of coordinating the efforts.

At the Berlin conference in 2003 [BERLIN03], the ministers for higher education stated that by 2005, there should be:

1. A definition of the responsibilities of the bodies involved in quality assurance.
2. An evaluation method for programs and institutions. It should include:

- Internal assessment and external review
 - The participation of the students (added from [98/561/EC])
 - The publication of the results
3. A system of accreditation, certification or comparable procedures
 4. An international network of cooperation

Once again, the ministers as well as the European Commission left it up to the ENQA, in coordination with the European University Association (EUA), the European Association of Institutions in Higher Education (EURASHE) and the National Unions of Students in Europe (ESIB) to implement the concrete steps towards the Bologna goals.

The Bergen 2005 conference [BERGEN05] is the most recent conference of the Bologna Process. In their communiqué, the ministers responsible for higher education acknowledged the progress and cooperation in the field of quality assurance in higher education. They underlined however the need for more student involvement and international cooperation. They adopted the guidelines for quality assurance as proposed by the ENQA [ENQA05]. This is a major step since a common set of rules is now available for every institution to implement.

5.2 The ENQA model

The European Network for Quality Assurance in Higher Education was created in 1999 by the EU council of ministers. It is a heterogeneous association of national bodies involved in quality in higher education.

In 2001, in Prague, the ENQA was put in charge of “*establishing a common framework of reference and to disseminate best practices*” in collaboration with other national bodies. Following this, a survey was sent in 2002 to thirty-four quality assurance agencies, working for both university and non-university higher education. A summary of their evaluation methods was made in [ENQA03].

5.2.1 The types of evaluation

The results of the survey show that European quality assurance is based on eight *types of evaluation*: a *type of evaluation* is a combination of one *method* and one *focus*.

Table 5-1 and Table 5-2 show the various methods and focus.

Method Name	Description
Evaluation	The synthesis of the feedback of the various actors (through a grading mechanism, satisfaction reports...) not necessarily in reference to a standard.
Accreditation	A process that gives a yes/no answer to the question of whether the object of the evaluation meets a certain (minimum or excellent) standard. Thus accreditation always involves benchmarking. An accreditation can be delivered <i>ex-ante</i> (before its target is in use) or <i>ex-post</i> .
Audit	A method for evaluating the strengths and weaknesses of the object of the audit.
Benchmarking	A comparison of results between two objects (subject, institution...), one of these being a reference (typically a best practice) and the other, the one to be evaluated.

Table 5-1 Evaluation Methods

Focus Name	Description
Subject	Knowledge that can be taught at different levels in various programs, e.g. marketing, computer science ...
Program	Set of studies leading to a formal degree, e.g. an MBA, a bachelor degree.
Institution	All the services constituting an institution: its organization, facilities, financial matters, teaching, and research.
Theme	One educational service that is cross-subject, e.g. ICT, student counselling.

Table 5-2 Evaluation Focus

The ENQA inquiry shows that only eight types of evaluation are used in Europe, namely by order of decreasing frequency:

- **Program Evaluation,**
- **Program Accreditation,**
- **Institutional Audit,**
- **Institutional Evaluation,**

and to a lesser extent,

- Institutional Accreditation,
- Subject Evaluation,
- Program Benchmarking,
- Subject Benchmarking.

The survey also shows that most agencies carry several types of evaluation.

The success of the Program Evaluation and Program Accreditation comes from the non-university field, where a very strong professional emphasis exists, whereas the institution focus is more used in university education.

5.2.2 Quality assurance systems: the four stage model

In their 1998 recommendation [98/561/EC], the European Council recommended that member states establish quality systems for higher education including

1. An autonomous body for quality assurance;
2. The targeted utilization of internal and external aspects of quality assurance;
3. The implication of the various stakeholders;
4. The publication of a report.

These characteristics are equivalent to the *four-stage model* used by independent agencies. This model namely implies:

1. The autonomy and independence of the evaluation body from both the governments and the institutions;
2. The use of self-assessment;

3. External assessment and site visits;
4. The publication of a report.

The two are obviously equivalent. Such a model is generally accepted as the shared foundation of European Quality Assurance in Higher Education. It applies whatever the type of evaluation chosen.

5.2.3 The External Actors and the Division of Work

[ENQA03] makes a clear distinction between the Quality Assurance agency (QA agency), which performs much of the evaluation and the *expert panel*, which usually endorses the responsibility for the evaluation. Examples of QA agencies can be found in ANNEX C.

The expert panel used to be a *peer-review group*, i.e. a group of academic professionals representing the academic field being evaluated. The peer-review groups are usually involved, most often in the self-assessment of the institution.

The expert panel is a somewhat extended version of the peer-review group: it includes national experts representing the area of focus, international experts, experts representing the peer institutions, students, employers, staff members. With this respect, the implication of all stakeholders, recommended in [98/561/EC] is fulfilled with the use of an expert panel.

Regarding the independence of such a panel, the institution still nominates the experts who will be representing it in relation to other institutions. Yet the QA agency appoints all the experts in the panel and ensures their independence in regard to the institution under evaluation.

Regarding their respective responsibilities, the evaluation process has been divided in the survey into 7 successive steps:

1. The choice of the basic methodology;
2. The preparation of the guidelines for self-evaluation;
3. The preparation of an evaluation concept;
4. Contact with the institutions;
5. The planning of the site visits;
6. The preparation of the guidelines for the site visits;
7. The writing of a report.

The expert panel generally enters the evaluation process at the moment of site visits and progressively takes over the work from the QA agency until the end report. Cases occur however where experts are involved from day one. Usually the QA agency performs the work while the experts take responsibility, for experts become more and more in demand as QA evaluation expands.

5.2.4 Evaluation vs. accreditation

As seen in section 5.2.1, evaluation and accreditation can be viewed as two methods or different types of evaluation. There is however an obvious link between evaluation and accreditation. In his introductory book on quality in higher education [PERELLON03], J.F Perellon underlines the natural link between evaluation and accreditation. Indeed, what is the value of an accreditation if not granted with the knowledge of the institution, and/or a previous, presumably external, evaluation?

The two methods and even others should be seen as complementary instead of exclusive form one another.



5.2.5 Final Developments of the ENQA at the Bergen summit

The last meeting of the Bologna process took place in Bergen in 2005 and adopted the ENQA document [ENQA05] as a ground for a common European quality assurance set of standards. In this document, the process of evaluation and accreditation is clearly divided into 3 stages.

The first stage is internal quality assurance; the guidelines for this first evaluation are the following:

1. Clearly-defined policy and associated procedures must exist; these should include students and stakeholders and be publicly available.
2. Monitoring and review of the programs should be periodic.
3. The students should be assessed using published criteria, regulations and procedures for the examination.
4. The competency of the teaching staff should be assessed and the results should be commented (not necessarily made public) in a public report. The results should be available to external reviewers.
5. Enough resources should be dedicated to student support.
6. Some information, qualitative and quantitative, about internal evaluation should be made available to the public on a regular basis.
7. An adequate system should be put in place to collect the necessary information for future internal assessments.

This internal quality assurance process will be reviewed at a second stage, by external quality assurance agencies. The second-stage guidelines are the following:

1. The external quality assurance agencies should assess the internal quality assurance process and take its results into consideration.
2. The aims, processes and evaluation criteria of the external evaluation/accreditation should be published in advance.
3. The processes applied by the external reviewers should fit their aims and goals.
4. The external review should produce a report containing commendations, recommendations, follow-up procedures and should be easily readable.
5. External reviews should be cyclical, with a cycle published in advance.
6. The reviewer should publish from time to time a summary and an analysis of their findings in assessing the higher-education institutions.

To ensure the quality of the external review, its fairness and objectivity, the external reviewers will be in turn assessed by a European level (or National level, following the subsidiarity principle) agency. The quality assurance agencies will have to undertake this review every 5 years. They will have to be registered in a European Register managed by a European Register Committee.

The European assessment body will:

1. assess the aims, procedures, and evaluation criteria of the external quality assurance agencies. In particular the process should involve a self-assessment on a first basis, involvement of all the stakeholders, a site review by the external agency, the publication of a report after the external review and a follow-up procedure.
2. check for the legal basis and their compliance with the jurisdiction in which they operate;
3. check for the regularity of their activity;
4. check for their adequate human and financial resources;



5. check for the clarity and the public availability of their goal objectives;
6. check for their independence from any third party, any higher education institution, ministry or other stakeholder;
7. check for the institution accountability for its reviews.

In addition to this quality assessment structure, the ENQA recommends to put in place a consultative body, The European Consultative Forum for Quality Assurance in Higher Education, gathering all the stakeholders, in order to exchange viewpoints and experiences.

6. The Specificities of quality in higher-education ODL

The implementation of Quality in ODL in Higher Education in Europe is directly linked to two domains, as shown in the figure below (Fig. 6-1):

- the quality of training in all universities and Higher Education institutions;
- the quality of ODL.

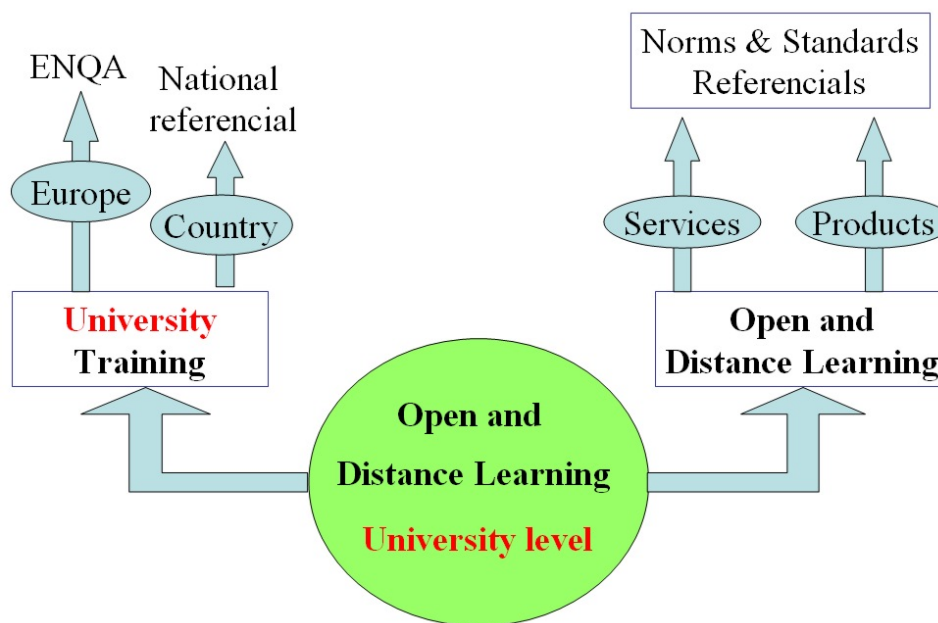


Fig. 6-1. The two aspects of quality in ODL in Higher Education in Europe

The 1st domain is still under a National system of reference, if any, but also, since the Bergen conference (2005), it is subject to the “Guidelines” written by ENQA, as seen in the previous chapter. As every ODL course or programme developed and delivered by any European university or Higher Education institution is a form of training under their responsibility, regardless of the pedagogical modalities, these courses and programmes must comply with the European “Guidelines”. However, as they also require specific modalities for their delivery, in terms of services and products, each implementation of quality addresses issues about norms, standards and referential for these two aspects of ODL. ODL training courses already mainly rely on communication technologies and the trend seems to be toward the greater involvement of these in pedagogical modalities. Furthermore, the quality of service and the quality of training material are crucial issues in ODL development and quality assurance.

Even if the scheme seems to show a separation between these two aspects of quality implementation, practically speaking, there are many interactions and overlaps between them. For instance, in terms of quality of service, the ENQA recommendation stating, “Enough resources should be dedicated to student support” fits quite well with ODL quality requirements. This is also the case with another ENQA recommendation: “Clearly-defined policy and associated procedures must exist; these should include students and stakeholders and be publicly available.”

Teachers and staff involved in ODL production and delivery in European Higher-Education institutions could see the Bergen decision – to implement Quality based on the ENQA Guidelines – as a strong incentive to implement quality in their own sector, because it is an extension of the same European objective and a solid base for discussion with decision makers within their institution.

7. Standards in e-learning: an overview

7.1 Introduction

The question of the sustainability and reuse of pedagogical material is essential, in one way or another, for every actor in e-learning. What is at stake is the medium and long time profitability of the investment in the preparation of a teaching set-up relying on information technologies. This investment is always significant in terms of financial resources as well as in individual commitment from the teachers and from the content designers. More explicitly, it is a matter of avoiding duplicating work already done elsewhere and of avoiding that the documents, tests, collaborative work procedures, study guides and so on remain encapsulated in the software environment used when carrying out the teaching set-up. Designers and developers, for their part, are faced with the coexistence of a variety of norms and standards⁴ and early in the decision process they have to make political decisions about this question. In a project team, it is thus important for each partner to be in a position to evaluate these stakes and to understand other actors' decisions.

Consequently, this review aims at presenting a quick overview of the problems surrounding the reuse of pedagogical resources. Four dimensions will be described: the reasons for the standardization problem and the issues it raises, some active actors in the field, a brief description of the various standardization levels and of the context of their use, as well as the main set-up steps. This text has been written for a non-specialized public to allow the development of a common perception and of a common vocabulary.

7.2 Description of the problem and the issues at stake

7.2.1 Resource multiplication and localization

The quasi-exponential growth of the knowledge accumulated by Man during the last centuries seems to compromise its accessibility. The explosion of the amount of information available caused by the information era has heightened this trend to the point where some of this information is inaccessible, simply because there is no straightforward means to access it. Indeed, what is more difficult than obtaining precise information in some particular domain?

This difficulty seems to be mainly due to two factors. First, each library or editor gives out some content in a format that is peculiar to itself, which generally compromises the easy importation of this content – making it dependent on its software environment. Such formats are said to be **proprietary formats**; in opposition to **open formats**, they rely on specifications that are not public. A format is said to be open when the specification on which it relies is part of the public domain (or possibly if its data representation mode is transparent). A proprietary format, by opposition, relies on some specification that is not part of the public domain; the disadvantage of this kind of format is that they are not fully interpretable by third-party software, the specification being unavailable. The fact that the content is inextricably mixed with its software environment is a recurrent problem in information technologies: one can still recall the painful early stage of micro-informatics, when various systems cohabited without any possible interoperability.

7.2.2 Changes in training demand

Such an environment cannot avoid having intended or unintended consequences on the role and practices of the learners. Training institutions cannot stay on the fringes of the increasing omnipresence of technological developments, and have to familiarize learners and students with the communication modes and tools they will encounter in their professional life. It is moreover unavoidable to prepare learners to adapt their practices to the generation of kids who have grown up in a universe invested by

⁴ In this text, no distinction is made between the *standard* and *norm* terms, which both express the normalised or standardised way to express concepts or content.



such technologies, and who will have integrated some expertise that could be beneficial to learning. Not integrating these technologies would mean renouncing tools that can be efficient and stimulating if properly used.

Besides, recent developments in our society mean that an ever-increasing proportion of active individuals has – or will have – to undergo some complementary, or even continuous, training. Given these circumstances, today's educational system cannot respond effectively to ever-quicker changes in work market demands [JACKSO03], which are justified by an increasingly versatile and competitive worldwide economy. The courses proposed by educational institutions (universities) cannot keep up with the frantic pace of subject matter renewal imposed by such new conditions. A university degree can nowadays be sufficient to step into the world of employment, but even third-cycle studies cannot guarantee the skills required to stay competitive in tomorrow's work market.

For all these reasons, the need for new learning modes has become tangible. These need in particular to meet the following criteria:

- flexibility of learning towards the learners and the conditions (adaptability);
- quick response to changes in the demand;
- authenticity of the supplied information;
- effectiveness of knowledge acquisition (high acquisition rate);
- development of autonomous learning skills, allowing the learner to update his/her knowledge once the main training is completed.

7.3 The challenge of interoperability

To satisfy these criteria, the learning material – to be understood here as documentary resources and activity sequences aiming to guide learning – has to be available in a digital form. Such a form is indeed essential to provide content that is adaptable to the learner and to the learning conditions, and that can respond quickly to changes in the demand. It would also allow the reuse of processes – sometimes sophisticated – that have proved their effectiveness.

At this time, a huge amount of digital learning resources exists, mainly elaborated by universities, large administrations or big enterprises. These offer their students or employees various computer-based training (CBT) means, allowing them to acquire new knowledge or to update it. Nevertheless, and as mentioned earlier, although these resources are locally exploitable – in the range of a university or an enterprise – the fact that numerous software environments (called in this case virtual learning environments, or VLE) coexist, compromises the exchange of learning material between institutions. A university using one VLE (several hundred are in existence) or possibly a self-made IT development then becomes dependent on it, as the availability of the material depends on the existence or sustainability of the VLE used, or on the stability of the license costs. Moreover, it would be very difficult for such a university to import into its VLE a course from another university using another VLE, or even to provide an exchange of material between its different courses.

The dependence of the learning material on the learning environment has a major disadvantage: the impossibility of guaranteeing sustainability. Indeed, how can a teacher, who has used a VLE to put his didactic material online, be sure that the VLE in question will still be usable after some years? The risk incurred is too high: re-developing the content periodically to make it conform to the successively used VLEs is simply unacceptable. Moreover, the huge redundancy existing in the didactic material sector is perceived as a hindrance to development and as a source of supplementary costs.



One can however imagine two types of solution to these problems. The first one would consist in developing “translating” software that would permit the different VLEs to “understand” each other, thus allowing the learning material to free itself from its software environment. This solution does however have its limits:

- a great number of such “translators” would have to be programmed;
- the architecture of VLEs may differ, making some functions “untranslatable”, or incompatible with other VLEs;
- how to limit the redundancy of the didactic material if each and every piece of material has to be transcribed into a new form as soon as a new VLE is used?

The second solution consists in creating a “**standard** language”, understandable by the various software environments. This solution has the advantage of allowing the accurate description – in a machine-readable language – of any type of digital content and of any type of learning activity. Some content described by such a language would then be independent from any proprietary format, and its designer would only have to worry about the content and no longer about technical considerations bound to the use of this or that software environment. Although the currently used VLEs usually provide some “translators” allowing the exchange of content or even learning activities with some other VLEs, their limitations urge designers to free themselves from the software environment to concentrate on the essentials, i.e. the learning material itself.

The concept of **standard** is recurrent in the information technologies field. From the microfilm reader to the software managing electronic mail, users have quickly got used to handling numerous different readers or software (Eudora, Outlook, Hotmail, etc.). These various readers or software are however all able to read a standard microfilm or read and write standard electronic mail; it would indeed be unthinkable that each person would use their individual format and would have to turn to numerous translators to be able to interpret different formats. This state of things would be at the expense of interoperability, and hence a hindrance to the design and use of resources. The question of standardizing e-learning contents can be viewed in the same way, and the overriding conclusion is that the use of standard formats is essential in order to respond to basic criteria of sustainability and interoperability.

7.4 The actors of standardization

In order to guide the various practitioners of e-learning i.e. the content designers, software developers, and users working toward a common purpose, various workgroups or committees have been formed. These groups enable collaboration between people of different horizons in order to establish standards appropriate to the need of the users and to the possibilities offered by the ICT: they are the actors of e-learning standardization. For the reader wishing to find out more about the standardization process itself – which we consider as beyond the scope of this paper –, some articles focusing on this aspect, such as [FRIESE05], are also available.

The actors involved in the standardization processes are many, and it would be impossible to present them all. Figure 7.1 schematizes the standards development process, and only some of the most important organisms will be presented hereafter.

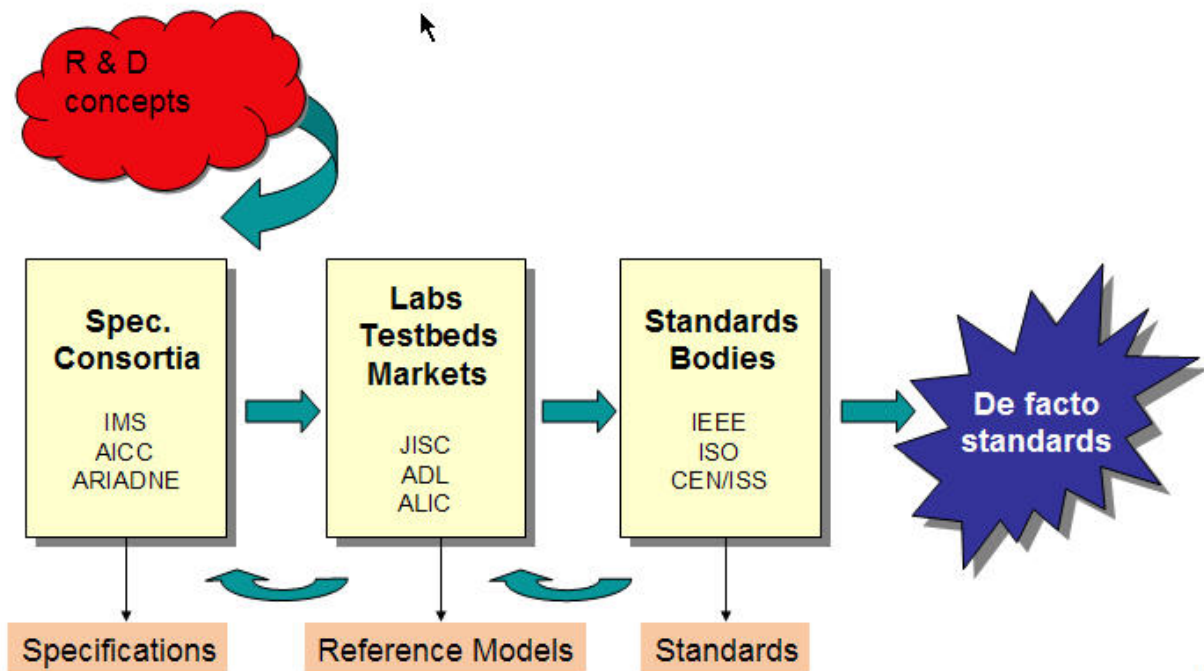


Figure 7-1: From specifications to standards

7.4.1 The specifications

7.4.1.1 IMS

The IMS project was launched in 1997 by Educom (presently Educause) in the USA within the frame of the National Learning Infrastructure Initiative. It is a worldwide consortium combining educational institutions, commercial entities from the IT sector, and governmental agencies. The project was initially intended to produce a unified specification covering all domains – metadata, content, user data, etc. The resulting specification was however considered too heavy and was rejected by the commercial partners. IMS reacted by splitting the specification into several parts (corresponding to the various components) and by defining distinct workgroups, each of them working on the publication of one of these parts [IMS04, CETIS03, CETIS04]. The various parts of these specifications are described later, in sections 7.5.3.3 and 7.5.3.3.3.

7.4.1.2 ARIADNE

The ARIADNE foundation [ARIADN02], is a non-profit organization founded in 1996.

The acronym stands for Alliance of Remote Instructional Authoring and Distribution Network for Europe. Its goal is to promote the results of the European projects involved in easing the production, management and reuse of distance learning materials. ARIADNE took part:

- in standardization activities under the supervision of the committee IEEE LTSC, within the IMS Educause project (a US-funded project). The target was to quickly obtain a set of Metadata for e-learning that were broadly acceptable.
- in the standardization work initiated by the European commission under the supervision of the CEN/LTWS (Learning Technologies Workshop)

7.4.1.3 DCMI

The Dublin Core Metadata Initiative Education Working Group is part of the DCMI (Dublin Core Metadata Initiative). Its goal is to develop the usage of the Dublin Core metadata for the description of educational resources. The Dublin Core is made of 15 elements whose semantic value has been established through international consensus among professionals of various disciplines: library management, text referencing, museology, computer science, and other related areas [DUBCOR05]. The main advantages of the Dublin Core are:

- Its simple creation and management
- A semantic value that is widely understood
- International recognition
- Its scalability

The Dublin Core can be applied to all file formats provided the metadata is readable by both search engines and humans.

7.4.2 The reference models

7.4.2.1 ADL

The ADL (Advanced Distributed Learning) initiative was launched in 1997, on an initiative of the US Department of Defence. ADL is made up of several Co-Labs, and among them is the Academic Co-Lab of Madison, which works especially in the higher education interest. Its goal is to compile the works of specialized organisms with the intention of offering a model allowing the interoperability of learning tools and contents. Its flagship project, SCORM (Shareable Content Object Reference Model, see section 7.5.3.1), aims primarily at defining a content structure model – derived from the work of the AICC. This content structure model allows among other things the assembly and sequencing of learning resources and activities, using LOM and IEEE metadata as well as IMS Content Packaging descriptors and metadata XML binding. These points will be detailed in the following sections.

7.4.2.2 CETIS

The Centre for Educational Technology Interoperability Standards [CETIS03] is a project of the British government funded by the Joint Information System Committee and coordinated by the Bolton Institute, in cooperation with the Universities of Wales, Bangor and the OUNL (see section 7.4.4.1).

CETIS is divided into special interest groups (SIGs), each working on one of the main specifications – such as metadata (see section 7.5.1), Question and Test (see section 7.5.3.3.2), etc. According to the progress of the various specifications, these groups represent the United Kingdom's arguments concerning specification development; they follow the developments of standardization in one specific domain, and test and evaluate the new specifications, preferably using practical cases. The last part of their job consists in disseminating the results of their work in the country, especially in the HE/FE institutions.

7.4.3 The standardization bodies

7.4.3.1 IEEE

The Institute of Electrical and Electronics Engineers is a standardization organism, mainly known for having developed standards for the electronics and informatics industries. It was founded in 1963 by merging the former AIEE (American Institute of Electrical Engineers) and IRE (Institute of Radio Engineers), and now includes contributing members from about 150 countries. It includes a committee dedicated to e-learning, the LTSC (Learning Technology Standards Committee), which has in



particular taken charge of the coordination of the works on learning objects metadata (LOM, see section 7.5.1). Among many other norms ratified by the IEEE, let us mention in particular the IEEE 802 standards concerning local area networks (LAN) and, more recently, the 802.11 standards concerning wireless networks.

7.4.3.2 ISO

The ISO (International Organization for Standardization), founded in 1947, is a worldwide federation of standardization organisms. It groups together standardization organisms from more than a hundred different countries, such as the AFNOR (Association Française de Normalisation, the French Normalization Association) in France or the SNV (Schweizer Normen Vereinigung, the Swiss Normalization Association) in Switzerland.

Within ISO, the JTC1 (Joint Technical Committee 1) mission statement is to “Develop, maintain, promote and facilitate Information Technology standards required by global markets meeting business and user requirements”. JTC1 is organized in 18 subcommittees among which SC36. The latter develops International Standards in Information Technology in the areas of Learning, Education, and Training. SC36's technical work is performed in Working Groups (WGs) and Rapporteur Groups (RGs). SC36 operates according to a business plan, which is approved annually by the JTC1. In June 2006, the list was as follows:

- WG1: Vocabulary
- WG2: Collaborative Technology
- WG3: Participant Information
- WG4: Management & Delivery
- WG5: Quality Assurance and Descriptive Frameworks
- WG6: International Standardized Profiles
- WG7: Culture, Language, and Human Functioning Activities

See also section 7.5.4, which is related to quality standards.

7.4.3.3 W3C

The World Wide Web consortium [W3C03, W3C04A, W3C04B, W3C05A, W3C05B] is in charge of normalizing all the internet protocols:

- The basic standards: HTTP, HTML, DOM, XML, XSL ...
- The standards towards the interoperability and the Web services: SOAP, WSDL and Web services
- The standards for multimedia content: HTML, XML, CSS, SMIL, VML, MathML, SVG
- The standards for accessibility: WAI
- The standards for the description of the resources and the semantic content: XML Schema, RDF, OWL ontology and anything that deals with Semantic Web.

RDF (Resource Description Framework) first appeared as a metadata framework. The goal was to promote interoperability among computers exchanging information on the Web. The RDF type of metadata can be used in various ways:

- To improve the capacities of the Web search engines
- For the indexation of the documents, the description of their content and the relationship between these contents



- In the usage of smart agents to make the exchange of information easier
- For content rating purposes
- To describe a collection of resources that forms a unique logical entity

RDF's current goal is to provide the following improvements:

- Data interoperability
- Machine-readable semantics for meta data
- Enhanced search capabilities.

The future developments should allow the usage of third parties' metadata and provide a uniform request format for resource search/recovery [W3C04A].

7.4.3.4 CEN / ISSS

At the European level, CEN is the European Committee for Standardization, and within CEN, CEN/ISSS (Information Society Standardization System) provides market players with a comprehensive and integrated range of standardization services and products, in order to contribute to the success of the Information Society in Europe.

For the Education sector, the Learning Technologies Workshop has been operational since February 1999. Its objective is to encourage the effective development and use of relevant and appropriate standards for learning technologies for Europe.

The Learning Technologies Workshop decided, as a matter of principle, not to duplicate work already being done elsewhere, but to ensure that diverse European requirements are properly addressed by global initiatives. Specifications, agreements, guidelines or recommendations will be developed when no initiative addressing the identified requirements is in place yet or when global solutions developed elsewhere need to be localized to European requirements. The Workshop has delivered a number of CEN Workshop Agreements, available for download from their website. In the domain of quality, at least the following three documents have to be mentioned:

- CWA 14644, Quality Assurance Standards
- CWA 15455 A European Model for Learner Competencies
- CWA 15533 A model for classification of quality approach in e-learning

Finally, in the domain of e-learning and e-training, considerable efforts are invested under the IST program as well as via many national or European initiatives. Projects producing specifications, architectures, reference models, etc., with the intention of attracting broader support and recognition of their work, can use the Workshop as a useful tool for reaching a European-wide consensus on their deliverables.

7.4.4 Actors of national or regional scope

In parallel to the work of the major organisms, various groups of national or regional scope have also appeared. Two particularly active communities in Europe are briefly described below.

7.4.4.1 OUNL AND UNFOLD

The UNFOLD (Understanding New Framework Of Learning Design) project, within the European Framework 6 project [EURCOM02], focuses its efforts on the IMS LD (Learning Design) specification. Its main goal is to promote e-learning development in Europe, in practice to reduce the required time to benefit from the advantages brought by the use of the e-learning standards. Having established three communities of practice, aimed at software developers, didactic material designers

and providers, the UNFOLD project is dedicated to the implementation and use of e-learning standards supporting a wide range of pedagogical models that are current or to come.

The OUNL (Open Universiteit Nederland) is an “open university” set in the Netherlands. It was at the basis of the creation of the EML (Educational Modeling Language) pedagogical description language in the nineties [KOPER01, TATTER03A] (see section 7.5.3.2), and is presently actively participating in the elaboration of the IMS LD norm (see section 7.5.3.3).

7.5 Which standards?

Having established that standards are essential to the future development of information technology-assisted learning, the next task is to determine which standard types are required, and for what purpose. In summary, the aims of laying down standards are:

- Accessibility to the information, that is to allow the search, access and delivery of the distance learning material in a distributed fashion.
- Interoperability: to allow the usage in different environments of material developed by a given institution on a specific platform.
- Duration: Components should undergo technology change without need for major reengineering. This contributes reducing the material development costs;
- Reusability: to build on existing material by reusing and/or accessing existing components in other environments. This can be done through the development and use of digital libraries or repositories dedicated to the reuse of didactic material.
- Adaptability of the learning material towards a learner or an institution;

These standards are often multi-part, typically consisting of:

- a “data model”, specifying the standard contents in an abstract manner;
- a “binding”, specifying how the data model is expressed in a formal idiom (usually in XML, see section 7.7.2.1);
- an “API” – which is less often provided – aimed at providing contact points between different software, or between content and runtime software.

The present discussion however will strictly focus on the *data model* and *binding* elements of the considered specifications, as the use of the API is usually restricted to software programmers and has little or no influence on the publication of the content itself.

As mentioned, the first condition the information has to fulfil is accessibility. Any content that has to be found by means of a search engine therefore has to be described in a sufficiently significant way, i.e. not only by a title and a file name, but by a set of descriptors or keywords, called **metadata**. These descriptive metadata can contain various description levels, from simple keywords helping to define the application field to a set of attributes allowing the description of use criteria (copyright, pre requisites, etc.), and can be considered as “data about data”. These metadata have to be standardized so that the various content designers and users can use the same keywords, and so that an adequate search engine can interpret requests to make available the corresponding content.

The second point, technically the most difficult to realize, consists in using standards to describe the content itself. Some content described with these standards would then not only be independent from its software environment (VLE), but would also be interpretable by a wide variety of VLEs. It would then respond to the demands made earlier, particularly those concerning interoperability and sustainability. Such contents are usually called **learning objects**⁵. The underlying idea is to accumulate

⁵ This term is used here in a wide sense and describes any form of resources useful for learning, including tests, work guides, document aggregates, etc., provided that they are diffused in digital

many of these learning objects in digital repositories – or databases – accessible by users and providing a dedicated search engine.

The development of such standards for resource or learning activities description implies the creation of dedicated workgroups (see section 7.4). These workgroups have to be made up of members of educational institutions, together with software (for instance, VLE) developers, because only active cooperation between these two circles will enable the creation of relevant standards. To date, several of these workgroups have elaborated and adjusted various standards allowing various description levels. The next section proposes an overview and a description of the main types of standard presently available in the e-learning domain.

7.5.1 Metadata

A first level of metadata is necessary to provide a general description of content. This level contains attributes allowing filing and searching the information using various criteria. The usual attributes at this level are: the resource name, keywords, author name, intended public, language used, copyright info, and so on. Among the most frequently used standards, let us mention:

- IEEE LTSC LOM (Institute of Electrical and Electronics Engineers' Learning Technologies Standards Committee Learning Object Meta-data – or norm IEEE 1484) [LTSC]: set of content-description metadata, issued by the IEEE;
- DCMI (Dublin Core Metadata Initiative): set of metadata developed by the Dublin Core consortium [DUBCOR];
- IMS MD (Instructional Management System Global Learning Consortium Metadata): set of metadata based on the IEEE LOM developed by the IMS consortium [IMS01A].

The goal here is not to go into the details of each usable metadata schema, but rather to supply the user with a tool allowing him to make a choice in the most pertinent way. The important point is that various specifications coexist, each of them allowing a detailed description of the content and the use of keywords. One can moreover note that Dublin Core and IEEE metadata are compatible and interchangeable by simple mapping [DUBCOR04], whereas IMS uses a schema that is practically equivalent to the IEEE one.

These workgroups – among others – have made the establishment of metadata schemas very widely applicable. Indeed, the above-mentioned norms recommend using a minimal set of metadata (such as title, keywords and author name, for instance), but leave to the user's judgment the use of a multitude of other ones, to refine the description down to the desired level.

7.5.2 Learning objects

The metadata layer described earlier is simply a data addition to the content, to make it easier to find when using search engines. However to be accessible to third parties, this content has to be described at a structural level by standardized schemas. This is why the learning object notion has been adopted, to be able to set out all the didactical material [DOWNES01] in a common form.

The definition of a learning object is quite broad, depending on the interpretations. This means that any type or set of resources providing information can be considered as such. A higher description level is necessary here, to define relations between the learning object components. If a one-page text-format document is considered, the case is trivial and metadata will do in most cases; but if one considers a whole course made up of several document types (texts, diagrams, possible interactive items), supplementary descriptors are needed to reproduce the original structure from its various components.

According to our definition, a **learning object** is thus a digital entity dedicated to learning, and containing one or several resources, a metadata layer allowing identification (and to find it within a repository), and a descriptor layer providing a description of the links between these resources. Various

format. The definition and ideal granularity of resources has been subject to heated controversy, but we consider these issues to be beyond the scope of this review.

workgroups have erected various models allowing the development of such learning objects; among these, the two most important are ADL SCORM Content Package and IMS Content Package.

ADL (Advanced Distributed Learning, see section 7.4.2.1) proposes a reference model for the creation of reusable learning objects (Shareable Content Object Reference Model): ADL SCORM Content Package. This model is not a specification by itself, but consists in a collection of various pre-existing technical specifications. One can note for instance that SCORM uses the IEEE LOM for its metadata layer [ADL03].

IMS (Instructional Management System Global Learning Consortium, see section 7.4.1.1) is another workgroup, proposing a series of standards covering various description layers (see following sections). The metadata layer uses, like SCORM, the IEEE LOM norm. An additional specification enables the creation of learning objects, named here in accordance with a more general nomenclature « Content Packages ». IMS CP will hereafter designate, depending on the context, as well the considered specification such as the content package itself.

So, both ADL SCORM Content Packaging and IMS Content Packaging allow the creation of reusable learning objects of various complexity levels. These two norms are almost equivalent and present a high interoperability level because they both rely on the IEEE LOM norm for their metadata, and because SCORM relies on the IMS CP norm concerning Content Packaging [ADL03]. The SCORM CP norm actually introduces some extra parameters that do not exist in the IMS CP specification; so a SCORM Content Package is compatible with IMS CP, but not the reverse. These Content Packages, or learning objects, appear as a computer file (usually a compressed ZIP file) including the learning resources themselves, or links pointing towards them, metadata and a description of the relationships between the various resources (for instance, hierarchical structure). These can then be interpreted by a range of VLEs that will be able, from the metadata and other descriptors that are in the file, to rebuild the original structure of the learning object in their own environment. At this level of content description, the learning object can be reused in a new VLE, but the teacher himself will have to implement the pedagogical aspects.

7.5.3 Learning units

At this level of content description, learning objects (as defined in the last section) are entities, which are independent of the context of their creation. Their portability is enhanced by the Content Packaging, which reduces the number of files to transfer down to one, whereas the metadata and various attributes associated with Content Packaging allow importation into various environments.

Only a part of the initial objectives is however fulfilled in this approach. Indeed, learning objects created this way are importable into various environments, but the descriptors brought by metadata and Content Packaging only reproduce the content structure, not the didactic approach used to teach the content.

What demands does a learning unit have to meet?

- the smallest unit satisfying a learning objective;
- cannot be divided without losing learning efficiency;
- for instance: course, studies program, workshop, exercises, case study ...;
- widely used concept, but not strictly defined: “entity, digital or not, that can be used during technology-supported learning”.

However, one has to scale down the above-mentioned demands a little. Such a definition – even if it covers a broad application field – has to be considered with care. Indeed, concerning the first two points, the fact that the learning unit should be as small as possible will enhance its portability – its small size will allow its incorporation into a higher number of units of higher granularity – but a unit which fails to respond to this demand still has to be considered as a learning unit. Later on in this text, the **learning unit** term will be used in its broad sense, as defined here i.e. an object encapsulated in a package, satisfying a learning objective, and consisting of metadata which allow the rebuilding of a didactic scenario (for instance, activity sequencing; see sections 7.5.3.1 and 7.5.3.3).

This means that a higher description level, taking into account the entire pedagogical aspect, has to be added to the learning objects to qualify them as learning units. This description level has to add a series of didactic descriptors containing a clear definition of the various roles (teacher, learner, and staff) and activities related to the resources of the learning object. Without this last level, the learning object in the form of a Content Package (containing metadata and arranged resources) could be likened to a simple written course support (having a title – metadata – and resources – texts, graphs, etc. – arranged into ages or chapters). By inserting into it the pedagogical aspect, that is, the expected objectives, the roles played by the various participants, and the various contexts within which these roles have to be played (collaborative or research work, exercises session, etc.), the learning object becomes a **learning unit**. This learning unit can be likened to a course, as it contains a description of every role and activity necessary for the completion of the associated learning objectives.

Questions arising at this point are: how can a very broad range of pedagogical approaches be represented by a technical standard? What has to be included in the specifications? The standard must on one hand respond to the interoperability conditions, and contain comprehensive specifications. However, on the other hand, the more detailed the specifications, the more difficult it will be to comply with the standard [ATTWEL04A]. These standards indeed risk narrowing the e-learning into a (small) set of existing pedagogical practices, whereas one would expect them to support new ones. These possible new pedagogical approaches still have to be developed but could for instance draw on the possibilities made available by CBT/CBL. Such a standard language aiming at the description of pedagogical approaches should not suffer from such limitations.

The remainder of this section will propose a brief overview of the two most important specifications allowing the implementation of pedagogical approaches in learning objects, making them learning units.

7.5.3.1 ADL SCORM

As mentioned earlier, the SCORM reference model is not a standard itself, but rather a set of technical specifications grouped into a “reference model”. Such a reference model may include only some items from the global set; this is then a “specification profile”. This means, than a SCORM Content Package may, as an IMS Content Package, contain only resources (arranged or not), contain metadata, and may or may not contain specifications about the pedagogical approach to be used [CETIS03, ADL03].

To build learning units, the whole SCORM reference model has to be used, in order to be able to include some technical specification of the pedagogical approach to use.

The development of SCORM was carried out according to four objectives: sustainability, interoperability, accessibility, and reusability. There is however some debate about its pedagogical neutrality (see section 7.5.3). Indeed, although considered pedagogically neutral by its designers, SCORM is considered favouring conservative pedagogical schemas, that is, **behaviourist**, **didactic**, and **instructive** ones. Moreover, it is focused on individual use: the approach is self-paced and self-directed, and does not allow any form of collaborative work (see section 7.5.3.3.1). This is probably due to the fact that SCORM initially was devoted to instruction inside the US Department of Defence (see section 7.4.2.1), and that it therefore implies a pedagogical model that is closer to those used in military and in industrial training [ATTWEL04B].

7.5.3.2 EML AND OTHER MODELING LANGUAGES

EML (Educational Modeling Language) is a notation system, developed in the nineties by the OUNL (Open University of the Netherlands), which aimed at the description of a wide variety of pedagogical scenarios. It was the first complete “educational modeling language”, allowing a formal description of learning scenarios, reusable and context-free [KOPER01, CETIS04]. Since then, EML has formed a basis for the establishment of the IMS LD norm. EML still exists, but is no longer updated since February 2003, due to the appearance and application of IMS LD.

The main difference between these is that, as EML presents a simple approach to the process (every facet of the learning scenario design is included in it), IMS LD belongs to a structure integrating other IMS norms: Content Packaging, Metadata, Question & Test, Simple Sequencing, etc. – and therefore is just an additional “layer” [TATTER03B].

Furthermore, it should be pointed out that other content modelling languages exist –to define the integration of mathematic formulae or of multimedia content. These usually use mark-up languages, such as XML or one of its variants, to benefit from the advantages of a structured language (hierarchical structure, machine readability, etc., see section 7.7.2.1). Examples include SMIL (Synchronized Multimedia Integration Language) [W3C05B], which allows the simplified creation of audiovisual interactive presentations, and MML (Math Mark-up Language) [W3C05A], which provides a description language dedicated to mathematical expressions.

7.5.3.3 IMS LEARNING DESIGN

The IMS Learning Design specification, for its part, supports the use of a wide variety of pedagogical scenarios [CETIS03, IMS03C]. Hence this specification is generally considered as pedagogically neutral [ATTWEL04A]. It has indeed provided a generic and flexible language, developed to allow the expression of a great number of different pedagogies. An undeniable advantage of such a structure is that only a set of design tools and runtimes has to be implemented.

This language was initially developed at the OUNL (Open University of the Netherlands) under the name of EML (Educational Modeling Language, see section 7.5.3.2) [KOPER01], after having examined a wide range of pedagogical approaches and associated learning activities.

The IMS workgroup on Learning Design works on laying down specifications to describe the elements and structure of any learning unit. There are for instance conceptual models to describe structured interactions (practical work, group projects, etc.) or learning activities (for instance, problem-based learning). The goal here is to allow the creation of various pedagogical scenarios, using a standardized notion that can be uniformly implemented in various courses or learning programs.

The IMS LD norm is divided into three implementation levels, each resting on the level below it, and adding some functionality to it. Level A includes the system basis, to define roles and activities for each actor of the pedagogical scenario: actors play different roles to attain various objectives, using support or learning activities (depending on their role) within the context of an environment consisting of learning objects and services (like a discussion forum, for instance). Level B adds to these the concepts of *properties* and *conditions*. A property may have to be satisfied for an activity to be considered accomplished – and conversely, the completion of an activity may influence a property. The use of conditions can trigger some events only under certain circumstances. Level C adds the possibility to use *notifications*: these allow not only the automatic notification of a role event, but also trigger or satisfy a property or a condition [TATTER03B].

One must however bear in mind that the IMS LD norm is only the upper layer of a set of norms prescribed by IMS, starting from metadata and content packaging and resulting in learning design. It seems relevant here to cite and briefly describe the other IMS norms concerning the description of learning objects and units – notice in passing that the existence of each “layer” is not obligatory and depends on the use one wishes to make of the learning object or unit. A brief description of other IMS specifications directly bound to the pedagogical approach can be found in the next two subsections.

7.5.3.3.1 IMS SIMPLE SEQUENCING – IMS SS

The IMS Simple Sequencing norm [CETIS03, IMS03B] aims at describing a simple learning scenario, in the sense that recognizes only the role of learner. IMS SS thus includes only a limited number of widely used pedagogical scenarios. It does however allow quite complex sequencing schemas to be built up using selection rules, objectives, and boundary conditions.

One has to note that the SCORM reference model uses the IMS SS norm to sequence the learner’s activities, and that this model is hence limited at the level of the pedagogical scenario description to an approach centred on an individual learner. In comparison, a pedagogically neutral description language such as IMS Learning Design or EML (see sections 7.5.3.3 and 7.5.3.2) can elaborate pedagogical scenarios that do not suffer from these limitations.



7.5.3.3.2 IMS QUESTION AND TEST INTEROPERABILITY – IMS QTI

The IMS QTI norm has been developed – as the name suggests – by the IMS consortium (see section 7.4.1.1) [IMS03A]. It allows the representation, in a machine-readable form, of questions and even tests, together with the processing of the corresponding results. It allows the formulation of various question types such as multiple choice, fill in the blank, true/false, etc., and their exchange between various VLEs. Besides, some software is emerging to build and evaluate tests conforming with the IMS QTI norm (see section 7.7.2), and it is even possible to almost seamlessly convert, questionnaires stored in an LMS proprietary format (such as WebCT for instance) into IMS QTI conformant questionnaires.

7.5.3.3.3 IMS LEARNER INFORMATION PACKAGE

The IMS LIP specification [IMS01B] aims at the compilation of information concerning the learner into a package. In this way, the information can be exchanged between various systems.

The LIP package may contain many elements, but most of these are optional and their implementation is left up to the user. Among these elements, the main one is *identification*, identifying an individual through elements such as name and address, among others. Non-comprehensively, other elements include *goals* (personal goals of the learner), *qualifications certifications and licenses* (which reflect his/her accomplishments), *accessibility* (reflecting preferences concerning for instance the language to use), *activities, competencies, interests and affiliations*.

The LIP norm provides further extension possibilities, in order to satisfy everyone's needs. This can be achieved in two ways. It is indeed possible to extend any element of the specification to attain a higher granularity or a more detailed description level. It is moreover possible to add elements to the package, which are external to the specification, and so include virtually any form of extra information needed.

7.5.4 Quality

More recently (November 2005), the International Organization for Standardization (ISO, see section 4.2) issued a “Quality Framework for Learning, Education, and Training”: ISO/IEC 19796-1 [ISO06]. Specifically aimed at learning, education, and training in their broader sense, it is suitable for use in ODL. It is not a standard for certification, but rather a common quality language helping to make quality interoperable.

As numerous approaches has been developed and implemented (see EFQM, ISO 9000:2000, etc. in sections 4.3 and 4.2), their various scopes and objectives can be quite confusing to the users. Therefore, the ISO developed this quality standard to serve the following purposes:

- harmonizing the quality approaches through the use of a common vocabulary;
- developing quality systems through process modelling:
 1. quality objectives
 2. responsible actors
 3. means to assure quality
 4. means to measure quality;
- extending existing quality approaches;
- combining quality approaches through the use of a clear terminology.

It is thus a reference framework for the description of quality approaches (i.e. does not provide specific requirements or rules, but serves as a guide through quality development), and mainly consists of two parts:

- a description scheme, to interoperably describe quality approaches by documenting all quality concepts in a transparent way;
- a reference model, which serves as guide through the different processes of building learning scenarios.

The workgroup in charge of this specification is presently (May 2006) working on additions to this framework, to help the implementation of this standard. These include a quality model, reference methods and metrics, and a best practice and implementation guide.

Up-to-date and more detailed information (both paper and electronic versions) is available at [ISO05].

7.6 Learning resource repositories

Even if the use of standards to describe content allows the development of sustainable solutions concerning resources/learning objects/units (the generic term *object* will be used within this section), the problems of learning object repository and accessibility remain. Content developers are looking for systems to deposit such objects, without making them prisoners of a proprietary architecture. The goal is to be able to reuse, update, archive, and recall them easily. Moreover they have to be searchable by search engines, as well as directly by human beings.

Many repositories exhibiting various properties could be cited and described here, but only a few interesting peculiarities will be mentioned within the scope of this paper.

Let us cite for instance the FEDORA project (Flexible Extensible Digital Object Repository Architecture), which proposes an architecture combining XML and Web services to form a distributed repository. Another one, MERLOT (Multimedia Educational Resource for Learning and Online Teaching) is playing an important role in the grouping of non-standardized resources: here one may find descriptions of and links towards more than ten thousand courses or learning objects of various forms and granularities.

The ARIADNE KPS [DUVAL01] benefits its members by allowing each of them to access their own material as well as the description and content of other members' resources. Based on the confidence and the good will of its members, this network allows the exchange of a large number of pedagogical documents, thanks to its relevant indexation.

GLOBE (Global Learning Object Brokered Exchange) ensures interoperability between resource repositories. Its founding members were the Ariadne Foundation in Europe, the Educational Network Australia (EdNA Online), eduSourceCanada in Canada, the Multimedia Educational Resources for Learning and Online Teaching (MERLOT) in the USA, the National Institute of Multimedia Education (NIME) in Japan. These organizations gathered to work collectively on a ubiquitous, quality access to educational material.

IMS Digital Repository is an attempt by the IMS Digital Repository Interoperability Working Group (DRIWG) [IMS01A] to establish the specifications for interoperability between repositories regardless of their internal architecture.



7.7 How to proceed?

The goal of this section is to provide some guidelines for the development and setup of learning objects. Individuals or organizations wanting to develop online teaching content will have to realize that they will need to pursue their objective in several aspects. The two main aspects of this question are:

- considerations about pedagogical strategy (see section 7.7.1): the question is indeed to know how to optimize the impact of the teaching technique, providing the learners with suitable pedagogy;
- technical considerations (see section 7.7.2): having considered the technical constraints of the didactic model used, the work will focus on developing the material itself in a manner that ensures interoperability – and hence sustainability.

The two following subsections aim at guiding the teacher or the learning material designer in his reflection about these two main aspects of the question.

7.7.1 Pedagogical strategy

In order to consider the process of developing learning objects or units in a global manner, creation strategies have to be designed. Among the various trends aiming to rationalize the use of ICT in the learning processes, two mainstreams stand out.

The *documentary trend* proposes a content-centred approach. This is linked to the increase of information mass, and takes advantage of the object-oriented approach, whereby learning objects can be shared, reused, and aggregated. Standardization work in this field has resulted in the use of metadata, to index objects prior to their cataloguing and reuse (see sections 7.5.1 and 7.6) [PERNIN04A, PERNIN04B].

The “*pedagogical engineering*” trend, for its part, proposes a process-centred approach. It is important at this stage to differentiate the concepts of *information* and *knowledge* [PAQUET02]. **Information** is made up of all data external to people, directly communicated by other people or by means of some media, whereas **knowledge** is the result of the mental construction made from information. The **learning** process then consists in transforming information into knowledge. A process-centred approach relies on two processes at the heart of knowledge management: firstly, the transformation of knowledge (say, from an expert) into information, followed by the transformation of this information into new knowledge through learning.

At this point, it is important to note that these two trends are not mutually exclusive, but are trends observed in the design of pedagogical objects. At this stage, the teacher or developer wanting to put didactic material online will first have to consider the following questions:

- what type(s) of audience is the learning material intended for?
- what are the learning objectives?
- what are the (pedagogical and technical) constraints to be taken into account ?

Depending on these points, the first step is to determine the suitable form of material [SHANK04]. This means that the various pedagogical aspects have to be considered, beginning with the pedagogical level desired for the didactic material. Various didactic material types may indeed be used, depending on the designers’ abilities and the learners’ needs. An encyclopedia on an Internet Website *is* didactic material, as well as a whole course online containing exercises and evaluations. The pedagogical level of an encyclopedic site is however far lower, simple document sequencing being able to guide the learning process, whereas a course needs the use of higher-level descriptors to describe each step of the learning scenario, together with the detailed interactions between the various actors (see section 7.5.3.3).

If a documentary-type pedagogical scenario is needed, simple sequencing will do in most cases. If the pedagogical scenario moreover takes an individual learner-centred approach (not taking into account any type of interaction between learners, such as group work for instance), then a norm such as IMS Simple Sequencing (or a reference model such as SCORM, as this uses the IMS SS norm to sequence activities) will most likely be suitable to express the desired pedagogical approach in a standard language.

At the other extreme, if the desired pedagogical scenario is of a more constructivist type, and if its designer wishes to implement every facet of a process-centred didactic, then a more evolved description norm is necessary. Such a choice will favour the “pedagogical engineering” trend (see earlier in this subsection) and most likely the use of the IMS Learning Design specification (see section 7.5.3.3). This specification, as mentioned earlier, indeed allows the description of a wide variety of pedagogical scenarios, can be considered pedagogically neutral and therefore the most suitable to describe evolved pedagogical scenarios.

7.7.2 Technique

The first thing to do at the technical level is to develop a detailed plan of the chosen pedagogical scenario. This is usually done by establishing a flow-chart representing each interaction between the scenario actors (professor, assistant(s), learner(s)) and their environment. Such a diagram enables the scenario to be proofed “on paper”, making it easier to transcribe to a machine-understandable format. A development of this kind requires a dual effort of abstraction, together with the decomposition and analysis of the considered scenario. These efforts are however indispensable, as an analytical representation of the scenario is essential to its accurate transcription.

The second point to consider is: what resources are available, in terms of data processing means and support? The data processing means should be suitable to the needs of the CBL, whereas data processing support people have to be able to guide designers and users using tools that may be completely new to them, as well as in facing any computer problems.

Once these points have been resolved, the learning material designer decides to use a precise pedagogical scenario, within a context of learners, didactical resources, and data processing means. The last step (but one to be kept in mind during the whole process) consists in choosing a standard specification suitable to the desired use of the learning material.

7.7.2.1 XML: EXTENSIBLE MARK-UP LANGUAGE

Having chosen a standard to use for the representation of the learning material, one or more manifests have to be created. These take the form of a computer text file, complying with the XML (eXtensible Mark-up Language) specification, and describe the learning object or unit according to the chosen specification.

The underlying structure in most of the standard specifications is a hierarchical form; that is, it is made up of main elements, themselves made up of smaller granularity elements, and so on down to the necessary (or desired) detail level. Mark-up languages, having themselves a hierarchical structure, are perfectly suitable for the computer representation of such structures.

To the reader who does not know any computer mark-up language, information and examples about two widely used mark-up languages can be found on the World Wide Web Consortium Web page: XML [W3C03] and HTML [W3C04A].

The internal structure of the created XML document has to correspond exactly to that of the used specification, in order to be machine-readable. The software environment interpreting the manifest, to create some content or activity, will indeed be unable to correct any grammatical or syntax error. There is therefore a guiding document for each specification, describing the “XML binding”, describing correspondence between specification items and XML-file items, to guide people in composing the manifest files.

7.7.2.2 SOFTWARE TOOLS

The structure of the manifests is however too complex to be successfully verified by a human being, so a template has to be defined for each specification. These templates are used to validate newly created XML manifests; these machine-readable templates define the accepted hierarchical levels and the permitted items within these levels. This allows the designer to design a manifest, which precisely and unambiguously describes the metadata, learning scenario, and other possible attributes corresponding to the used specification(s).

The use of an XML editor together with specification templates is anything but easy, and fastidious to the point of discouraging even the most enthusiastic. It involves:

- transcribing each specification item into an XML item using the XML binding;
- validating the XML manifest against its template;
- using the XML manifest in a software environment able to interpret it.

Out of these three tasks, the first one is the most fastidious: it presupposes the conversion (by a human mind) of abstract concepts (roles, activities, environments, etc.) into a computer-interpretable language.

This is a recurrent problem in computer science: the use of new concepts supposes that the first users have to suffer the pioneer/guinea pig role until the software industry provides some tools allowing the seamless use of the new concept. Remember the first word processors, where one had to manually insert tags to define boldfaced or italic text: the new word processors take charge of these functionalities seamlessly and automatically, using intuitive graphical user interfaces. Nowadays, few people still use word processors requiring the use of tags, as the recent user interfaces usually avoid the learning of lots of tags and code words by proposing whole sets of easy to use predefined commands.

The state of progress of e-learning standardization is presently at this point, and software is beginning to emerge. This software allows the creation and possible conversion of several manifest types. The present discussion will restrict itself to citing a few important software tool types, without trying to be exhaustive; we aim to show that software is emerging, and that using these will make the use of standards possible in practice.

7.7.2.2.1 THREE SOFTWARE TYPES: CONVERTERS, EDITORS AND PLAYERS

The first software type is the converter. What could be more useful than being able to put into an easily exportable standard form (that is what it is all about!) some content, which is available in a proprietary format? A case in point is the Respondus [RESPON] questionnaire and test converter: this piece of software – among other functionalities – will extract questions and tests from various VLEs and convert them into the IMS QTI (see section 7.5.3.3.2) format. The use of this kind of tool makes sense when all the material has already been created in a proprietary format and when, for migration or sustainability purposes, one wishes to extract this material to avoid having to repeat the whole creation phase. Some other tools in this category (such as Q-player for instance [QPLAYER]) will, for instance, convert an XML manifest complying with the IMS QTI norm into a Macromedia Flash automated questionnaire. Macromedia Flash can here be considered a standard *de facto*.

The second type of software is the editor. This allows the simplified creation of learning objects or units, using intuitive user interfaces and input masks. Among these, RELOAD (Re-usable E-Learning Object Authoring & Delivery) [RELOAD05] is an editor allowing the easy implementation of metadata (IMS and SCORM) and creation of IMS- or SCORM-compliant Content Packages. In its latest version, this software moreover allows the creation of IMS Learning Design-compliant learning units (although level A only, see section 7.5.3.3) – it is the first IMS LD editor. It will also export Content Packages (without the Learning Design layer) to HTML format (using Javascript), for easy publication on any Website and their visualization using any Web browser. The software can thus be considered a Content Package “player”, but so far it will not “play” IMS Learning Design.

The third and last type of software tool is the “player”. Such pieces of software can preview – or even use – standards-compliant learning objects or units, to assess their quality without having to load them into a VLE. Apart from Reload, cited earlier in this section, many other programs allow the playback or



exportation of various standards. Among these, Q-player [*QPLAYER*] will integrate IMS QTI-compliant questionnaires into a LMS. However, one of the most impressive improvements is the apparition of IMS Learning Design players, featuring the CopperCore engine [*COPCOR05*]. With the CopperCore engine the learning designer can preview and test learning units compliant with the IMS LD standard. On the other hand, RELOAD software [*RELOAD05*] includes in its latest version an IMS LD player –actually a GUI for the CopperCore engine – which is so far limited to Learning Designs of level A (see section 7.5.3.3).

Numerous other software tools exist – in the public domain or as commercial versions –, to edit or reproduce some facet of the various standards exposed in this document. Moreover, more and more software is appearing that integrates these standards into applications or LMSs – and so aiming at software developers firstly –but listing them would be beyond the scope of this review.

7.8 Conclusion

Throughout this study of standards, the question arises as to how they contribute to quality implementation. To answer this, one has to remember that quality has a cost. As standards become more and more complex, their cost in application to pedagogical resources increases. Indeed, the actors may consider the effort needed to fill in the learning object metadata tied to a resource, as tedious. However, adding metadata is mandatory before adding the resource to a repository, thus making it reusable, and therefore sustainable. Actors must be convinced of the benefit of standardization if they are to apply it.

The choice of a given standard is based on different needs: indexing a learning object, describing a learning unit, performing a learning activity into a virtual learning environment. Each standard addresses one or more of these needs.

It should also be pointed out that as standards become mature, they become unified. The Unified Modeling Language (UML) standard is a clear example of this, and e-learning standards are following this trend. These standards are now separate according to different aspects: metadata, content package, scenario, etc. Considering these different views makes unification easier, because standards become reliant on others.

Standards help the actors to be aware of the communities to which they belong. With standards, an actor may anticipate the way the other members of the community will reuse their learning unit. In other words, standards may supply communities with a common ground. The use of standards may be seen as a quality criterion to produce learning resources. However we still need to define the indicators – such as usage statistics – to measure their effective use.

8. The initiatives for e-learning quality in Europe

There are many projects on e-learning in progress. A list of the 161 projects of the *e-learning* program [ELEUROPA] can be found at [ELCOMP], and a list of 312 *Socrates-Minerva* projects can be found on the ISOC database at [ISOC-MN].

Three groups of programs can be considered: the young, small projects, to which e-Quality also belongs, the well-established projects, and the official organs: those of the European Union, which help and fund other projects while conducting their own research, and the standardisation bodies.

8.1 European projects

Examples of such European projects are:

- **EQUEL** “e-quality in e-learning” [EQUEL] has created a group of 7 Special Interest Groups (SIG) on e-learning, which are so far devoid of any contribution.
- **SEUSISS** “Survey of European Universities Skills in ICT of Students and Staff”. The project has produced a comparative qualitative and quantitative report on the findings for rectors and senior staff of universities. It will also be of interest to agencies that are seeking to improve graduate and academic staff ICT skills and to researchers in the field. Their final report is available at [SEUSISS03].
- **SEEQUEL** “Sustainable Environment for the Evaluation of Quality in e-Learning”. “*Funded by the E-learning initiative of the EU, aims at taking the required step to establish a European +e-learning Quality+ Forum that will address the following issues: Quality assessment, evaluation and conformance practice, cases of +good practice+ and design guidelines, quality assurance frameworks (with criteria and standards)*”. See their site at [SEEQUEL]. Their forum, common to the EQUAL, SEEQUEL, SEEL and QUAL projects is housed by the Cedefop and can be accessed at [QELFORUM]
- **E-TUTOR**, the “Innovative e-Learning Methodology for Tutors in Multi-cultural, Collaborative and Synchronous Context”. “*The e-Tutor project aims to highlight guidelines useful for tutors during launching of educational programmes using fully the capabilities offered by Information and Communication Technologies (ICT)*”. The project started at the beginning of 2004, and finished at the end of 2005. See their Website at [ETUTOR].
- **SPOT+**, gives a “*Students’ perspective on technology in teaching and learning in European universities*”. “*The project activities will help to assess the added value brought about by the use of ICT for didactical purposes in terms of collaborative learning methodologies, access for less favoured categories, effective development of students’ transversal skills, and enhancement of the outcomes stemming from physical mobility experiences*”. Their Website is available at [SPOT+]
- The **DLAE** (Distance Learning Accreditation in Europe) project is a Special Interest Group (SIG) started in January 2004. The main output from the project will be a proposal for a European accreditation system in e-learning and blended learning. The initial target will be the European Master of Science. Their Website is available at [DLAE]
- The **QUAL-E-LEARNING** project. The general objectives of this project, described on their Website [QUALEL], are to:
 - *Contribute to the definition of a general framework of e-learning quality;*
 - *Form the basis of a European debate on the characteristics of use and on e-learning quality;*
 - *Promote a better coordination of the actions carried out in this field both by each Member State and at Community level;*
 - *Guide the reflection and the choices of those who are and especially who could become teachers, producer-users, customers or users of these training instruments.*”

8.2 Networks

Some institutions have already reached international status:

- **EDEN**, the European Distance and E-Learning Network [EDEN], was created in 1991. It is an American-type scientific society whose goal is to help the development of e-learning. It holds a conference once a year.
- **EQO**, the European Quality Observatory of e-Learning [EQO], has been involved in many conferences, and is developing its network all around Europe. It is now running a survey on quality in E-Learning.

8.3 Official bodies

The third source of information for the community is the European Commission and the standardization bodies. They fund a large number of projects like e-Quality and advertise the results of some of them on their site like the one of the E-Learning initiative [ELEUROPA].

- The *E-Learning Initiative* of the European Commission was created in parallel to Socrates and Minerva to specifically help the development of the educational use of the technology. It offers a comprehensive Website at [ELEUROPA].
- The CEDEFOP at [CEDEFOP]: The Cedefop is the *European Centre for the Development of Vocational Training*. It helps policy-makers and practitioners of the European Commission, the Member States and of social partner organizations across Europe in making informed choices about vocational training policy.
- ENQA: the *European Network for Quality Assurance in higher education* at [ENQA] is not specifically interested in e-Learning but it has been put in charge by the Conference of the European Ministers Responsible for Higher Education of proposing a European quality model impacting also e-Learning.

8.4 The AFNOR reference of good practices

This 60-page document [AFNOR04F] has been produced by a working group set up under the auspices of AFNOR⁶ and FFFOD⁷, a French consortium bringing together the main stakeholders in open and distance learning. The aim was to start from existing practices and to build a set of recommendations that could improve quality in e-learning design and implementation. A specific focus is put on the integration of existing standards in e-learning and on how they meet the specific needs of the actors involved. The authors are mainly professionals in the field of professional training for companies, they aim at making their practices explicit and at drawing from these general rules that could be turned into processes and reproduced by others. They intend to improve the quality of the services they are providing to their customers⁸.

⁶ AFNOR is the French standardization body

⁷ FFFOD is a French acronym which stands for “Forum Français pour la Formation Ouverte et à Distance” or in English: “French Forum for Open and Distance Learning”

⁸ Note for e-Quality: The context of e-learning delivery within public higher education institutions is different; its specificities should be analysed, listed and compared to the context of training delivery for companies.

In the existing norms for training (ISO 9001), training is viewed as a process. Following the same approach, the document proposes 5 sub processes to describe a global training process:

- Needs analysis
- Design
- Production of material
- Training delivery
- Evaluation

For each sub process several phases are identified, as well as associated recommendations resulting from the authors' experience. Within the bounds of the e-Quality project, we should be interested in material design (i.e. the Design and Production of material phases), and the student support process.

During the design phase, quality management follows the guidelines:

- Locate the initiative in a typology to be sure the system and the material are adapted to their purposes. It will limit the size of the project to be carried out and the resistance to change it might encounter. To help draw the boundaries of the project, the AFNOR gives a classification of the degree of distance on the basis of the presence-to-distance ratio:
 - face-to-face instruction enriched
 - face-to-face instruction improved
 - face-to-face instruction reduced
 - face-to-face instruction limited
 - face-to-face instruction almost non-existent

An alternative is to define the purpose of the technology: information, communication or both.

- An iterative approach. Each iteration ends with a testing period, which is a chance for all parties to appropriate the course.
- The process of design is driven by need: this approach is congruent with the student-centred approach of the e-Quality project. However, it is not limited to that, since the need can be expressed by any stakeholder. A negotiation should take place to foresee their expectations and developments.

At first glance, the needs analysis process is quite different for a public institution. The main questions that have to be answered during this process are the following:

- Why is ODL chosen?
- What is the benefit, compared to other training approaches?
- Which partnerships are needed?

As far as quality is concerned, the recommendations are:

- Quality must be taken into account as a major objective from the beginning of any project.
- A reference document is to be designed
- Tools for efficiency and conformance measures will be provided for at least the following criteria: Pedagogical quality, Tool quality, Training support quality, User satisfaction, Cost analysis



Among other recommendations, the following seem interesting for e-Quality:

Many actors are involved in the process: more categories of actors are involved in ODL than in face-to-face learning. Roughly speaking, in face-to-face learning, during training delivery, only trainers and trainees are involved. In ODL, many other actors play a role: the system or resources administrator, the tutor who is often not the author of the training material. You can find a subject tutor who is different from a general tutor. Whatever the context may be, the advice is:

- Clearly identify the different actors;
- Make each role very explicit by writing a roadmap for each of them;
- Make each actor a project partner (as opposed to the teacher alone).

Learners should be more active: as learners are more or less alone, they should be supported adequately, they should be given assessment tools, but they should also be clearly aware of what they have to do, when, why, how long it will take to cover the curriculum, etc.

Synchronous and asynchronous communications: In face-to-face learning the communication among actors is synchronous. In ODL, it is mainly asynchronous. Many studies have however shown the interest of communication among distance learners and cooperation between them. The advice is to pay attention to the communication facilities offered to distance learners.

ANNEX A. Glossary

ADL	Advanced Distributed Learning [http://www.adlnet.org]. The ADL initiative is a technology department effort sponsored by the US Department of Defence. They are seeking to have global access and reuse of learning tools and content through development of industry-supported guidelines and specifications, which is how SCORM was developed.
AICC	Aviation Industry Computer-Based Training (CBT) Committee [http://www.aicc.org]. AICC is an international association, which develops guidelines for the aviation industry in the development, delivery, and evaluation of CBT and related training technologies. They currently have 9 Guidelines and Recommendations.
API	Application Programming Interface – a kind of “service definition” providing software engineers some contact points to use for communication between services or between content and services
Asset	An asset is a part of what makes up a SCO. Some examples include: a Web page, graphic, document, audio, video. An asset can be searched, so the appropriate meta-data should be included.
Behaviorist	Qualifies a teaching pedagogy, in fashion in the 1950’s, based on the reproduction of competencies through the use of repetitive exercises. At higher degree, such pedagogy may possibly be used to modify (social or scientific) behaviors by mimicry.
Blended learning	combination of online learning and normal learning
CAI	Computer-Assisted Instruction
CanCore	Canadian Core Learning Resource Metadata Application Profile. It was developed by national and provincial educators and technology developers to allow educators, researchers and students to more easily search and locate material from any online repository of educational objects.
CBT / CBL	Computer-Based Training / Learning
CEN	European Committee for Standardization [http://www.cenorm.be/]
Constructivist	Qualifies a teaching pedagogy favouring knowledge construction from former knowledge or experience.
de facto standard	A specification that has not been officially established by an accrediting agency but that is accepted and used as a standard by a majority of practitioners.
Didactist	Qualifies a teaching pedagogy during which the learner is explicitly driven to following a reasoning, to bring to him conclusions or new knowledge.
Documentary	Qualifies a teaching pedagogy during which knowledge is built through the study of documents
EML	Educational Modeling Language – pedagogical description language

Granularity	the degree of detail into which a thing can be broken up; the granularity of an object is defined in e-learning by the discrete number of content objects it is made up of
GUI	Graphical User Interface
HTML	Hypertext Mark-up Language – tagged programming language used to design documents that can be displayed on the WWW
HTTP	Hypertext Transfer Protocol – the rules and standards defining data transmission across the WWW
ICT	Information and Communication Technologies
Instructive	Qualifies a teaching pedagogy based on instruction (such as activity sequences or templates).
LCMS	Learning Content Management System – a piece or set of software managing the creation, storage, use and reuse of learning content (see VLE)
LD	(IMS) Learning Design
Learning curve	Mathematical models of the time required to perform a task under conditions of improvement with a constant rate of experience. Learning curves reflect the ability of humans to learn, to do something faster the second time than the first time, with improvement for each additional unit of experience.
Learning object	a set of reusable information, used as an adjustable “brick” to elaborate e-learning content
Learning unit	a learning object containing a didactic scenario
LMS	Learning Management System (see VLE)
LOM	Learning Object Metadata: IEEE specification to attach metadata to a learning object
Open format	Digital format relying on a public specification: www.openformats.org
Metadata	“data about data”, to classify and retrieve objects in a database
Process	a systematic series of actions directed to some end
QTI	(IMS) Question and Test Interoperability
SCO	Sharable Content Object
SCORM	Sharable Content Object Reference Model – a set of specifications used by ADL, in the production of reusable learning objects
SMIL	Synchronized Multimedia Integration Language
SS	(IMS) Simple Sequencing
VLE	Virtual Learning Environment – learning software platform



W3C	World Wide Web Consortium [http://www.w3.org], an organization developing specifications for the interoperability of software and tools across the Internet.
WWW	World Wide Web = the Internet
XML	eXtensible Mark-up Language – hierarchically-structured tagged language (see also HTML)

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ANNEX C. Examples of Quality Assurance Agencies

The list of ENQA members can be found on <http://www.enqa.net/links.lasso>.