Integration of ICT into educational institutions at the brink of convergence.
Ubiquitous learning as operational framework of Management, Teaching and Learning (MTL) processes.

Stefano Perego
Auralog – Tell Me More (Italy)
stefano.perego@auralog.com
stefano6974@hotmail.com

Abstract

Drawing from a quantitative and qualitative research on European 2020 flagship objectives on investments and policies for digitalization and ICT integration for language teaching, learning and management purposes in European educational institutions, this paper argues that ubiquitous computing will shortly bring national educational institutions to re-evaluate the adequacy of the "e-" prefix (as in "e-learning" and eEducation) at the time when ICT is becoming a silent pervasive enhancing infrastructure, available anywhere, anytime. Although the degree of ICT integration into education amongst European countries is not homogenous and abandoning paper is still controversial, policies and investments have been strongly outlined, giving birth to thousands of top-down, bottom-up and horizontal projects for platforms, products and contents developed by a wide variety of actors ranging from countries to top private companies, to SMEs and public schools, to universities, to individual teachers as well as simple students.

Such complexity cannot be managed by micro-defining areas of operations linked to very specific areas of interaction such as e-learning, video-learning, pad-learning, mobile learning, digital Tele-learning, pod, pad, playstation, car-computer, Skype, VLE, MIS, LMS and LCMS.

Taken singularly, there is a strong risk of assessing short-lived processes which are constantly expanding, evolving and converging toward a common framework of cross interoperable multi-device interaction, available to school administrators, teachers and students anywhere anytime.

If different types or forms of e-learning can be considered as a continuum, from no e-learning to full symbiotic integration of ICT into schools and universities, such continuum embraces and expand e-learning to become a ubiquitous infrastructure able to provide a common dimension for synchronous/ asynchronous interaction of teachers, learners and objects wherever they are.

As a result, "e-learning" and "e-system" are not more able to represent the variety of dimensions, devices and channels of communications available to all actors for the planning, management, supervision, interaction, personalization, support and evaluation of learning processes.

Accordingly, the change of prefix from "e-" to "u-" of ubiquitous seems increasingly necessary to put the ubiquitous relation of actors at the centre of converging educational projects.

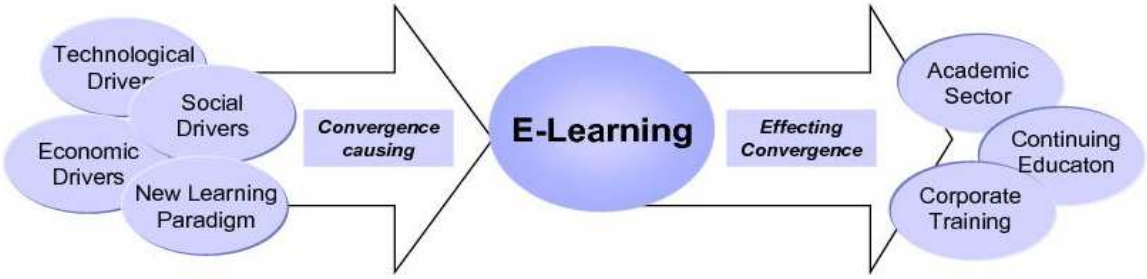
Although the degree of ICT integration into education amongst European countries is not homogenous and transition to a paperless society is taking place slowly, during the last ten years, policies and

investments toward development of knowledge, innovation, and education in Europe have been strongly outlined both at Communitarian and national levels.

The birth of thousands of networks of top-down, bottom-up and horizontal projects taking place in European educational institutions reflect the heterogeneity of integration theories applied in analyzing European Union developments [1]. From a top-down perspective, strategic goals in the field of education set in the Lisbon Strategy [2] to be implemented within the frame of Bologna Process [3], definition and implementation of the Seventh Framework Programme (FP7) [4], Competitiveness and Innovation Framework Programme (CIP) [5], Education and Training programmes as well as Structural and Cohesion Funds as key pillars for the European Research Area (ERA) [6], up to the 'Europe 2020' strategy, show a clearly identifiable strategy in terms of allocation of rights and resources toward the objective of creating '"the most competitive and dynamic knowledge-based economy' in the world [7].

By identifying the development of human resources as crucial to smart, sustainable, and inclusive growth, the 'Europe 2020' strategy places education and research at the centre of Europe's future economic well-being. Convergence of education and innovation becomes central in definition of legislative and economic priorities. 'Innovation union' [8], 'Modernization of higher education agenda' [9] and the Digital Agenda for Europe' - creating a digital single market and making ultra fast internet accessible to all - drive administrators, teachers, learners and devices toward a shared super-fast digital/web infrastructural environment, where each actor is at the same time epicenter of a multidimensional network of all around tools, contents and connections available anytime from any device, and periphery of others' teaching/learning worlds.

Figure 1 – E-learning convergence



Source: "Rethinking Management Education" E-Learning Business Models - Strategies, Success Factors and Best Practice Examples [10]

Even with significant discrepancies in terms of investments in education [11], European countries are adopting and incorporating objectives and directives toward a progressive convergence and technology into educational systems. In Italy, for example, the art. 2 of the Law133/6 August 2008 envisioned the complete transition to digital school textbooks for primary and secondary educational institutions by the academic year 2011/2012, recently postponed to 2012/2013 [12]. According to major technology and "publishing" players [13], the remaining steps toward a complete paperless ubiquitous educational society are primarily social, rather than technological. The transition from printed to digital knowledge is the real brink, where natural reluctance to move away from traditionally known mediums plays a crucial role in achieving full convergence.

Universities are frontrunners, with hundreds of horizontal and vertical digital-only programs [14], new academic publications primarily accessible in pdf rather than printed, courses and exams at times managed making use of third parties' digital MTL objects and contents integrated into their platforms [15] to provide enhanced learning experiences, etc. Abandoning paper In primary and secondary European schools might take longer in some countries more than others [16], but technology is

bringing the long standing objective of one pc per student nearer than ever, with some examples of national decisive actions toward this objective [17].

From a technological perspective, waves of digitalisation inputs have created incremental communicational channels covering all actors of society. Since the birth of personal computers, integration of technology in education has been exponential all over the world, following the trend taking place in societies. Initially devoted to computer science, the concepts of interoperability of devices, convergence and continuous web connection are gradually impacting on all aspects of Education, not only in terms of methodology of teaching and learning, but also in terms of overall procedures, management and scopes [18] of Educational Institutions, universities or secondary schools alike. The magnitude of moving from paper to digital can only be compared to moving from pergamena to printed paper. From molecular presence in single lessons, administration files or library records, pc-enabled technology has been evolving radically to cover all aspects of human actions and interactions. Digital integration has been taking place during three main phases, each comprising hardware and software converging dimensions of inter-cooperation and communication.

During the first developmental period, devices could perform only specific tasks (ex. Musc, videor game players, card-calculators, etc), using basic operating systems and micro-softwares. Different communication media used their own technology and each entertainment content had to be played on a specific device (videos had to played on a television with a dedicated video player, music was played on a tape player and lately on compact disks players), etc.

The second phase has been characterized by digitalization of contents and interoperability of hardware, where devices could perform the tasks for the media they were primarily designed for, but also the ones initially performed by other devices or formats on the base of a common digital source. This is the period of the first individual personal computers (laptops and desktops) able to play videos, music, sending emails, gaming etc. The adjective "personal" still defined an individual device, non yet connected to others. Operating systems as well as softwares existed as "strangers" entities, able to live only withig their own environments. Windows, Macintosh, were the main operating systems with web services like Yahoo, Google, Linux and Android not yet there.

In Education, secondary institutions and universities incorporate computers in their administrative operations while many aspects of their pedagogical activities (homework, class study or exams) are predominantly linked to presence and paper. Nevertheless, administrators, teachers and students use at least some sort of cpu-web enabled device in carrying out daily activities. Learning materials begin evolving from static to interactive. Departments and schools restructure their IT and language laboratories. Newly born e-learning companies [19] integrate for the first time Spoken Error Tracking System technology to language learning, Machine to human interaction becomes accessible as a educational tool. Educational actors and contents are incorporating technology but individual devices and entities still stare uneasily at each other across their desktops" [20], mobile phone screen, tv or pads. (figure 1)

The process of convergence and interoperability of all cpu-web-enabled devices is driven forward by increasing hardware and software connecting capability for local networking as well as for horizontal web-based interaction. Collaborative open source concepts embracing coding and contents spread throughout the molecules. Collaborative softwares empower interoperable hardware devices and a flowering of bottom up projects making use of part of available technologies to connect with other actors, as well creating and propagating ideas and contents

In education, teaching methods begin embracing web enabled contents over a multitude of apparent diverse communicational channels. From learning platforms, to e-learning, to video, to mobile teaching to pad-learning, from distant-education to podcasts, the singularity of paper is undertaking an erosion by the multidimensional identity of digitally enabled platforms, devices and services, Through common

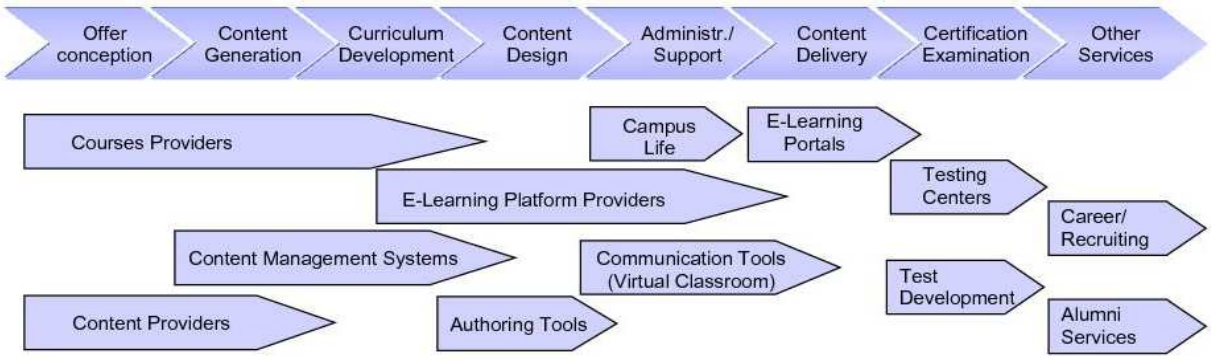
standards, [21], platforms [22], technological companies [23], and learning contents "publishers" [24] provide administrators, teachers and students with infrastructural multi-access learning environments [25] in which actors employ dedicated simplified interfaces to organise the complexity of their activities and roles within educational institutions. By becoming an infrastructure rather than the object of attention [26], from no e-learning to full computer and network-enabled transfer of skills and knowledge [27], computer-based, internet-Based, web-Based, blended, Long Tail [28], Virtual classrooms and synchronous video learning, computer-supported collaborative technologies expand their identity with the concepts of permanency, accessibility, immediacy, interactivity and adaptability [29], making educational tasks interoperable objects for multidimensional relation between actors involved in educational processes and impacting directly on school/university administrators, as much as teachers and learners.

Multi-directional [30] and multi-dimensional [31] channels of communications, each able to perform all channels' tasks amongst these actors, shade away technological differences between individual cpu/web-enabled learning tools. Mobile learning or social networking, videoconferencing, or blended learning, printed papers or pdf, they all constitute the transitional phase of digitalization of knowledge, expressing itself through an apparent complexity of local declinations. Technologies and devices allowing access to ubiquitous digital knowledge recede into the background, becoming empowering silent agents taken as granted (as much as railways or electricity).

Learning environments move from the e-prefix of e-learning into pervasive infrastructures providing ubiquitous learning environments [32] where all actors are at the same time epicenters of all round educational tools and peripherals of others' learning worlds. Common interoperable environments allow new interactions between educational institutions and companies which now provide MTL multimedia interactive objects, mergeable into existing institutional platforms

If, initially, commercial suppliers or educational providers provided simple web-enhanced -learning objects by specializing into sectors of the classic educational value chain [33], convergence merges sub-sectors requiring "publishers" to create digital all-round MTL objects [34] (figure 2), sometimes becoming structured digital educational institutions themselves [35]

Figure 2: Educational Value Chain



Source: "Rethinking Management Education" E-Learning Business Models - Strategies, Success Factors and Best Practice Examples [36]

In the case of languages teaching and learning processes, for example, existing courses published by the global private companies [37] using the most updated technologies (ex spoken error tracking system, movie dubbing, voice recognition, content authoring, synchronous and asynchronous video-lessons etc) are facing strong pressure toward the provision of all round educational interoperable and integrating objects, able to exist on smartboards, laptops, pads, digital televisions, mobiles [38], eventually cars computers, appliances or any other object of any shape and size as long as it is

cpu/web enabled. As a result, "e-learning" and "e-system" are not more able to represent the variety of dimensions, devices and channels of communications involved in the planning, management, supervision, interaction, personalization, support and evaluation of learning processes

Even if the degree of ICT integration into education amongst European countries is not homogenous and abandoning paper is still controversial, policies and investments have been strongly outlined, giving birth to thousands of top-down, bottom-up and horizontal projects for platforms, products and contents developed by a wide variety of actors ranging from countries to top private companies, to SMEs and public schools, to universities, to individual teachers as well as simple students. The resulting multi-dimensional and multi-directional moltitude of CPU/web-enabled actors, devices, tools, objects and contents, always and anytime able to communicate with other CPU/web/digital-enabled devices, tools, objects, contents and actors within educational MTL processes needs an inclusive theoretical framework wider than the "e-" prefix as in its numerous declinations (e-Learning, E-learning, etc) to account for the ubiquitous interconnection of entities able to access everything anywhere anytime. Micro-definition of areas of operations linked to very specific devices and methods of interaction such as e-learning, video-learning, pad-learning, mobile learning, Television-learning/videoconference, pod, pad, playstation, car-computer, etc, face the risk of assessing short-lived processes which are constantly expanding, evolving and converging toward a common framework of cross interoperable multi-device interaction, available to school administrators, teachers and students anywhere anytime. Learning environments move from the e-prefix of e-learning into pervasive infrastructures providing ubiquitous learning environments where all actors are at the same time epicenters of all round educational tools and peripherals of others' learning worlds. The change of prefix from "e-" to "u-" thus appears increasingly necessary to understand and manage educational MTL processes.

References

[1] Bieling, Hans-Jürgen/Lerch, Marika (2006): Theorien der europäischen Integration: ein Systematisierungsversuch; in: Bieling, Hans-Jürgen/Lerch, Marika (Eds), Theorien der europäischen Integration, Wiesbaden: VS Verlag, 9-37
[2] http://www.esib.org/documents/publications/info-sheets/0510_info_lisbon.pdf
[3] http://europa.eu.int/scadplus/leg/en/cha/c11049.htm
[4] http://ec.europa.eu/research/fp7/index_en.cfm
[5] http://ec.europa.eu/cip/index_en.htm
[6] http://cordis.europa.eu/fp7/understand_en.html
[7] http://ec.europa.eu/information_society/eeurope/i2010/ict_and_lisbon/index_en.htm
[8] Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the committee of the Regions - Europe 2020 Flagship Initiative Innovation Union SEC(2010) 1161
[9] http://ec.europa.eu/education/higher-education/doc1320_en.htm
[10] E-Learning Business Models - Strategies, Success Factors and Best Practice Examples - Dr. Sabine Seufert - Institute for Media and Communication Management - http://elearning-reviews.com/seufert/docs/elearning-busniess-models-book.pdf
[11] http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/978-92-9201-033-1/EN/978-92-9201-033-1-EN.PDF
[12]http://firenze.repubblica.it/cronaca/2011/08/04/news/libri_di_testo_dentro_lipad_il_futuro_pronto_le_scuole_no-20039152
[13] Acer Education, Toshiba Italy, Giunti Labs, Apple, but also Mondadori, macmillan, Auralog, etc
[14] Online only higher education courses and programs are nowadays offered by several European traditional universities such as Politecnico di Milano, University of Manchester, University of Liverpool, but also from 100% online institutions such as the Open University etc.

[15] Bryant University(USA), Princeton (USA), Virginia Tech (USA), Harwich School (Uk), Ecole Polytechnique (Francia), Beijing City University (Cina) for example are using MTL objects for languages
[16] www.edscuola.it/archivio/software/edisty.pdf
[17] Macedonian Ministry for the Information Society (http://www.mio.gov.mk/?q=taxonomy/term/9)
[18] W. Bostock, "The Global Corporatisation of Universities: Causes and Consequences", *Antepodium, electronic journal of world affairs,*1999.
[19] http://www.tellmemore.com/about/aboutus/history
[20]The Computer for the 21st Century" - Scientific American Special Issue on Communications, Computers, and Networks, September, 1991
[21] SCORM, AICC
[22] http://moodle.org/ - http://www.docebo.com - http://www.claroline.net - / http://www.olat.org - http://www.dokeos.com
[23] Apple, Acer, Microsoft, Toshiba, Dell etc have dedicated policies for eductional institutions
[24] Ex Tell Me More, Rosetta Stone, Atlas online, etc
[25] Cmpatble with Apple, windows, linux, android, symbian, etc
[26] Mark Weiser and John Seely Brown, Xerox PARC , December 21, 1995
[27] http://en.wikipedia.org/wiki/Elearning#cite_note-16
[28] Karrer, T (2008) Corporate Long Tail Learning and Attention Crisis- Elearningtech.blogspot.com
[29] Learners can get the right information at the right place with the right way - http://www-yano.is.tokushima-u.ac.jp/ogata/clue/ref.html
[30] top-down investments on digitalization of education - bottom-up and horizontal cooperation amongst individual universities, departments and professionals creating and developing networks
[31] Diversity of actors existing and operating from multiple devices within a common interoperable environment
[32] Zhao Xinyou, wan Xin, Okamoto Toshio (2010-4-16). "Adaptive Content Delivery in Ubiquitous Learning Environment" (PDF). The 6th IEEE International Conference on Wireless, Mobile and Ubiquitous Technologies in Education(IEEE WMUTE 2010). Kaohsiung, TAIWAN. http://www.myresearch.biz/sharefile/file/WMUTE2010.pdf. Retrieved 2010-07-22.
[33] E-Learning Business Models - Strategies, Success Factors and Best Practice Examples - Dr. Sabine Seufert
Institute for Media and Communication Management - http://elearning-reviews.com/seufert/docs/elearning-busniess-models-book.pdf
[34] Examples of MTL objects offered by companies include: SAP (management), Tell Me More v10 (teaching and learning languages),
[35] Next Generation University - www.unext.com; University of Phoenix, Motorola University
[36] E-Learning Business Models - Strategies, Success Factors and Best Practice Examples - Dr. Sabine Seufert
Institute for Media and Communication Management - http://elearning-reviews.com/seufert/docs/elearning-busniess-models-book.pdf
[37] Rosetta Stone, Tell Me More, Worldspeaking etc
[38] Auralog corporate data