

## 2010 - TOWARDS A KNOWLEDGE SOCIETY - 2030

### E-Learning Technologies - Achievements and Perspectives

Marin Vlada<sup>1</sup>, Radu Jugureanu<sup>2</sup>

(1) University of Bucharest, 14 Academiei Street,  
RO-010014, ROMANIA, E-mail: vlada@fmi.unibuc.ro

(2) Siveco Romania, Bucharest, B-dul Averescu, nr.22  
RO-050034, ROMANIA, E-mail: radu.jugureanu@siveco.ro

#### Abstract

*Information Society has led to the use of IT&C as a reference point for systematic changes in educational systems, and challenges have been shaped, in the beginning, on three major directions, having as starting points the Lisbon and Feira Summits: equipping schools, training teachers and providing the necessary resources.*

**Keywords:** e-Learning, Information Technologies, Knowledge Society

#### 1 Premises and objectives

*MOTTO: „The informatics/computer science re-establishes not between the pure and the applied mathematical sciences, the technique and the concrete mathematics, but also that between sciences, the human being and the society. It restores the abstract and the formal and makes peace between arts and in the scientist' conscience, but in their philosophy as well.”*  
**Moisil (1906-1973) - Computer Pioneer Award of IEEE**



*only the unity  
concrete  
the natural  
concepts of the  
science not only*  
**Grigore C.  
(1996)**

Computer's invention and utilization has revolutionized the development of contemporary society, therefore we are talking nowadays more and more about the concept of *informational society*. Moreover, even since 1997 *N. Moore* has pointed out, in his report presented at UNESCO, the four aspects that define the parameters of contemporary society (Drăgănescu 2001):

- Information is a resource of organizations and private individual, becoming a source of wellness for the company and individual;
- Information is the basis of new economical branches, in fast development;
- Information can be used in commonly without consuming it;
- IT&C development revolutionizes fundamental activities of human society: business, education, government, enterprise management.

Though, mankind's ideal is that of achieving the stadium of "*global informational society*" and for that it's necessary, as *O'Brian* states, to go through the four stages (waves) (Drăgănescu 2001, Vlada 2005):

- The stage of information enterprise (1970 – 2010) – first wave;
- The stage of interconnected knowing people (since 1980) – second wave;
- The stage of global interconnected society (started since 1991) – third wave;
- The stage of global information society (will start after 2010).

This ideal is in fact man's desire of *knowing* as much as possible. Because of that the fundamental terms which define the paradigm of contemporary society become, naturally, *information, knowledge and computer communication*.

As a science, Informatics (*Computer Sciences*) is characterized by the most spectacular evolutions in its impact upon man's activity. Computer has technologies man hasn't even dreamed about. Although, through time, the use of computer has sometimes been seen reticently, today most people are convinced of the performances and utility of the computer in all areas of activity. Nowadays, even since primary school pupils find out about the impact of computer in their life. Out of these reasons, educational systems of countries are conceived to implement development strategies oriented towards computer utilization, not only for beginner, but also in its continuous usage. In the beginning of the 21<sup>st</sup> century can be stated that *information and knowledge* were the basis of scientific, technological, economical, social, cultural (and so on) process/events.

The professor Roger E. Bohn shows that it is important now to understand *technological knowledge*, in specific, knowledge about the way of producing goods and services. Knowledge is addicted to the learning process. Also it is worth remembering Bohn's formulation of the learning concept: "*Learning is evolution of knowledge over time*" (Bohn 1998).

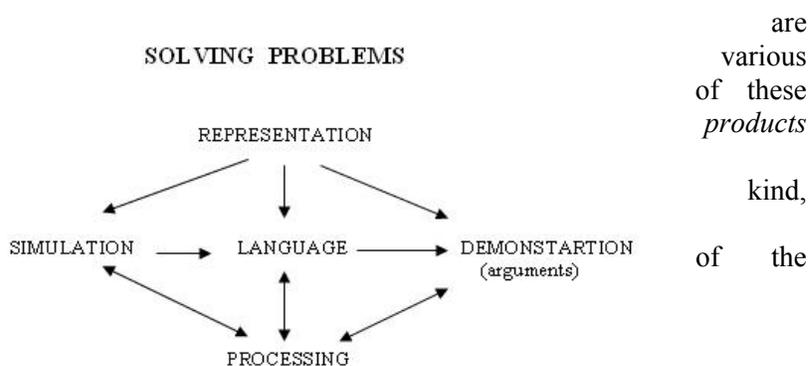
Today, by the appearance of different *technologies, operating systems, programming languages, specialized programs* etc, it is used the expression "*Information technologies and communications*" (IT&C) which includes a great variety of information processing and a great utility of this processing in all areas of activity. Still, at every level of human society development had always been substantiation on *information*. *Information* is a primary form of *knowledge* attainment. We mention the following moments from the significant examples: **the ABACUS** (3000 B.Ch.), **the paper** (50 B.Ch.); **the newspaper** (1700); **the telegraph** (1837); **the photography** (1839); **the telephone** (1876); **the electricity** (1882); **the tabulator** (1890); **the film** (1891); **radio - television** (1920-1936); **the robot** (1921); **the transistor** (1947); **the graphic display** (1953); **the microprocessor** (1971); **Web technology and Internet** (1991). All these moments have contributed at a better utilization of information in society and at increasing levels of knowledge and human wellness (Drăgănescu 2001, Vlada 2005).

The explosive development of *software and hardware technologies* has made possible for *informatics technologies and Internet services* to be used in all areas of activity today: education, research, economy, health, commerce, tourism, business, defence etc. Applications for financial on-line transactions, on-line commerce, multimedia on-line services, e-Learning, on-line magazines, electronic libraries, services of information search on the network etc have been developed. Today, the economical aspects of a company are related to the great potential of WEB technologies, and the educational system of a country cannot ignore the impact of these technologies towards the objectives followed by education. *Web site* represents more and more a determinant aspect of any activity/business. The WEB is one of the most important communication/knowledge tools that a company / firm / institution / organization has, demanding however a series of investments that cannot be done if only cheap solutions are considered.

## 2 Knowledge Society, e-Learning and Educational Software

**MOTTO:** „*Learning is evolution of knowledge over time.*” Roger E. Bohn

Specialists from certain fields, confronted nowadays with and complex problems. Many require *computer and software* utilization. The complexity of activities, competitions of all efficiency and activity accomplishment, require the use



most preferment hardware and software products. It is noticed the explosion of tools and methods given by *Information technologies and communications* (IT&C), by peripheral equipments with various functions. Research, development and innovation programs are in a larger number every day and results are seen right away. In the same time, *continuous improvement*, knowing and using new knowledge from the activity area must be major desires for every specialist. And under this aspect, Informatics and Information Technologies and Communication, offer *e-Learning* technologies and *educational Software*.

In the new global context of competition based on scientific-technological innovation, the European Union Council elaborated the program "*European Research Area*", launched in 2002. This program consists in forming the basis of a new free internal market for innovation. In the way of achieving this goal there is a series of barriers regarding free and efficient fulfillment of innovating transfer process. According to that, E.U. wants to eliminate the fact of remaining behind Japan and U.S.A. Although E.U. is a major research force, it isn't doing so well in transferring the science results in economical innovation and performance. To eliminate the difference in the key area of innovation, E.U. has launched "*The Lisbon Strategy 2000*" which has as primary strategic goal that in the perspective of the year 2010, E.U. to become "the most competitive and *dynamic economy based on knowledge* in the world, capable of a lasting economical growth that offers more and better jobs, and a big social cohesion."

Building an informational society (that will represent the passing on to the society of knowledge) cannot be done without research and investment projects, in the IT&C area as well as in education. The final desideratum being *competence*, there is no technology, no theory, no approach that can eliminate or neglect the *professor-pupil/student relationship*. All of those will be efficient and convenient tools both for professor and for pupil/student. Sometimes, these tools can be unique in regard to the traditional tools in education. "*All what is correct thinking is either mathematics or feasible to be transposed in a mathematical model*" (Grigore C. Moisil). There are some representations that can be reproduced or simulated only by the computer which offers methods and techniques regarding *graphics, animation and sound*. For instance, 3-D representations or the evolution of physical, chemical, biological phenomenon, which develop dynamically, can only be *represented or studied using the computer* (Fig. 1). *Competence implies experience in solving problems in a certain area of activity*. *Competence and experience in solving problems* can only be gained if it is always taken into account the interdependence *physical reality-virtual reality*, and if efforts are made to *get new knowledge* for an appropriate knowledge of all aspects regarding *the physical model*, respectively *the virtual model*, aspects determined by the characteristics of the problems that need to be solved in a particular area of activity. For instance, a programmer that creates programs for various problems to be solved has to have technical skills according to the scheme (Fig. 2).

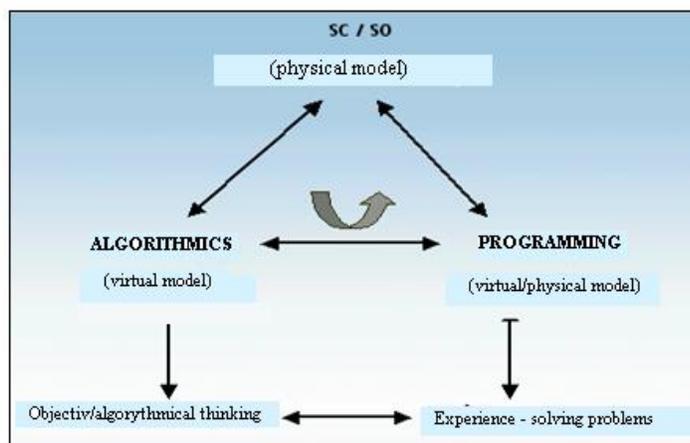


Fig. 2

If in the 70's, the predominant expression was that of Information Society (the main pursuit being the realization of a national information system with ideas and trends that refer to an *information society*),

gradually, the concept of information society gained ground and became a reality after 1990 as *Internet technologies* propagated. *E-learning technologies* that are spread today are the result of evolution, of pedagogical and psychological methods in education, as well as IT&C technologies (Web, multimedia and communication technologies).

Thereby, using the Internet system, programs of Web products elaboration, audio/video recordings, CD recordings, integrating the results from the graphical area on the computer, have made possible the elaboration of on-line courses, of educational software for various disciplines, of *virtual libraries and campuses*.

In the future there will be platforms based on *management architecture* that use Web services architectures (**XML-eXtensible Mark-up Language**). The software and system components will *describe themselves*, meaning that through *a standard protocol* they will be able to be accessed and opened efficiently and conveniently. Lots of old applications will be improved in this way.

*The Internet technologies* development in the last years, has determined the existence of new ways and possibilities of using the computer in all areas of human activity. In particular, in the *education field* the new technologies offer possibilities that have never been dreamed of 15 years ago. This is due to the development of Informatics and compute systems from the hardware and software point of view. One of the main targets of *modern education* is continuous improvement of *teaching-learning processes* and that is by using the *new multimedia technologies*.

Multimedia technologies allow a close correlation between audio-video effects in making lessons, courses, complex presentations that can be easy to follow, suggestive and mostly to contribute in the assimilation of new knowledge. Unanimously, professors and psychologists consider that learning is a process that implies all aspects of human personality. Regardless of the learning content, from the simplest knowledge to the most complex ones, the entire chain of processes is realized in the purpose of understanding, processing, interpreting and valuing the learned entities.

Virtual Learning (e-Learning and educational software) imposes itself as a very attractive, useful and efficient form of learning, forming and informing. This popularity is based on pupils' / students' free choice: *what to learn, where to learn, when to learn, how much to learn, the learning order, the learning method etc.* Certainly, the elaboration of *software systems* for *e-Learning* is not an easy activity. This kind of systems have to be done by competent persons that will correspond to the modern requirements in the educational area, that's way the most preferment systems are those made by professors, psychologists, pedagogues, IT&C specialists.

What to teach with e-Learning? How much to teach with *computer*? These are few of the questions that need an answer when educational software is conceived and elaborated for pupils, students or different users of these products.

Next, we will analyze *the e-Learning* and *educational software* concepts to eliminate any confusion and determine the objectives of these modern technologies (Vlada 2005, 2004).

**Definition.** *E-Learning includes traditional or modern methods and techniques and by using the IT&C technologies (multimedia processing and asynchronous or synchronous communication), leads the subjects that uses it, to gaining experience in understanding of knowledge and skills in an area of activity.*

Basically, *e-Learning* offers the convenient and efficient access to the newest information and knowledge, new and efficient teaching, learning and evaluation knowledge's methods, constant training and forming. In the same way, e-Learning is an alternative to constant education in nowadays' or tomorrow's *informational society*. The specific characteristics of e-Learning technologies bring new dimensions in education which can be complementary or alternative than traditional methods in education. These characteristics offer the possibility to organize on-line learning on subjects or themes, while traditional learning is organized on groups/ age classes.

*The teaching-learning-examination* process gets new dimensions and characteristics through *e-Learning technologies*. The educational system in our country is involved directly and determinant in substantiating and building the informational society.

An *information society* is born in an environment in which the majority of her members have access to *IT&C technologies* and use informational technologies frequently, for training and professional perfecting, as for personal activities regarding solving economical, social etc problems.

**Definition.** *Educational software stands for any software product in any format (executable or not) that can be used on any computer and represents a subject, a theme, an experiment, a lesson, a course etc, being an alternative or the only solution towards traditional educational methods (blackboard, chalk, etc).*

The verification and evaluation stages of knowledge and skills in gaining adequate competence to the didactic script can be or not implemented in educational software, this depends on the knowledge characteristics corresponding to a didactic discipline. For instance, is the case of Informatics' and IT&C' disciplines which have as base computer utilization in gaining skills. In this case gaining skills must be done after verification and evaluation of assimilated knowledge, as well of skills in correct and efficient computer utilization. All of these must be obtained by presenting the various projects directly on the computer, by the examined one, to prove the examiner professor the grade / level of competence.

Nowadays, it is desired the transition from an *informational society* to a *society of knowledge*, and that is between the years 2010-2030. The European Programs (FP6, FP7) are conceived and elaborated to achieve this desideratum. If in the 1970s the predominant expression was that of *Informational society*, (the biggest concerned being the making of a national Informational system, with ideas and tendencies aiming for an informational society), on the way the concept of *Informational society* has spread more and more and became a reality after 1990 from the moment that Internet technologies have expanded.

WWW technology (World Wide Web) is the most troubling transformation and expansion for the human society. Electronic mail (E-Mail), electronic/virtual book (E-Book), and *WWW Technology* have determined a global self organization process which is still in full development today. People, organizations, institutions, countries, regions, continents etc also have to organize themselves.

### 3 Educational Technology

**MOTTO:** „*The real environments of nature are governed by languages. The Languages exist not only for communication, but mainly for knowledge.*” **Marin Vlada**

The human society development is done through knowledge and learning. Roger's Bohn formulation for the learning concept “*Learning is evolution of knowledge over time*” is based on development and evolution of information and communication technologies. *Technology-Based Instruction* has a wide meaning, referring to forms of instruction using other places than the traditional class-room. These include computers, television, video devices, stereos (multimedia equipments).

Instruction through computer have been having a great impact in the knowledge area. “*We have to replace education and schools by hyper instruction, which represents not only a form of instruction, free of any constraint but also a world completely free of education constraints. Nations that choose instruction systems that use the newest technologies will be, economically, the most powerful in the 21st century. This new type of study will spread beyond school, beyond the static roles of professor and student and beyond school years. Intelligent ways of instruction, interactive hypermedia systems, intelligent and biomedical technologies, the infrastructure of communications that allow access to knowledge in any moment and place, represent the four key components of hyper instruction technology. The impact of HL revolution (Hyper Learning) will include access to instruction through education at distance, to intelligent ways of instruction that adapt learning characteristics to particular situations, access to instruction of people of all ages and levels.*” (Lewis Perelman, 1996).

A system for education management (LMS - *Learning Management System*) is a system of software applications that allow on-line organization of education (Lăculeanu 2006). This kind of applications

allow tracking progresses of instruction, test results, exams in on-line training, and aim going through the entire educational course. Most LMS applications allow information transfer to other administration software of recordings of whole educational process. Universities have been and still are the leaders in adopting new technologies to increase access to education and tutoring.

The professor James Taylor (*Southern Queensland University, Austria*) presents in his article “*Fifth Generation Distance Education*” the following stages:

- 1<sup>st</sup> generation – The Mail Model based on typing technology;
- 2<sup>nd</sup> generation – Multimedia Model based on typing, audio and video technologies;
- 3<sup>rd</sup> generation – Tele-Learning Model based on telecommunications technologies to provide synchronic communications opportunities;
- 4<sup>th</sup> generation – Flexible Instruction Model based on on-line teaching over the Internet;
- 5<sup>th</sup> generation – Flexible Intelligent Learning Model.

At (Anohina 2005) it is shown a classification of terms used in the *Virtual Learning* field. There are 8 basis groups for the most used terms: The C Group (*Computer*), The I Group (*Internet*), The T Group (*Technology*), The D Group (*Distance*), The O Group (*Online*), The W Group (*Web*), The E Group (*Electronic*), The R Group (*Resources*). The used education concepts are: instruction, learning, teaching, tutoring, and education.

Integrating New Technologies into the Methods of Education (Microsoft Research Cambridge, UK), by researching in cognitive psychology’s standards and methods, it improves the teaching learning evaluation activities at all academics levels, and all forms of curricular fields. “*The learning quality becomes superior when true understanding of the learning subjects becomes main objective. In this way, professors have the possibility to see what students know and can truly understand.*” (Oldfather & West, 1999).

McCombs and Whistler (1997) have theorized 12 major learning principals that puts the pupil/student in main role and which refer to the following aspects: The nature of the learning process; The objectives of the learning process; Building your own knowledge system; Superior thinking; Motivational influences on learning; Intrinsically motivation in learning; Task’s characteristics that stimulate motivation; Limits on individual development and favorable moments; Social acceptance, self- esteem and learning; Individual differences in learning; Cognitive filters.

## 4 IES Project and AeL platform

**MOTTO:** “*All what is correct thinking is either mathematics or feasible to be transposed in a mathematical model.*” **Grigore C. Moasil**

The **IES - Informational Educational System** is a complex program initiated by *Research and Education Ministry* in 2001, with main objective supporting the teaching-learning process in academic levels with the newest technologies. The program supports the objectives of education Reform, it is according to the action plan *e-Europe 2005* started by *The European Union* and with the European initiative of e-Learning. The program is implemented by partnership. The main involved in the IES are SIVCO Romania, HP and 2001). IES was created as an solution at national level made regional network solutions. lab in schools is an integrated itself, ready to use by teachers



a public-private companies implementation IBM (Siveco, integrated of local and Each informatics solution by and students. IT

labs (local solutions) are integrated in a logic network that includes all the schools in a region. All regional systems are themselves integrated in a national network connected to Internet and controlled by the management IES unit which is at the Research and Education Ministry.

Nowadays, the following have been done:

High schools: 1510 informational platforms (25 computers, servers, printer etc) – 37150 latest generation computers; 1510 servers; 1510 installed and configured networks; over 3000 formed network administrators; over 23800 trained professors;

Schools: 3228 informational platforms – 33000 latest generation computers; 3228 servers; 3229 installed and configured networks; over 35000 trained professors; CCD: 42 platforms for professors' tutoring – 840 computers; 42 servers; 210 instructors; 25 credits out of 90 onto course levels (Istrate and Jugureanu, 2006, Jugureanu 2005).

AEL is a complete solution for *e-Learning*, teaching/learning support. AEL has administrative and delivering capabilities of various types of *educational content*, such as multimedia interactive and tutorial materials, exercises, simulations, educational games and so on. AEL is *an integrated teaching/learning and content management system*; meant to support professors/tutors, students, content developers, and the other participants in education process. Although initially conceived for universities/education at distance, AEL is now used for the academics level, being extremely suited for various language studies, regions, various study levels and types of organizations. The latest technologies are being used: *Enterprise Java Beans, jdbc, Java servlets, jsp-s, Java applets, XML*.

*The IES Project* is considered to be the most rewarded Romanian *e-Project*. Thereby, AeL – Learning and Content Management System – platform has been noticed and rewarded in the European Competition *e-Europe Awards* for e-Government (<http://www.e-europeawards.org>). Also, *AEL Lessons*, in a competition with 20000 projects from 168 countries, were considered the best educational content in the world. The competition was called World Summit Award (<http://www.wsis-award.org>) and designated it's winners in the WSIS, at Tunis in 2005. These results were possible through the consequent involvement of the SIVECO company in *supporting various local, national or international events* in the **e-Learning** field: “*Siveco Coup* – national contest of educational software” (organized by Siveco company), *NCVL* – National Conference on Virtual Learning and *ICVL* – International Conference on Virtual Learning (organized by Bucharest University), *eLSE* – Scientific communications session “e-Learning and educational software” (organized by National Defence University), *NCES* – National Educational Software (RAER - Romanian Educational Resources, Brasov), *OnLine EDUCA* (organized by ICWE GmbH-Berlin, [www.online-berlin.educa.com](http://www.online-berlin.educa.com)) etc.

*The AeL e-Learning platform* is a complete platform of computer assisted training management. It offers the basis to teach and learn, evaluate, to administrate the content, to monitor curricular concept process. Educational content (educational software) : 1700 multimedia lessons; 9500 interactive and individual moments; 7400 simulations of phenomenon studied in school; 1100 process emulations; 3 math, physics and chemistry editing programs; 7 interactive tutorials for PC utilization; courses for English language lessons, for study years 1-8 (Siveco 2006).

*Academic AEL platform* is a learning platform assisted by computer through flexible excellence, with a friendly interface, specially created for educational and administrative needs of a university creating (Siveco 2006):

- Filling the existing system with standardized educational content specific for technical faculties (process simulators, virtual experiments, chemical labs, dedicated diagrams and graphics);
- The integration of applications with specialized informatics applications (IOLS, simulators, editors, video – conference, CAD software, dedicated platforms, virtual encyclopaedias and dictionaries, knowledge bases);



“Carol I”  
Conference on  
Association of  
**Berlin**  
[educa.com](http://www.online-berlin.educa.com)) etc.  
integrated,  
and content  
to test and  
the learning and  
(lessons –

- Improvement of present modules for management of didactic activities and of communication with different functions (forum, chat, video-conferences, time schedule, opinion polls, organization of packages for courses, planning, tracking and evaluating educational activities for creating and administrating educational content, multimedia materials, students' testing and evaluating, monitoring the training process and evaluating its results).

## 5 What's next ? Adaptive thinking ?

MOTTO: "*The book of nature is written in the characters of geometry*" Galileo

The dynamic of informational *flow* in the last years creates an amazing vision on **educational process**, and mostly on school activities. In a perspective of only 10 – 15 years, we know today that our students, because of *technological diversification* to which they will be direct participants, will have to change 10 – 14 places of work by the age of 38. This is also because the 10 most wanted jobs that will be in 2010 didn't exist in 2004.

An **educational system** has to implement new valences considering that fact we are preparing pupils and students for:

- Jobs that not exist and are not defined yet;
- To use technologies that aren't yet invented;
- To solve problems about we don't know-how to be solved.

All these aspects have to be analyzed and implemented considering that today the following are already happening (Intel Education Services 2007):

- Every month *2,7 billions of unique questions* are enunciated on Google;
- Every day over *6 billions of text files* are surfing the INTERNET;
- Over *3000 books* are published every day and *the informational volume* of the year 2007 reaches **1.5 Exabytes** ( $1.5 \times 10^{18}$ ), meaning more than the information sum of the last 5000 years; the increase rate is doubled every 2 years.

These challenges and changes in the society have to determine essential adaptations to these changes for all factors of the educational process:

- Pupils, students and professors have to be prepared to face the fact that everything they learn in the first 2 years of study, in the 3<sup>rd</sup> year is already old;
- The teaching-learning-examination methods have to quickly adapt to modern educational methods.

The common element of every **present educational system** is the 3 "gained *cognitive reflexes*": writing, reading, calculating. We will have to know to create this kind of reflex: *computing thinking* or *statistic thinking*.

Beyond *writing, reading, and calculating* we will have to invent another thing: **adaptive thinking!** The presence of simulators, process emulators, and formative interactivity in the true act of learning it cannot be at "*fashion*" level, but it must rise to "*necessity*". **The multimedia interactive educational content** and **integrated platforms** for computer assisted education (CAE) can answer the question: "*How do we form adaptive thinking?*"

## References

- [1] A. Anohina, *Analysis of the terminology used in the field of virtual learning*, *Educational Technology & Society*, 8 (3), 91-102, ([http://www.ifets.info/journals/8\\_3/9.pdf](http://www.ifets.info/journals/8_3/9.pdf)), 2005
- [2] Roger E. Bohn, *Measuring and Managing Technological Knowledge*, pp. 295-314 in Dale Neef a.o., Eds, *The Economic Impact of knowledge*, Butterworth-Heinemann, Boston, 1998 and Sloan Management Review, vol. 36, number 1, fall 1994, <http://irps.ucsd.edu/faculty/faculty-directory/roger-e-bohn.htm>

- [3] Mihai Drăgănescu, “Societatea informațională și a cunoașterii. Vectorii societății cunoașterii.” 2001, [www.acad.ro](http://www.acad.ro)
- [4] Florin G. Filip, *portalul ROINTERA*, Academia Română, [www.rointera.ro](http://www.rointera.ro), 2004
- [5] O. Istrate, R. Jugureanu, “eLearning – componente didactice”, CNIV-2006, Virtual Learning-Virtual Reality, Conferința Națională de Învățământ Virtual, Software și Management Educațional, Ediția a IV-a, 27-29 octombrie 2006, Editura Universității din București, 2006 (Editori: M. Vlada, Gr. Albeanu, D.M. Popovici) (ISSN 184 - 4708), <http://fmi.unibuc.ro/cniv/2006/>, pag. 27-36
- [6] Radu Jugureanu, “Proiectare pedagogică a soft-ului educațional. Taxonomia lui Bloom și Bloom-Anderson”, Arhiva CNIV 2005, [http://fmi.unibuc.ro/ro/cniv\\_2005/](http://fmi.unibuc.ro/ro/cniv_2005/)
- [7] Ana Maria Lăculeanu, *Tehnologia informației cu aplicații în sistemul educațional*, Teză de doctorat, ASE, 2006
- [8] M. Vlada, Al. Tugui “Information Society Technologies - The four waves of information technologies”, ICVL-2006, Virtual Learning - Virtual Reality, International Conference on Virtual Learning, Software and Educational Management, 1<sup>st</sup> Edition, october 27-29 2006, Bucharest University Press, (ISBN 978-973-737-218-5) (<http://fmi.unibuc.ro/icvl/2006/>), pp. 69-82, 2006
- [9] M. Vlada, “Tehnologiile societății informaționale”, CNIV-2005, Virtual Learning - Virtual Reality, Conferința Națională de Învățământ Virtual, Software și Management Educațional, Ediția a III-a, 28-30 octombrie 2005, Editura Universității din București, (ISBN 973-737-097-X) ([http://fmi.unibuc.ro/ro/cniv\\_2005/](http://fmi.unibuc.ro/ro/cniv_2005/)), pp. 19-32, 2005
- [10] M. Vlada, “Supremația limbajelor în domeniul procesării informațiilor și cunoștințelor”. Sesiunea de comunicări științifice cu participare internațională, “Provocări la adresa securității și strategiei la începutul secolului XXI”, Secțiunea E-Learning și Software Educațional, UNAP, 14 -15 aprilie 2005, Editura Universității Naționale de Apărare, București, pp. 165-178, 2005
- [11] M. Vlada, „Virtual Learning - Virtual Reality”, Sesiunea de comunicări științifice cu participare internațională, secțiunea E-Learning și Software educațional, Secțiunea 9, vol. 1, Universității Naționale de Apărare, Editura Universității Naționale de Apărare, ISBN 973-7854-44-6, București, 2006, pag. 149-158 ([www.unap.ro](http://www.unap.ro))
- [12] M. Vlada, *Birotică: Tehnologii multimedia*, Editura Universității din București, ISBN 973-575-847-4, 2004
- [13] <http://fp6.cordis.lu/fp6/home.cfm>, <http://fp6.cordis.lu/fp7/>, <http://www.cordis.lu/ist/>
- [14] <http://www.intime.uni.edu/>
- [15] <http://portal.edu.ro/index.php>, [www.advancedelearning.com](http://www.advancedelearning.com), <http://www.siveco.ro/>
- [16] Intel Education Services, <http://www97.intel.com/education/>
- [17] Bersin & Associates, <http://www.bersin.com/>
- [18] HP Education Service, <http://www.hp.com/education/>
- [19] Portalul SEI, <http://portal.edu.ro>
- [20] 2020 Science, Microsoft Research Cambridge, UK