Position Paper on Education and Training

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1. Abstract

This paper presents the relationships between NEM technologies and education from a double point of view: on the one hand, how future NEM professionals are trained and, on the other hand, how NEM resources can be used in the educational process. Some NEM technologies are explained in a more detailed way, such as applied games and web-based models. These issues are dealt in the framework of the European Higher Educational Space. Moreover, the situation in some representative countries is included.

2. Introduction

This paper introduces the NEM position on education and training, and intends to facilitate communication among the NEM community. This educational strategy relies on three basic points:

1. A short review of the different levels of Higher Education in Europe regarding NEM Technologies and Services.
2. An assessment of the possibility to adapt education and training in response to new technologies and competences.
3. A review of new NEM technologies, tools and services that may be used in the educational process.

3. Education as an essential factor of the European Innovation

Rather than being a separate enterprise, Education should be considered as an opportunity to push evolution and creativity in every single field of knowledge, tightly integrated with Research and Innovation. Even UNESCO, in its 2005 world report on "*Education for All. The quality imperative*" recognizes that *"...a more educated society may translate into higher rates of innovation, higher overall productivity through firms' ability to introduce new and better production methods, and faster introduction of new technology*" [1]. However, to enable such evolution, new curricula must be defined, being dynamic and flexible to adapt to the new requirements of the market, including both academic and industrial players in a real world context. The ICT/NEM initiative can and must contribute to optimize the expert's profile, through the use of advanced concepts and tools.

The ICT market is evolving to a clear convergence of telecommunication, media and IT companies. The new educational models must ensure that the new arising needs of the combined evolution of these industries are met. For that to happen, a closed cooperation with them, enabled through the European Technology Platforms (ETP), is required. These new models imply:

- Training/re-training opportunities to increase skills and competency levels.
- Recognition of degrees throughout Europe.
- Links to global research networks, going beyond traditional disciplinary structures.
- Sharing knowledge with other societal disciplines.

- Enhanced interdisciplinarity and transdisciplinarity.

It is widely recognized that the above capabilities are essential factors for regeneration of the European economy. The way they are assembled to create the renewed value chains is the key challenge in that perspective. The basic principle is to not forget that the new academic models have to be used to educate the specialists of the future in jobs that currently may not even exist. In this way, higher education institutions become places where learning to learn occurs, according to EC policy about lifelong learning.

4. European Higher Educational Space

Following the European Commission goal and the EIT strategy for creating a catalogue of structured academic levels, and taking into account the emerging ideas about how to promote the transfer and acquisition of knowledge to the students (very different to classical and well-known procedures), Education becomes a crucial element in the triangular relationship with Research and Innovation. The Bologna process has already enabled a deep transformation of the European Higher Educational Space, through the transformation of the metrics that assess the individual and collective effort to harmonize procedures for defining curricular paths and knowledge profiles. Student mobility and the co-operation between higher education institutions are key issues in the construction of this new European Higher Educational Space.

The Bologna Process (or Bologna Accords) is named after the Bologna Declaration, which was signed in the Italian city of Bologna in 1999. It aims to create a European Higher Education Area (EHEA) based on international cooperation and academic exchange. Today, 47 countries have committed themselves to harmonising the architecture of the European Higher Education system. The envisaged EHEA will:

- Facilitate mobility of students, graduates and higher education staff.
- Prepare students for their future careers and for life as active citizens in democratic societies, and support their personal development.
- Offer broad access to high-quality higher education, based on democratic principles and academic freedom.

This will be achieved by organizing the education in a three-cycle structure (e.g. Bachelor-Master-Doctorate): Countries are currently setting up national qualifications frameworks that are compatible with the overarching framework of qualifications for the European Higher Education Area, and define learning outcomes for each of the three cycles. Quality assurance will be performed in accordance with given guidelines. Recognition of foreign degrees will be done in accordance with the Council of Europe/UNESCO Recognition Convention.

5. Overview of the NEM area in Higher Education

The following subsections will provide a general overview of Higher Education in several European countries.

5.1. UK

The United Kingdom (UK) is one of the world's leading digital media economies. The strength, breadth and depth of its Networked Electronic Media (NEM) related higher education provision is a major contributing factor. This provision contributes to producing the content creation specialists of the future in a variety of digital media areas and encompasses applications and technologies contributing to the digital media economy at large.

A particular feature of the NEM related higher education provision in the UK is the speed at which entire new areas of study have emerged. The innovation in provision is particularly notable because many of the degree programmes offered are not only multidisciplinary, covering two or more disciplines, but transdisciplinary, crossing disciplinary boundaries to provide a holistic approach to content creation and delivery. For example, degrees focussing on aspects of Digital Media, an area now known in the UK simply as Digital, commonly address relevant aspects of technology, the arts, design, and computer science. Some of this provision is the direct result of initiatives with local employers in the NEM area and is tailored with their particular needs in mind. Nevertheless, specialist technical provision that has emerged out of traditionally focussed engineering departments that have specific research expertise in the area of the provision is also widely available. Consequently, Bachelor of Science degrees exit alongside Bachelor and Master of Engineering degrees in the NEM area. Bachelor's degrees with honours comprise three years of study with each year being made up of 120 credits. A Master of

Engineering degree is a four year undergraduate made up of a total of 480 credits. Taught Master of Science degrees exist which are one year postgraduate degrees and provide an avenue for further study for both Bachelor of Science and Bachelor of Engineering graduates. These are made up of 180 credits. In the annexe UK degree programmes are grouped together under key words which effectively provide headings for lists of related programmes. The key words have been chosen to be as prescriptive as possible.Nevertheless some programmes could easily be put under more than one heading. However, each programme, named in the annexe, appears in only one list, the one that is believed to best represent the focus of the programme. No attempt has been made to provide a comprehensive list of all UK degree programmes related to NEM content creation. However, a good starting point for further analysis could be the Skillset Media Academies Website (**http://courses.skillset.org/pick the tick/skillset academy network/skillset media academies**). Skillset Media Academies were launched by the UK Government in December 2007, with the remit to work with universities and colleges, which are already established centres of excellence in television and interactive media, in collaboration with industry to create new opportunities for learning and teaching, research and business.

5.2. Spain

In Spain, after the introduction of the European Space for Higher Education (Bologna process), both public and private universities can offer two types of degrees: university's own degree courses, and official degrees valid all over Spain. The former do not have the legal validity and legal competences of the latter.

Official degrees are listed on the Official University Degree Catalogue, and are authorised by the government upon receipt of a favourable report from the Autonomous Communities and the relevant quality control organisation.

The higher education studies have been organized in bachelor degrees (grades), master degrees and doctoral degrees. To obtain a bachelor's degree, students must earn a total of 240 ECTS credits over four academic years, and between 60-120 ECTS in one or two years for a master degree. ECTS (European Credit Transfer System) represent an approximate workload for the student of 25 hours. A full-time student is expected to obtain 60 ECTS in an academic year.

As previously mentioned, each university is free to propose a degree as far as it follows the main guidelines proposed by the ministry, it is approved by the government, and falls in one of the five defined areas: Arts and Humanities, Experimental Sciences, Health Sciences, Social & Legal Sciences and Engineering & Architecture. It is in the latter category where a number of degrees related to the Networked Electronic Media can be found, which are listed in the annexe.

The complete catalogue of official university degrees in Spain can be found here: https://www.educacion.gob.es/notasdecorte/jsp/compBdDo.do

It must be mentioned that, especially at the Master degree level, the Universities are offering many other degrees related to NEM technologies. However, these degrees have mostly remained as *own university degree* as they have not gone through the official validation process.

5.3. Norway

The Norwegian higher education sector consists of eight universities, nine specialised university institutions, 21 state university colleges, two national academies of the arts and 16 private colleges. The national higher education system is in accordance with the Bologna process, with bachelor's degrees (*first cycle*, three years), master's degrees (*second cycle*, two years) and doctoral degrees (*third cycle*, three years). The complete list of the universities and university colleges can be found at http://folk.uio.no/hjr/hoyskoler.html. Universities and university colleges offering degrees related to the NEM technologies are listed in the annexe.

5.4. Austria

In Austria, the Public Higher Education System is divided in Universities and Universities of Applied Sciences. Both provide Bachelor and Master Degrees according to the Bologna-Process. In total, there are 15 for NEM relevant Public Higher Education Institutes in Austria.

- Universities

The complete list of Universities offering degrees related to the NEM technologies can be found at http://www.univie.ac.at/services/universitaeten-in-oesterreich.

- Universities of Applied Sciences

The complete list of Universities of Applied Sciences offering degrees related to the NEM technologies can be found at http://www.fachhochschulen.ac.at.

Further information about the bachelor and master degrees related to NEM technologies can be found in the annexe.

6. Innovation in educational methodologies for NEM [2]

Education involves a strong social element: the interaction between educators/facilitators, experts and students. The access to new technologies and the new social communication possibilities offer many new alternatives to this group. The learning process is already evolving, taking many forms: self-learning, classical classroom based, on-the-field practice, online participation, either on site or remotely (using mobile connected devices), etc. And more often, different types of more complex and real-time interaction are progressively required.

Innovation is a driver of growth and well-being. New technologies, products, services and organizations create jobs and rejuvenate industries. But to reap those gains, policy makers need to understand how the way we innovate is changing. This has implications for human resources and education systems if they are to feed this innovation society. This also presents new opportunities for innovation and improvement in education systems [3].

Technological change, which not only permits new activities but makes those new activities superior in many important ways over the previous method of operation, creates long lasting innovations in society [4].

Social progress needs for innovation. Innovation is the soul of a nation's progress is an inexhaustible motive force for national prosperity, and progress of a nation depends on the innovation of countless individuals. Students are the future of school education. To develop in students awareness of innovation, creativity and innovation capability has a special status and role of the education activity course, [5].

Economic and social development needs new ideas, new knowledge, new technology and innovative talents. This is the inevitable evolution of social functions of Higher Education .

7. NEM and Future Internet as resources in the educational process

The tools used in the new learning process are evolving. Not only must the NEM technologies be present in the new curricula, but they have become useful resources inside the classroom. Today it is not strange to see that the teaching-learning process includes new technological tools, such as: webcasting, podcasting, video sharing and specific channels in platforms such as YouTube, serious games, tablet PCs, mobile applications, open source learning resources, social learning channels, etc. Among these technologies, serious games and web-based models are explained in a more detailed way in this section.

As a matter of fact, the future specialists in these technologies are expected to be able to create:

- New network configurations, incorporating access features to heterogeneous demands, autonomous characteristics, openness and scalability, ability to interact with the physical environment through disperse and system-embedded devices.
- A wide variety of new communication paradigms, including person-to-person, social networking, machine-to-machine and person-to-machine models.
- Connectivity and interaction capabilities for a broad spectrum of peer requirements, and full flexibility towards the most appropriate control schemes (e.g., centralized and decentralized control).
- New features for virtualization of production and service processes, as well as for modelling and controlling complex processes and (possibly low-tech) systems.

7.1. Serious games

Serious games, that is, (digital) games used for purposes other than mere entertainment can be applied to a broad spectrum of application areas, e.g. military, government, educational, corporate and healthcare. Some experts prefer to talk about "applied games" to underline the capabilities of this paradigm to increase the competitiveness in Europe, the innovation and the excellence.

In fact, today's "serious games" is a serious business; as stated by IDATE [6] the serious game sector is expected to enjoy significant growth in the medium term. It currently generates a total 1.5 billion EUR in revenue around the globe, and that by 2015 sales will be almost seven times what they are in 2010 – with an average annual growth rate of 47% between 2010 and 2015. We can expect to see the business world's interest in serious games increase around 2013, and especially small and medium enterprises (SME) which still have a rather limited awareness of these tools.

Serious games are becoming ever more important in the global education and training market. Serious Games have emerged as a new tool to assist traditional learning programs. In these environments, the student is immersed in the learning process (learning by doing), getting closer experiences through multimodal sensations and interacting with virtual objects or even, real-time interaction with other people.

Serious games allow learners to experience situations that are impossible in the real world for reasons of safety, cost, time, etc., but they are also claimed to have positive impacts on the players' development of a number of different skills.

Compared with standard training representation, Serious Games bring an opportunity to change more radically the paradigm of training skills as they empower them through automation, precise monitoring, full recording of real-time quantitative data and real-time feedback. Virtual Reality technologies offer the opportunity to reconsider didactic learning processes with new eyes.

7.2. Web-based education models [7]

In today's world there is a great demand for learning. The Internet is being marketed as the effective vehicle for teaching and learning. With the global nature of the Internet, this teaching and learning vehicle can more easily and effectively reach the mass audience. This pressure from the "education industry", which has been felt by the traditional universities since 1996, challenged the universities to redefine and restructure their strategies for the higher education environment [16]. As a result, higher education institutions are setting up their own Internet based "virtual" campuses [17].

Many early references to eLearning were technocentric and equated eLearning solely with electronic learning. Roffe [8] added substantially to this limited definition of eLearning by arguing that the "e" term should not be seen exclusively as equating to electronic learning, but rather needs to be understood in terms of the human purpose of learning. He also proposed that eLearning should be defined as being concerned with more human "*e*"s: engagement of the learner, enhancement of learning, ease of use, empowerment of the learner to control the learning schedule, and the pace of execution of the learning program [9].Furthermore, the benefits of eLearning offer a solution to the requirement to support the learning of the mass population beyond the constraints of diverse locations and times [10].

This discussion raises the question of whether eLearning will become the new paradigm for modem learning. An advantage of eLearning is the range of possibilities information and communication technologies (ICT) enables for interactions between learners and materials, and learners and teachers in the learning process by eliminating the limitations of time and space [11][12][13].

According to [8], eLearning is "*a competitive arena, where solutions are created by a fusion of technology, learning and business*". eLearning comprises three essential dimensions: technology, access and quality (although these may assume different weightings in different contexts) [14].

Technological change, which not only permits new activities but makes those new activities superior in many important ways over the previous method of operation, creates long lasting innovations in society. Web-based education is one of those innovations [4].

The synthesis and analysis of the literature supported the notion of informal learning as an effective way of educating learners who engage in cooperative work placement. This emerging paradigm of learning and informal learning recognizes the importance of individual activity as well as collaboration and collegiality in learning [15].

Why is the remarkably fast growing innovation of web-based education important to our world? Firstly, it is radically growing in the first world nations of the world, especially in the United States. This alone means that it will likely grow in other nations in the world, as this innovation dominates education at all levels. Secondly, teachers at all levels can merely post their syllabi on blackboard but some have radically changed their whole method of teaching so that the class venue for the teacher and the

student becomes the computer. The classroom now is a "virtual learning environment." Learning is no longer bound by space and time [4].

There are seven important functionalities in web-based education: 1) real time announcements, 2) posting of text, html, spreadsheets, videos, presentations, and audio files, 3) real time grade book, 4) external links, 5) discussion board and chat rooms, 6) automated quizzes, and 7) emails to individuals and lists **¡Error! No se encuentra el origen de la referencia.**.

In a resource-based economy, these educational institutions play significant roles in the economic infrastructure because without the provision of quality education, many people are reluctant to live in remote communities. Since the advent of the Internet in teaching and learning, many changes have taken place in the organization and development of small rural schools. At a time when the economies of many countries are becoming inter-dependent, so individual schools as well as school systems are able to link with one another. Global economic changes of the last decade have shown that national economic systems cannot survive by sealing themselves off from one another, and nor, we predict, can national school systems.

7.3. Network, Framework and Education [18] [19]

In higher education, the advent of massification has radically changed the traditional patterns of knowledge production, diffusion and application over the past two decades. In the wake of burgeoning enrolments from the 1970s to 1990s, demand has continued to rise and the world's student population could reach an estimated 150 million by 2025. While this demand has been obvious in OECD Member countries (e.g. from 2.2 % in the 1960s to 59 % in 2002 in the USA), it is certainly not confined to them. Strong population growth in Africa, Asia and Latin America, coupled with increased enrolment in primary and secondary education, has boosted demand at the tertiary level.

This demand is varied in objective and scope, covering traditional academic and research based teaching and learning, as well as specialized and more practically-oriented training. As a result, institutional diversification has become essential in order to achieve a range of provision: all forms find their legitimate place in the development of a nation's cohort of skilled human resources. Also, this diverse landscape has led to the emergence of a new tertiary educational paradigm with specific characteristics, namely the promotion of "learning by doing" and of individual creativity; the widening of access, through both face-to-face and open learning; and engagement with regional and local priorities. This new paradigm has also generated its own research agenda.

Regarding the particular role and contribution of research universities, these are characterized by top graduates, cutting-edge research, and vigorous technology transfer. Their critical dimensions are a concentration of talent, abundance of resources and favourable governance, which combine to assure excellence in graduate education and research output [20].

In contrast, when countries lose their base for academic excellence – through outdated policies, neglected institutions, the exodus of their best graduates or woefully inadequate investment in research – their competitiveness in the global knowledge society will dwindle and eventually disappear.

The debate on the role of ICT for creativity and innovation in education has become an important one over the past decade. The rapid development of technology, mainly as a result of the Internet, has brought about an upsurge of technological tools which young people are appropriating for use in their everyday lives. As explored by the domestication theory, the arrival of ICTs in homes has brought the mobilisation of material resources, skills, cultural values and social competences and capabilities [21]. The recent rise of social media is also having an impact on education. These applications have shifted the way users seek information and the way knowledge is created. Blogging is an example of how youngsters are using technologies to express their creativity and to be innovative. Creativity can be at both the individual level and the collective level. These applications demonstrate the variety of ways in which users learn how to learn, which according to Rogers [22], is a major component of creativity. The example of blogging shows that children learn how to write for a public, how to link their work to other works, how to network with other bloggers, how to utilise the blog for their eventual career paths, amongst other skills. This facilitates creative learning, as it enables users to use technology to learn in new, creative ways. Such learning processes demonstrate that technology has great potential for creative learning.

Technological skills are important not only for children at schools but also for lifelong learning [23]. The different levels of interaction and collaboration characteristic of new technologies facilitate personalisation of learning paths. Learners become active stakeholders, who are "*empowered to shape their own learning spaces and resources*" and collaborative learning processes [24].

Continuous technological change means that learners today need to develop positive attitudes towards change and also, adaptability [25]. As Hinkley argues [25], students in the future will endorse "*portfolio careers*", moving through several careers and different jobs, including jobs that today still do not exist. Hence, it comes as no surprise that substantial pressure

is being put on schooling systems to acknowledge new ways of dealing with continuous rapid technological development. Young people today, often referred to as the NetGen or Google Generation [26], are growing up surrounded and immersed in technology. Appropriation of technological platforms requires new approaches for education.

7.4. Impact of NEM on areas of study related to 'society at large'

In all of the above discussion it should not be forgotten that the impact of NEM on human interaction has been so profound that NEM is increasingly becoming a mainstream topic for degree programmes in a wide variety of established areas of study. In those Social Sciences degrees which have a particular focus on the ways in which humans communicate with each other and the ways in which they build communities NEM is now a key topic. Psychology degrees are being driven to address NEM as it is increasingly being recognised that its use can change individual behaviour patterns. In the Arts the digital arts are increasingly being recognised as a vital aspect of an all-round education in the fine arts. Business Schools are increasingly focussing on NEM as a key business enabler, a trend that has been reinforced by the current focus on outsourcing through the use of Cloud services. Such degree programmes are of critical importance as avenues through which the NEM community can better understand its user communities as they both study these user communities and respond to their demands through their curriculum development.

8. Conclusions and recommendations

Education is a key aspect to support the growth of any society, and an opportunity to push evolution and creativity in every single field of knowledge. Both educational contents and methodologies should evolve and adapt to the market requirements. It is a dynamic concept. Different European countries have different career profiles, although the Bologna Accords are progressively aligning the metrics to define curricula and, therefore, effectively leading to a common European Higher Education Area. Innovation in the educational methodologies is currently an emerging requirement according to the new social-media capabilities and the NEM-related technologies new opportunities.

The recommendations of the NEM initiative in education and training should be:

Action 1: *To create a catalogue of levels of Higher Education in Europe regarding ICT´s trends and demands.*

Action 2: *To define new academic profiles gathering the requirements and demands of the NEM community, taking into account that they should consider jobs that currently do not even exist.*

Action 3: *To research and develop new recommendation for the use of new technologies in the educational process.*

Action 4: *To research and develop tools helping liaison between school and students.*

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