The Efficiency of Communication Technologies
in Distance Higher Education

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Abstract: The present paper analyzes the functions that the new communication technologies play in relation with the distance education. Computer mediated communication is the most accessible and efficient means in teaching and learning process and this attribute was underlined in few international projects that recommended its use in higher education and continuous training. The electronic design standards are another important factor that composes the foundation of distance learning, teaching learning and training being designed according to these principles. We intended to gather and use in a technical application (an electronic learning platform) all this features, to highlight the many benefits that distance learning and distance training has on the modern educational system. A special attention was given to the Romanian models of distance learning that shape the current image of the higher education. The conclusion that we draw was that we need to use at maxim level the facilities offered by this architecture in order to improve the quality of learning and training for all.

Keywords: computer mediated communication; e-learning standards; electronic platforms

Describing the attributes and the performances of the new technologies used in higher education, Tony Bates makes the difference between *media and technology* concepts as follows: *media* is considered a form of communication associated with particular types of representation, knowledge organization reflected in forms or styles. According to this point of view that we share, a particular environment, such as video can be presented through several technologies (satellite, cable, video box) and can store a system of symbols consisting of: voice, moving images, captions) and formats (news, documentaries, screenings). We show in the table below the relationship between media, technology and educational applications from Tony Bates's perspective (Bates, 2001, p. 43)

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Media	Technologies	Educational Applications
Face to face	Class, lab	Lectures, seminars, experiments
Text(and graphic)	Print	Course units, additional materials, correspondence tutorship
Audio	Cassette, radio, telephone	Radio broadcasting, Phone tutorship, audio conferences
Video	Broadcasting, video cassette, cable, satellite, optic fiber, video-conference	Tv broadcasting, video-conferences.
Digital Multimedia	Computers, WWW, telephone, cable, satellite, CD ROM, DVD, wireless	Power Point, CBT, IAL, e-mail, forums, Web cast, WebQest, Web Conferences

Figure 1 Media technology and educational applications according to Tony Bates

In the analysis of media used in distance education, we aim to focus on tools that define the functionality of *Computer Mediated Communication, CMC*: (a) email; (b) computer-mediated conferencing; (c) access to remote databases; (d) data and videoconferencing. The selection applied has a *temporal justification*, given by the performance of the communication systems used in providing distance education (initial training or continuing education), *a technique justification* derived from computer-telephone network relation and *a professional justification* based on the importance of info-documentaries structures and their mission in the new context. *Computer mediated communication* allows a special type of communication via computer *with people* but more important *with the resources and learning resources*. This type of communication allows students to interact with teachers, peers, and individual, also to login to an institution or a remote database from which to access and download the study materials. This model was originally designed for military purposes, because the latest researches demonstrated its role in providing an alternative solution to education. Technologies and software products used as tools for composition, storage management and information distribution in the field of educational activities, in the sphere of mediated communication (including *email, one-to-one or one-to-many discussions lists, forums*, *conferences*) facilitates the extension of interactions and the analyses of their feedback in groups' discussion. It is a type of relation that has two educational facets: *formative* and *psychosocial*. The interaction through speech act is an important creator of social bonds. Language is a force that moves and stimulates knowledge in the academic environment and beyond and requires new ways of transmission. According to Morten Søby's: tomorrow's training in higher education

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must be a result of curriculum research and experimentation, using satellite, computer conferencing and hypertext (Søby, 1990, p. 241). Søby foreseen since 1989 that initial training will be improved by communication technologies, augmenting for the introduction and development of new didactic and technological models of education. He considered in this regard, that *Computer Mediated Communication* moved from the institutional sphere focusing now on interactivity. The computer-mediated communication was experimented and analyzed in few important projects that we will mention further on. The model of CMC developed in College of Computer Science NKS in Norway had as main purposes: (a) the development of new models of computer-mediated communication in support of distance education; (b) the development of interactive learning and examination of teaching methods; (c) management of distance education; (d) development an integrated system for distance education; (e) analysis of international experience in the field of mediated communication; (f) developing and promoting CMC programs.

PortaCom project was experienced in management and business disciplines, being entitled: *Computer as a tool,* and the main field of study was the architecture of data processing systems, especially modern learning environments and data file transfer. The program was structured to provide: a lecture by a professor, four tutors and 100 students, four courses with tutors and 25 students, a cafe line, an online working group with 3-5 students involved, and electronic mail data transfer, administrative and technical staff. The entire experiment demonstrated the hypothesis that Søby assumed that implemented in distance education; CMC develops communication skills and socialization of students. During a session 1,500 students had access to this project, have logged into the system and had written interventions in conferences. The large number of logs per week of a student, the number of hours allocated, demonstrated the potential of this type of communication in education. *Cosy System* was implemented first by the University of Guelph Ontario Canada and in 1986 was acquired by the Open University in Britain. The main features of this structure were given by: (a) asynchronous communication; (b) optimal transmission environment; (c) high level of interactivity; (d) collaboratively work environment; (e) physical isolation decrease. *Cosy* and *PortaCom* are some of the important projects that have allowed research and development of computer mediated communication in '80-90 years. Also in the '80s, William Pery analyzed the evolution of distance education programs in the world on types of media and the results are synthesized below. (Pery, 1984, p. 283)

Media	West Europe	North America	Other zones Africa, Asia, Australia, Middle East
Audio	28	40	50
Telephone	21	28	20
Kit-uri	9	19	25
Radio	8	7	30
Video	8	20	28
Television	5	25	9

Figure 2. Distance education pro grammes' distribution in 1984

Readers or (course materials) - were the first support materials for students, containing fragments of text or logical structures, which helped the assimilation and orientation in the lecture notes and bibliography. All could be copied and shared to remote colleagues who cannot come or had not the possibility to arrive in due time at some courses. *E-mail* has substantial attributes that made it the preferred means of communication in distance education system. It combines traditional elements of correspondence with the advantage of a rapid feedback. The *mail, chat or forums* are used for educational purposes, often as an alternative mode of supply of another. All provide additional communication channels, support the transmission of a course and also facilitate student-teacher exchange. The email has an essential role in distance learning given its very important attributes: speed, efficiency, empathy, exchange, and assimilation. According to Hölmberg Bőrhe whose opinion we assumed, *it is more valuable than the conference call, Blackboard sites, facsimiles, satellite and telephony* [Hölmberg 1990, p. 42]. Those technological components that help a good communication process, with results in the assimilation of information and teaching skills, support substantially the distance learning process. The main purpose of any means of communication is to *facilitate learning,* to *establish relations* and *mediate communication* between the participants involved.

The study of the role played by media should be based on educational needs that distance-learning system requires. The value of **computer conferences** in collaborative learning was highlighted by Linda Harasim; she underlined the idea that computer conferencing facilitates the sharing of knowledge and understanding among members of a group, that does not work together in the same place or at the

same time (Harasim, 1989, p. 52). Robin Mason structures the key attributes of computer conferences as follows: (a) mail facilities by one or more participants in training; (b) conferences where participants can read and write messages in group; (c) sub-conferences within conferences that classify the topic; (d) levels of access to initiate conferences, moderate the discussion, delete messages, for certain types of searches (Romiszowski; Mason, 2004, p. 397). ***Databases*** are distributed through computer networks, some of which are accessible on CD-ROM. Distance education has a major role in library service ICDL International Center for Distance Learning, the British Open University, United Nations University with Commonwealth of Learning Service provided the largest collection of material on distance learning in world, both online and on CD-ROM. (Bates, 2001, p. 205).

1.   International Standards for Distance Learning Design

The need to represent and explain possible worlds, domains, and their relation enabled the construction of ontologies, thesaurus through which the implicit become explicit. The Knowledge Representation is a complex process realized through: (a) scheme; (b) taxonomy; (c) thesaurus; (d) ontology; (e) semantic web. *Data about data* or *metadata* is characterized by: location-URI, attributes of relation. We intend to present the metadata and its benefits in representing knowledge.

Dublin Core Metadata Initiative is a controlled vocabulary that helps to describe the properties of metadata structure and sets out how XMP resources are represented; it is in fact a metadata vocabulary. The *microformats* are vocabularies that help in semantic annotations of programming languages like XHTML. The electronic environment requires harmonization and logic organization of documents produced by different institutions, in order to make them interoperable and allow *search* and *retrieval.* Online content management begins with the definition of courses design methods, packing strategies, storage and transmission pathways analyze. In electronic design, units that compose the course content are considered *learning objects*. The architecture of learning objects should be designed on three coordinates: *technological coordinate*, *instructional design coordinate*, and *networking coordinate*. The *learning objects* are characterized by several attributes: *interoperability, adaptability, ability to be reused, and independence*. These are defined by content, expressed by metadata descriptors, and designed to represent an educational goal: "*any entity, digital or non-digital*

that can be used, reused or referenced during learning with technological support."(RIO Strategy, 1999, p.6) The descriptors that establish the relations between different *learning objects* shape a *semantic network*.
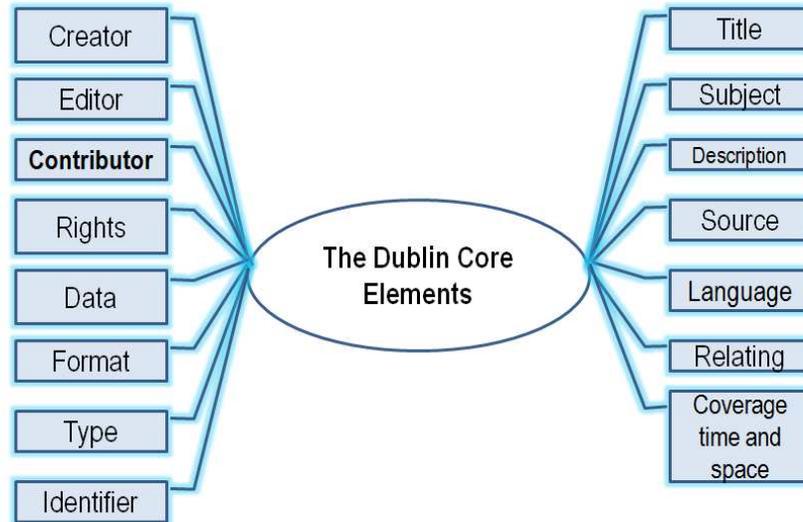
Figure 3. The Dublin Core Metadata elements

A group of experts from Cysco Systems defined the content strategy design in two terms: *RLO-Reusable Learning Object* corresponding to a lesson and *RIO-Reusable Information Object* the equivalent of a sequence. The structure of the learning objects can be described by four stages: planning, design, distribution and evaluation. All content units have a fixed structure: *content*, *application and evaluation*, and support the main objective of learning, expressed by the RLO. The system architect must describe the following metadata: (a) course title; (b) subject; (c) author; (d) the function; (e) date of creation; (f) conditions. RLO strategy allows the construction of a hierarchy with five levels, that authors can use to ensure that creates a consistent structure of the courses: *course, module, lesson, section, topic, subsection*. We applied this type of design on the E-learning platform *Open Learning Library*, www.oll.ro realized for librarians training in higher education. The platform is based on *Content Management System* Open Source Plone build on Zope, written in Phyton and developed by Plone Foundation. It is a soft with an attractive interface that allows the search and indexing of the information and also a content management of the educational process and above all, the facility to

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communicate in real time. We used a MySQL 5.0 data base server and as web server an Apache 2.2.8. Taking into accounts these arguments, we considered opportune to develop and test an application that provides learning and training for librarians. The Plone contents has attributes according to Dublin Core Metadata Standard and, through the facilities offered, this kind of learning platform enrich the teaching, learning and evaluation process supporting the main objectives of the higher education institution. In this regard, we developed a cataloging methodology structured on learning units. Each student had the opportunity to print the unit in .pdf format or send it by mail to others.
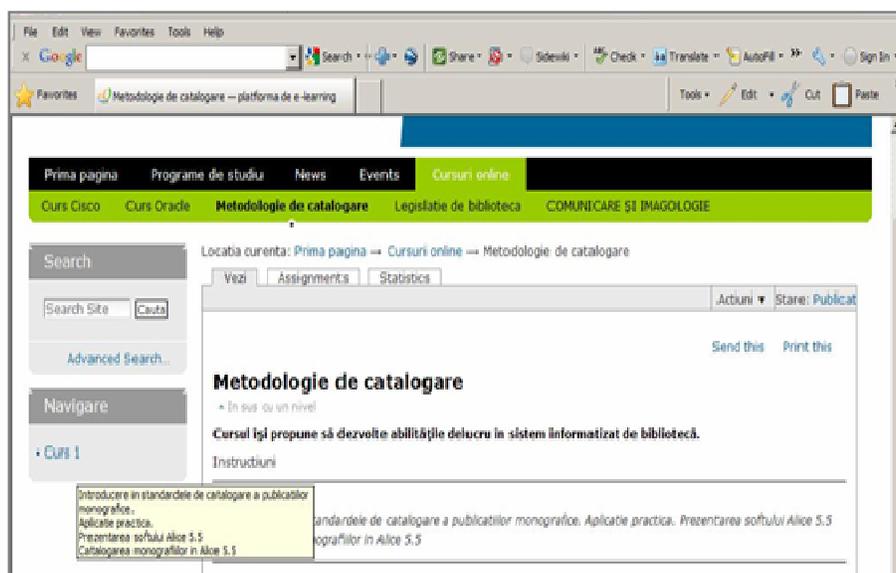
Figure 4 Alice 5.5 Course Unit

We introduced in the portal a course held at the University Danubius DL: College of Communication and Public Relations, and we structured it on learning units adapted for remote use. The course objectives, learning sequences, modular structure and time for assignments, can also be observed in the figure below.
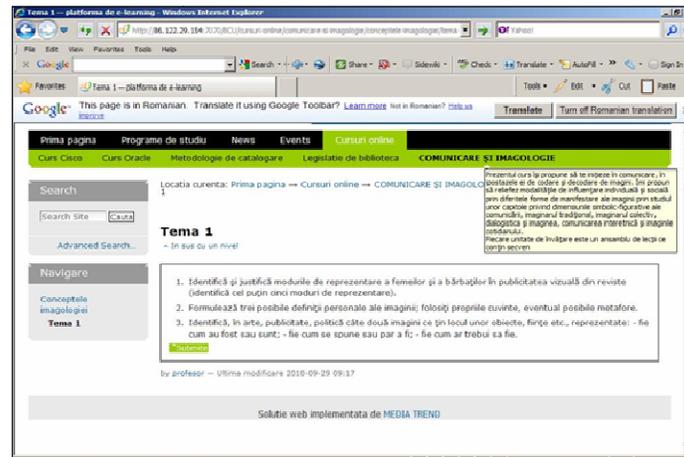
Figure 5 Communication and imagology course divided into units

Shareable Content Object Reference Model is a set of design standards for electronic content, used especially in computer-based training. The main objective of these standards is the organization of content in units of learning, sharing in different contexts. SCORM allows the integration of pedagogical elements with specific technologies to support collaborative learning: LMS-*Learning Management System*, e-portfolios, and the evaluation systems.

The *Dublin Core Metadata for Electronic Resources* is covered by ISO 23950 standard that includes a set of fifteen elements describing the physical properties of electronic resources, developed in the seminar organized by OCLC in 1995, dedicated to metadata. The significance of descriptors is established by a group of interrelated experts. The appearance of the first standard of elearning, *Learning Object Metadata Standard* was strongly influenced by the ideas developed in the Dublin Core Metadata Initiative. It establishes a set of metadata that allows the description of distributed resources that can be identified and reused with attributes.

2. Electronic Platforms for Distance Learning

The course design is made on the specialized software of data storage, teaching management, counseling and communication. Each program provides different types of learning centered on student or on teacher. These systems manage content,

skills, students' knowledge, training and human resources. *Learning Management System* allows online programming of courses, evaluation and grading. *Learning Content Management System* manages the structure and dissemination of content, the frequency of accessing, logical relations between items, creation of standard-based templates.

Course Management System is present both in the design of materials and online courses and includes instructional design programs for educational purposes. It's an architecture that enables data management, text, assessment and portfolios. An illustrative example is ***Blackboard,*** the American elearning platform that has contracts with international publisher Thomson ISI. *Murray Goldberg computer scientist from the University of British Columbia Canada developed* ***WebCT,*** after many years of research, which showed that learning performance, could be optimized using the web platform. Its name derives from the application environment "*web-based course tools."* The platform was launched at the fifth WWW conference in Paris, in 1996.

In 2002, WebCT was purchased by Blackboard Learning System, which added new communication facilities on the existing platform. **E-College** was founded in the Real Education Company in 1996 and in 2002 changed its name in *eCollege.com* and included LMS for content management and dissemination.

Moodle the acronym for Modular Object-Oriented Dynamic Learning Environment is open source software for courses production and distribution in electronic environment. It runs PHP and MySQL database support for SCORM standard. Martin Dougiamas designed it in Australia; the acronym is a combination of *muse (muse)* and *doodle*. Originally, Moodle appeared as an attempt to improve and put into electronic media the courses at Curtin University's Teachers Technology. Before becoming a commercial service, it was tested on case studies in high schools and universities, demonstrating its abilities to integrate pedagogy with technology. The electronic platform of Bucharest Academy of Economic Studies: www.ase.ro is based on Moodle and manages the distance learning courses for the faculties of cybernetics, international relations, management and marketing. The platform is structured on four components: administrator, course creator, teacher and student, which define the four roles of the actors involved. Indiana University, Institute of Technology Massachusetts, University of Michigan, and Stanford University created Sakai. As Moodle or Blackboard, is a student centered learning platform, adaptable and interoperable that includes an open source system: *E-portfolio*.

Danubius University integrated **Sakai 2.5.0.** in 2009. The platform *danubiusonline* was launched in 2010 when Sakai 2.6.0 was integrated for undergraduate and master. It is installed on an VMware ESX 4.0 Server using Apache 2.2.8., Tomcat 5.5 and MYSQL database. The survey applied the university revealed a high level of remote use by the students and teachers also. About the learning process in Danubius University Ioan Bordeian said: "*the distance learning in Danubius University is organized according to ARACIS principles and methodology being structured as follows: department, teacher in charged with programs, tutors having groups of 20 students per discipline.*" Sakai facilities and performances have been strengthened by Monica Pocora in the interview: "*in terms of IT infrastructure, the Danubius University has two strengths comparing to other universities: Sakai platform and MSDN Academic Alliance technologies available for students.*"

Among the educational benefits of Sakai we find: tasks catalogs, curricula and management section and the portfolio instruments such as evaluations, glossaries, templates, pre-forms, reports, tutor. Organized in a modular form of websites, Sakai platform of Danubius University from Galaţi has a set of tools that allows teachers to create their own web page, courses and tests templates, forums and chats for interaction with students. E learning has significant effects on educational theory and practice of the educational system, including: the students' learning methods and forms of resources learning organization to provide the needed level of instruction.
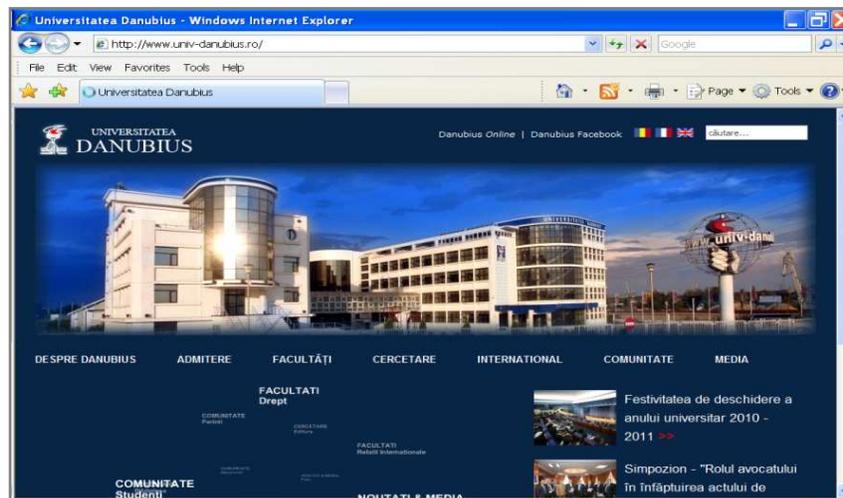

Figure 6. The Danubius University, Official Website

The university strategies argue the role and the mission of higher education institutions in social life and also the particular attributes of the university in the national education system. The distance learning has important effects on theory and pedagogic practice in the educational system aiming at: students learning methods and learning resources organization for a better instruction. The distance learning programs determined the reshape of study program and the appearance of new learning materials. The quality of educational act is a constant preoccupation of all universities that succeed to impose as high-level structures and design the scientific objectives through a fine analyze of relation between learning, needs and standards. The learning forms influence the professional training and the structure of study cycle as follows: graduate, master, continuous training, research and mobility programs. The professional training is a field where the distance education had been intensively used on specific themes, with specific instructional methods. It becomes a regular process in 20 century, determined by the multiplication of resources and knowledge acquisition. New technologies involve new methods of teaching, learning and training. However, the universities lack well-defined structures to accomplish it. We took an interview to the great specialist in distance learning systems, Tony Bates, from British Columbia University: Who should teach/train e-teachers?

Good question. The normal practice is to establish a Teaching and Learning or Professional Development center with experts on pedagogy and educational technology. However attendance at workshops organized by these centers is usually voluntary, and often the professors who need it most don't come. Some faculties/academic departments delegate a 'respected' academic within the department to be responsible for professional development of their colleagues, particularly newly appointed young professors. These are both what I would call weak approaches, although better than nothing. What is really needed (and won't happen) is for professors to be formally accredited following training in teaching. This would best be done by radically reforming the post-graduate training to include training in teaching as well as research as part of the Ph.D. process. (Bates, 2010)

The evolution towards an industrialized economy, the challenges in technology, the communication interactions optimized the adults' access to different forms of learning. The training institutions are forced to include in managerial plans the continuous training courses for the improvement of the quality.

Due to the ICT implementation at the corporate level, the continuous training could take pace anytime without affecting the quality of the professional activity; it is a modern response and a way to improve the organizational management. As distance learning, distance training becomes an open process, structured on knowledge level, on specific subjects, accomplishing the individual and organizational needs. Training programs in such cases, must take into account the educational level of the trainee and the specific learning styles. Through the competitive and modernist character, distance learning must become part of knowledge management. The professor Sever Bumbaru from Danubius University assumes same opinion: *What is the difference between the knowledge transmitted by such means to the traditional "face to face" model? Each model has advantages and disadvantages. The best results are obtained combining the two. However for the post university and continuing training the e learning is the most efficient solution.* E learning is related both to innovations in information and communication technologies and also to the paths that information can be accessed and applied in a knowledge society. This model of training brings with it the need for specialization of persons involved and a need for large investment in technology. The introduction of distance education programs in traditional universities, led to the restructuring of curricula to new learning materials, to new modes of teaching and a diversity of students.

The force of this type of education to promote creativity in education is influenced by the interaction between *distance education systems* and *traditional systems*, by the communication exchange between them that allow them to act as national resources centers.

The *Sinpers Project* is an example of good practice concerning the training in accord with the needs of work market, of the students and study fields required for continuous training and professional improvement. The National Institute for Research and Development in Informatics Romania coordinated it having as partner The Bucharest Academy of Economic Studies, and had been developed after a deep analyze of the work market, where the continuous training was a *rara avis.* The main objective was to realize a platform that served as self-instruction tool and content delivery tool, according to the field of the company. The target group of this project was formed mainly by managers, teachers, and course instructors and delivered project management content. It had as final objective to design a distance-training portal. The main stages of the project were: (a) the analysis of the training needs; (b) the Romanian e-learning system evaluation. The

expected results on the managerial coordinate aimed: the optimization of the professional abilities costs diminishing of the courses delivery, and the creation of new workplaces. The applicative and fundamental researches developed between 2005-2008 and the results were disseminated in international and national conferences.

Figure 7. Sinpers Project Website Presentation

Through the possibility to provide continuous training at the workplace, through the diversity of IT instruments used and the contents based on the constructivist approach, Sinpers demonstrated the innovative character on the electronic learning coordinate. It is a modern instruction model for many corporate companies from our country that intend to raise the level of instruction of their employees.

In the distance-learning environment this universal language helps to represent the knowledge, the contents and also to achieve high quality learning and teaching. We noticed that each technology has its means of representation and an educational application but the supreme form that combines and explores the advantages of all are the electronic platforms designed on international standards and dedicated to earning and training. The modern means of communication that the platforms use, offer the chance to skip the prejudices and barriers of all kind and have at any time the possibility to be a well trained person in a dynamic society. All the projects mentioned and all the platforms presented indented to shape a model of good practice and application of ICT in higher education and also in socio-economic sphere.

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