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STANDARDS AND COSTS FOR QUALITY MANAGEMENT OF E-LEARNING SERVICES

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Abstract

The proportions of the technological development in the field of communications and information represent an irrefutable premise for significant changes in all the spheres of human life. Corroborated with the advance of the Internet recorded in the last decade, these changes form the perfect recipe for the emergence (ever since the '90s), functioning and development of flexible forms of labour at distance, using the technology of information and communication.

Among the first domains where the impact of technology is very strong may be named education, marketing, advertising and commerce; the forms of manifestation are materialized in e-learning, cyber-marketing, online advertising and electronic commerce. But the simple use of technology does not automatically assure the success of the new forms of activity.

These transformations of the traditional into digital, of the classic into virtual must be accompanied by the adequate support with respect to the quality of services, standards, platforms and the hardware and software technologies. If we are referring to the educational domain, we have to analyze the e-learning phenomenon or tele-education in its spectacular evolution in such a recent history.

Quality represents a landmark of major importance in all the fields of modern society based on knowledge. From the perspective of tele-education, quality assurance must be focalized on three main directions: the quality of the actual educational process (class/course support, platform, technology, etc.); the quality of the instructor (professional training, qualification, specialization, pedagogic ability, teaching method, etc.); the quality of the person undergoing the course/class (training, knowledge thesaurus, involvement, accumulation wish, etc.).

Also, like in any activity, quality standard reporting means an economic approach by quality costs. Theat means that the good product or quality services in e-learning are very strongly linked with educational multimedia production and good costs.

Keywords: quality, standards, e-learning, technology, cost.

JEL Classification: I21

Introduction

Direct descendant of education through courier service (the 19th century), e-learning means using the informational technology for transmitting and assimilating new knowledge, for presenting the course and seminary supports, for evaluating and certifying the students and the instructors. Just like traditional education, the e-learning services claim their own concepts and quality standards, in durable agreement with the reason for which these were born and develop – unlimited access to continuous education. Thus, in the educational processes of the e-learning type we encounter concepts such as tele-class, virtual university, electronic book (e-book), virtual instructor, diploma/digital certificate, etc.

If assuring the quality of the student (person undergoing the course) represents a strictly subjective issue which cannot be solved through standards and generally valid norms (only through an eventual admittance exam), but the quality of the instructor is assured through statutes and performance indicators with national or international availability. From the perspective of the quality management, the e-learning services must be divided in at least two categories, depending on the target public of the educational process: ① specialty institutionalized education and ② permanent and continuous education.

In the first case we could talk about a quality standard offered by a law (for example the Statute of the teaching staff) and about the criteria of professional promotion in education.

In the second case, as long as these activities are not carried out under the coordination and control of an authorized institution (such as the Ministry of Education, Research and Innovation [4]), quality assurance through standards remains a desideratum. Despite all these, at international level, there was sketched and later adopted a series of standards for the e-learning services. The most important such approaches represent this paper's object of study.

1. Initiatives regarding standardizing in e-learning services

One of the current tendencies from the e-learning domain is that of standardizing the method of structuring and designing such a system. Any system of instruction (no matter the means used, computerized or non-computerized) is conceived by defining the learning-instruction process within which is involved a multitude of actors, resources, activities, methods, environments, etc. placed in a diversity of relations. The standardizing tendency has in mind the interoperability of the various systems of e-learning, the possibility of transferring on various platforms and the exchange of information between different environments/systems so that the concepts of continuous learning, instruction at distance, personalization and user centring be applied on a large scale.

The standardizing preoccupation of the way of defining an e-learning system is complex and attracted a large number of interested organizations, both from the academic and commercial environments. The most renowned groups are [7]-[8]:

- IMS (IMS Global Learning Consortium) – a large consortium – over 135 organizations, which includes the main software developers and distributors, representatives of the institutions for education and learning and of some governmental agencies.
- ADL (Advanced Distributed Learning) – an initiative of the Defence Department from U.S.A. which desires to assure by standardizing the interoperability of the future systems of e-learning acquired by the American government.

- LTSC (Learning Technology Standards Committee) – a division of The Institute of Electrical and Electronic Engineers (IEEE), well-known and appreciated for the standards elaborated in various technological domains.
- AICC (Aviation Industry CBT Committee) – an association of the developers of technologies for the aviation industry.

All these groups permanently communicate and collaborate in order to harmonize their concepts so as to achieve adequate standards for distance training.

2. The quality cost of e-learning services

From the perspective of the costs, quality was abstractly described as being the degree of satisfying the client's requests – in our case, the student. In this context, the management levels were not able to find an actual measurement instrument for the quality of specific e-learning educational programmes and, most important, the cost of deficiencies. The satisfying product or the quality of services is tightly connected with production and satisfying costs. Unsatisfying quality means inadequate use of the specific resources. This aspect may be expressed through the squandering of materials, work and time of using the equipment, consequently high costs.

By contrast, a satisfying quality means the efficient use of the resources, thus reduced costs. By emphasizing and measuring these costs, the management and quality control may clearly and effectively evaluate the quality of the services in economical terms through money. [1]-[2]

Another approach that may be evoked in the quality management of e-learning services can be centred on the term economic efficiency. The general objective of any business, according to the theory of classic management is profit maximizing. Expressing the business in the terms of e-learning services and introducing a systemic approach, we may evaluate the economic efficiency through the cost-performance report.

All the elements with systemic character that an e-learning process interacts with shall be pretty difficult to quantify. That is why, for e-learning services the theory of quality cost may be perceived from the perspective of two main components: the conformity cost and non-conformity cost. These costs may be divided according to various components such as prevention, evaluation, internal failure, external failure. Thus, the conformity cost could mean the costs of performing the operations in a correct manner, able to measure them on two axes: prevention and evaluation.

The cost of prevention refers to the effort claimed by the prevention of flaws appearance and non-conformity situations, including expenses connected with prevention of unsatisfying products and services.

This effort can be found in the quality planning phases, those of educational processes control, of design and development for the educational infrastructure, staff instruction and development of the educational systems and specific management.

On the other hand, the evaluation cost includes the effort necessary to maintain the quality level of e-learning services through formal evaluations of the product or service quality.

This effort can be found in processes and activities such as testing and inspection of the materials acquired (used within the educational process), laboratory tests, inspections,

quantification, verifying work, preparation for testing or inspection, evaluation of the testing and inspection equipments, quality audit, maintenance and calibration of inspection equipment and quality testing, respectively field testing.

The non-conformity cost refers to all the costs involved in the erroneous performance of the operations. It can be evaluated on two dimensions: the cost of the internal failure and the cost of the external failure. The cost of internal failure includes the unsatisfying quality costs within the business, being found in elements such as scraps (see the promotion/non-promotion statistics), the costs of material procurement. On the other hand, the cost of the external failure includes the costs of the unsatisfying quality induced by the environment in which e-learning services develop (see the external complimentary principle from the theory of cybernetic systems [5]). These costs are more serious and harder to correct. These costs are detected by the student/client with all the negative implications that supervene from this.

For the quality management of e-learning services, an important issue is the cost of high quality multimedia materials for electronic learning. It is relatively easy and quick to publish course notes on the internet, but much more difficult and with much higher time consumption to design and develop simulations. For example, in U.S.A. the development of these materials was promoted through important investments by the Army and the Marine

In a report to the education department of U.S.A., the authors enumerate a series of contracts between the Army and the Marine on one side and the private industry and public learning institutions on the other side.

The five years project *On-line access to the University of the Army,* launched at the end of the year 2000 with an initial contract of 453 million dollars and signed with Price Waterhouse, has the purpose of reaching the number of one million American soldiers in the entire world.

While in U.S.A. such a huge project is possible, in Europe there's an additional language issue. In Europe, electronic learning was introduced by the university sector, most materials being made in English. If within the university environment such materials can be accepted, most students in the field of vocational education need materials in their own native tongues.

Moreover, while at the level of university are used larger resources and common structures of the disciplines in several countries, at vocational level the needs are more specific, with limited national (or even international) market. The MESO study (Multimedia European Software Observatory) made in 1998, drew the attention upon the market issues regarding the software and materials in national languages, especially in the case of the languages spoken by limited groups. At that moment it was estimated that only the English market is sufficiently developed in order to be viable in a wide range of domains. [3]

3. Interoperability standards

The electronic learning has not achieved yet durable models for content development. There is still a number of measures and promising movements in this direction. The first one is the emergence of open standards which allow the materials developed on a certain system or platform to be also used in another context, to circulate from an institution to another or from a user to another. The second is the development of smaller learning

materials called learning objects. The third is represented by content deposits development that should store and provide learning objects upon request.

The latest tendency is the appearance of the model opened by content. Taken together, these tendencies and developments lead to a durable content model. Still, none of these tendencies is sufficiently mature or lacking controversy, in the situation in which there is not a well -accomplished system of categorizing and explaining the learning materials based on computer.

For such a reason, the world of learning materials is rather chaotic and many materials of good quality are underused. Other aspects of technology application suffer due to a similar lack of interoperability. The files of the students are registered in formats that are specific to each system, an aspect that makes very difficult or even impossible their transferring from one system to another and makes inconvenient the student migration from one institution to another.

The same situation is also valid for some other administrative information (for example the descriptions of courses).

The expansion of the internet, followed by the use of intranet, groupware and learning environments emphasized this problem. People want to find easily the content wherever it might be on the internet and to integrate it into their courses. Students want to be able to migrate between institutions, taking with them their study files. The teachers who use the electronic learning system want to benefit of adequate informational support from the administrative systems.

Interoperability standards are necessary to solve this situation.

For the educational content are necessary not only technical standards (such as compatible graphic formats), but also standards for software management in order to assure portability. There are also necessary standards for the description of educational materials in order to facilitate their search and localization.

Administrative systems must come to an agreement concerning the data memorized and the method of their storage so that these can be easily transferred to other systems or between systems that commonly use this information (for example in virtual learning environments).

If an agreement is reached, electronic learning shall be freed from the burden called lack of information exchange. But reaching the agreement is much more difficult. There are two major difficulties in the path of designing these standards:

- the users and providers' needs are very different;
- defining some interoperability standards that might not affect functionality is very difficult.

Despite all these, achieving the interoperability standards for the learning technology may have a profound effect. The lack of open standards leads to a fragmenting of the market of education products, reducing options and tying users to specific systems.

Up to this moment, the market of electronic learning materials was limited by incompatible formats and platforms. The standards for educational content mean that each material that observes it will function in any system, increasing very much the range of materials available. Instead of being forced to buy complete costly solutions, institutions shall have

the option of combining elements with desired facilities without worrying about integration and formats.

4. The content of the most common quality standards in e-learning

Before analyzing the most common standards, the issue of metadata which standards are based on must be presented. Metadata are data about data. Metadata allow a computer to obtain information from another computer about structure, content and use of a learning application or electronic learning material. Of course, in order to achieve something like this, a certain consensus is needed, with respect to what metadata to be used , in order to describe an object. These shall be different from one community to another. The various communities must come to an agreement upon the representation schemes used through a committee.

At the moment there is a group called Dunlin Core, which deals with the metadata usually transmitted between communities. The educational community operates through the learning management systems (LMS or SMI) and made the metadata scheme for the educational objects (LOM). Based on LOM two standards with large usage were developed: SCORM (Sharable Content Object Reference Model) and Learning Design. While describing the learning technology may be relatively simple, the description of learning or usage of a learning object is not always that simple. There was sufficient criticism on LOM for the lack of attention paid to the pedagogical aspects and purposes. Secondly, the educational community is very wide.

Standards appeared from the instruction community,which may have different concepts from those of university or those of the education for adults.

Thirdly, there are tensions between the interests of technical and applicative developers and those of teachers and instructors.

ISO (International Standards Organization) is the internationally known standardizing group established under the UN in 1946 and is responsible for the creation of standards in many fields, such as computers and telecommunication. IEC (International Engineering Consortium) is a similar international organization which “prepares and publishes international standards for all electronic and electric technologies”. In order to avoid the duplication of the effort, ISO and IEC formed an associated technical committee called JTC1 (Joint Technology Committee 1) to ”develop, maintain, promote and facilitate IT standards” in a number of departments of common interest. One of the JTC1 sub-committees was founded in the year 2000 in order to develop special standards for ”the information technology for learning, education and instruction”.

SC36 (Standards Committee 36) emphasizes the development of formal coordination standards in e-learning with relevant standard activities in other fields.

ITLET (Information Technology for Learning, Education and Training) serves as a preeminent international forum for the development of standards in the domain of information technology for learning, education and instruction. There is a strong necessity for international standards and technical reports on the information technology that can be used especially by students, instructors, creators and institutions of instruction and education.

LMML (Learning Material Markup Language) is more than a simple XML, DTD or XSchema language. It is based on a modelling structure for the management of knowledge and represents an extension of the languages based on XML, flexible and adaptable for learning and teaching materials.

The main advantages consist of the fact that: it offers sub-languages for varied educational fields; it is used in university, post university education as well as training within companies; as development environment it is oriented to describe mainly the content of the learning elements in arbitrary fields of the application; it offers a basic pedagogical language but it is not specific to a certain pedagogic model; it may be used to model the content used in a pedagogical EML (Educational Modelling Language).

According to LMML, learning materials are organized modularly (figure 1). It consists of varied modules which themselves contain modules. The structure of LMML documents and the shape of the materials resulted is defined by the DTD modules (Document Type Definition).

The basic materials of information within this hierarchy of modules considered relevant for the provider of educational content are called content Modules. These contain multimedia objects such as pictures, animation or text, which may be structured in lists or tables.

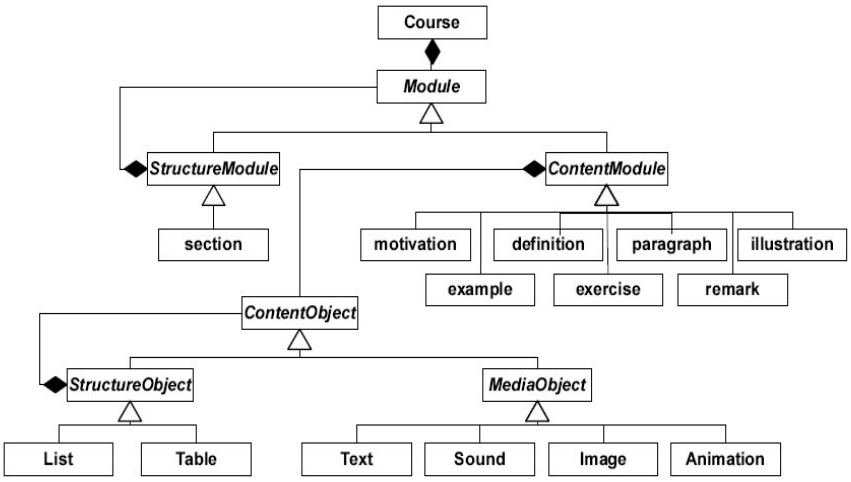

Fig. 1 The structure of LMML documents (after [6])

LRN (Learning Resource iNterchange) was created by Microsoft, being a commercial implementation of the industrial specifications and of the existing standards which address the description, packing and execution of the learning resources in order to allow reciprocal exchanges and interoperability on a large scale.

More precisely, it is a Microsoft implementation of IMS (Instructional Management Systems), an industrial standard for the reciprocal exchange of online educational content.

IMS specifications are open standards based on XML in order to perform online instruction and educational applications.

LRN is an instrument for content assembly which also supports SCORM. The materials which make up the learning resources may be created using the instruments preferred by the author and may be included without conversion in other formats.

Conclusions

As we anticipated, the issue of standards is very important for the durability and reuse of electronic learning materials. Standards intend to allow the exchange and reuse of the materials between different systems and platforms and to offer to the potential users vital information about the construction and content of the materials. These are valid for all environments, including those for own platforms using open architecture.

Thus, at first glance, standards are a good thing. The reality is more complex though.

Due to the tight relationship with the learning objects, many critiques directed against learning objects actually refer to standards. There is a series of aspects that are intensely discussed.

One aspect is that of the entire development process of the standards and of the management of this process: which must be the role of the education projectionists with respect to the interests and preoccupations of the important software developers?

The second aspect is the way in which the approach and the pedagogical usage may be represented in a technical standard.

The third aspect refers to what exactly has to be included in the specifications of standards. First of all, standards must contain thorough specifications. Secondly, standards must be useful and assure interoperability. The more detailed specifications are, the greater effort is necessary to observe them. Moreover, there is the risk that too detailed standards might restrain experimentation and innovation.

The specifications about internet and about the current web technology, although evolving fast, are inadequate for learning, education and instruction. This is due to the fact that e-learning experiences involve much more than just ”content delivery” and internet connection.

Apart from the low cost and specialized technological systems for e-learning, interoperability is also necessary. Educational and instruction environments use distributed technologies at distance. All users, providers and institutions expect interoperability and a better performance offered by these diverse operational environments.

Education, instruction and content development depend on collaboration and cooperation.

Institutions and providers cannot develop all the materials and necessary resources and for this, organizations must collaborate, reuse and sell the didactic resources.

International standards are critical for the success of collaboration between organizations and for the reuse of content.

Successful international standards allow institutions and other users to buy technology which functions well and is interoperational. The development and use of international

standards produce a decrease of the costs and technological systems may be used in a large range of applications increasing efficiency and assuring the quality of e-learning services.

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