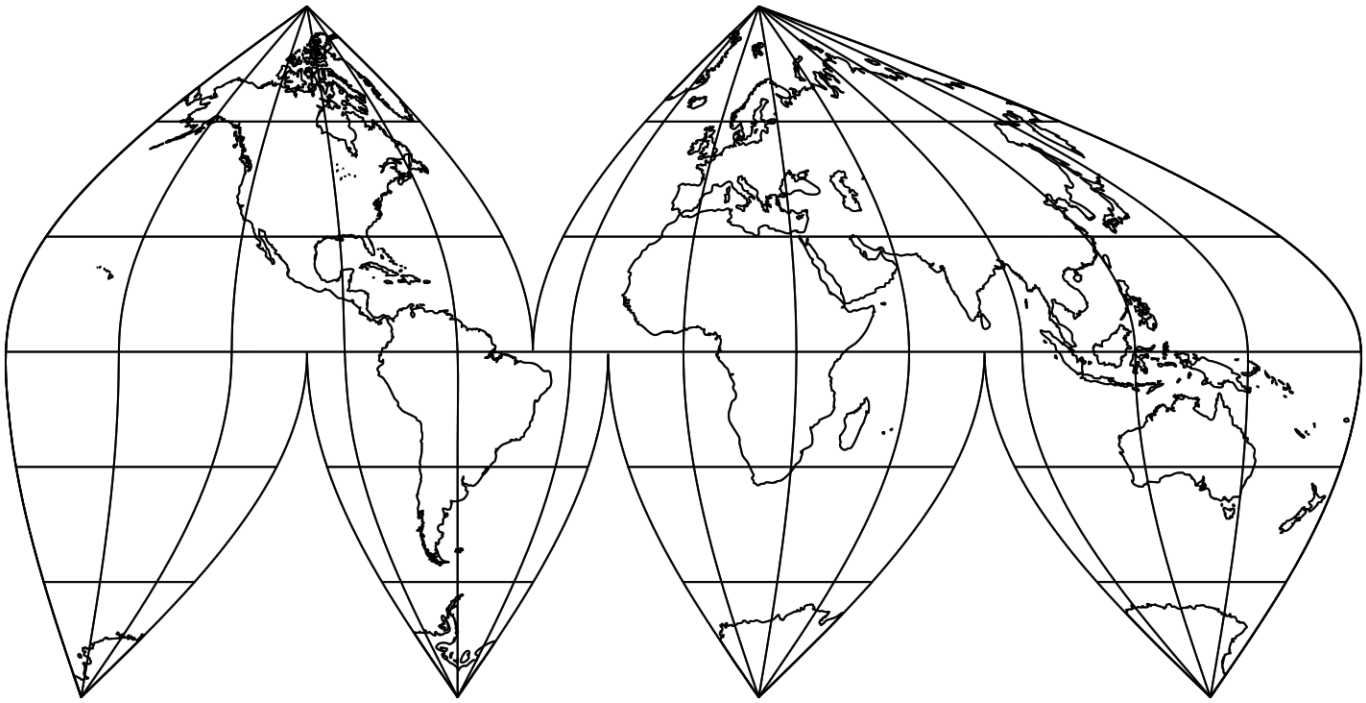
NMC Horizon Project

Technology Outlook

Iberoamerican Tertiary Education 2012-2017



An NMC and UOC Horizon Report Regional Analysis

Technology Outlook: Iberoamerican Tertiary Education 2012-2017

A Horizon Report Regional Analysis

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A Horizon Report Regional Analysis

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Executive Summary

The *Technology Outlook for Iberoamerican Tertiary Education 2012-2017* reflects a multi-year collaborative effort between the New Media Consortium (NMC) and the eLearn Center of the Universitat Oberta de Catalunya to help inform Iberoamerican educational leaders about significant developments in technologies supporting teaching, learning, and research in tertiary education.

All of the research underpinning the report makes use of the NMC's Delphi-based process for bringing groups of experts to a consensus viewpoint, in this case around the impact of emerging technologies on teaching, learning, research, or information management in Iberoamerican tertiary education over the next five years. The same process underlies the well-known *NMC Horizon Report* series, which is the most visible product of an ongoing research effort, begun a decade ago, to systematically identify and describe emerging technologies likely to have a large impact on education around the globe.

The *Technology Outlook for Iberoamerican Tertiary Education 2012-2017* was produced to explore emerging technologies and forecast their potential impact expressly in an Iberoamerican context. The study ran from February through April 2012, based on the work of a group of 45 carefully selected experts. Discussion of emerging technologies focused on the consideration of relevant articles, news, blog posts, research reports, and project examples as part of the preparation that ultimately pinpointed the most notable emerging technology topics, trends and challenges for tertiary education in Iberoamerica over the next five years.

Convened in March 2012, the advisory board for the analysis comprises a body of professionals representing a wide range of approaches and perspectives in the tertiary education sector. The group began by considering a series of questions designed to foster discussion of the most significant trends and challenges that are set to emerge over the five-year horizon and to identify a broad spectrum of technologies with educational potential. The project has been conducted under an open data philosophy, and all the interim projects, secondary research, discussions and ranking instrumentation can be viewed at: ibero.wiki.nmc.org. The precise research methodology employed in producing the report is detailed in a special section at the end of this document.

The 12 "technologies to watch" presented in the body of this report uniquely reflect the state of tertiary education in Iberoamerica. As the table below illustrates, however, they also overlap in interesting ways with the globally focused *NMC Horizon Report > 2012 Higher Education Edition*. The advisory boards of these two projects — a group of 92 acknowledged experts — agree that mobile apps are likely to appear in mainstream use in educational settings in the coming year. For the first time, both boards also identified cloud computing as a technology set for imminent application, as well as agreeing that learning analytics and game-based learning would see mainstream adoption within two to three years, reflecting a worldwide consensus among experts regarding the utility of all three technologies.

The Iberoamerican experts also highlighted geolocation and personal learning environments as technologies ready for adoption in the next two or three years. Massively open online courses (MOOCs) are a new consideration this year. The choice would seem to fit logically with the advisory board's placement of open content in the mid-term horizon, as open content is a key supporting technology for MOOCs.

Short List topics across the IB Report and the NMC Horizon Report 2012

IB Tertiary Education 2012-2017	NMC Horizon Report 2012
Time-to-Adoption: One Year or Less	
Cloud computing Collaborative environments Mobile Apps Open Content	Cloud computing Mobile apps Social reading Tablet computing
Time-to-Adoption: Two to Three Years	
Augmented Reality Learning analytics Massively Open Online Courses Semantic Applications	Adaptive learning environments Augmented reality Game-based learning Learning analytics
Time-to-Adoption: Four to Five Years	
Game-based learning Geolocation Personal learning environments Tablet Computing	Digital identity Natural user interfaces Internet of Things Gesture-based computing

The chosen technologies, taken in a contemporary context, reflect the everyday reality of education in Iberoamerica. To guarantee adequate coverage of this perspective, the advisory board conducted an exhaustive review of articles, interviews, and new research studies to identify and classify those trends which have a particular bearing on teaching, learning, research, and information management across Iberoamerican tertiary education.

Top trends across the IB Report and the NMC Horizon Report 2012

IB Tertiary Education 2012-2017	NMC Horizon Report 2012
People expect to be able to work, learn, and study whenever and wherever they want.	People expect to be able to work, learn, and study whenever and wherever they want.
The abundance of resources and relationships made easily accessible via the Internet is increasingly challenging us to revisit our roles as educators in the processes of sense-making, coaching, and credentialing.	The technologies we use are increasingly cloud-based, and our notions of ICT support are decentralized.
Changes in university teaching have led many institutions to view the training of educators as a strategic element in assuring the quality of tuition.	The work environment is increasingly a collaborative space, making it necessary to introduce changes in the way students are prepared for professional life.

Only one of the trends identified in this analysis coincides with the outcome of the *NMC Horizon Report > 2012 Higher Education Edition*, with experts in both cases concluding that people expect to be able to work, learn, and study whenever and wherever they want. Student mobility has increased, leading to demands for more flexible integration of technology in personal, professional, and academic lives. Working and learning are often two sides of the same coin, and solutions are sought to make the transition between both more seamless.

The trends identified clearly reflect the current situation, innovation, and obstacles that characterize the Iberoamerican area as a whole. The advisory board particularly notes how the abundance of resources and relationships made easily accessible through the Internet is challenging us to revisit our roles as educators in the processes of sense-making, coaching, and credentialing. This challenge has a clear bearing on changes that have been seen by the majority of Iberoamerican universities to adopt teacher training as a strategic element in assuring the quality of education versus the tuition. This approach has taken root across the region, as most tertiary education institutions are embarking on new teacher training initiatives.

Top challenges across the IB Report and the NMC Horizon Report 2012

IB Tertiary Education 2012-2017	NMC Horizon Report 2012
Institutional structures must be changed in a move towards knowledge society models.	Economic pressures and new models of education are bringing unprecedented competition to the traditional models of tertiary education.
Academics must make efficient and appropriate use of technologies to facilitate learning and research.	Appropriate metrics of evaluation lag behind the emergence of new scholarly forms of authoring, publishing, and researching.
Digital media literacy is a key skill in every discipline and profession and must therefore be promoted across all educational programs.	Digital media literacy continues its rise in importance as a key skill in every discipline and profession.

Any study of the implementation of an emerging technology must give due consideration to the difficulties and challenges implicit in its application. As such, the advisory board based its analysis on a detailed examination of recent developments, reports, articles, and similar sources, in addition to leveraging the personal experience of each member, to identify the principal challenges faced by tertiary education institutions when adopting new technologies.

Of the challenges identified in the two reports, a consensus was reached over the fact that digital literacy continues its rise in importance as a key skill in every discipline and profession. The Iberoamerican advisory board also concluded that institutional structures must be changed to reflect knowledge society models**.** Many of the difficulties affecting the integration of ICTs stem from the organizational models currently employed by educational institutions. Universities continue to implement traditional educational models that impede the creation of new ICT-based learning and communication environments.

These insights and comparisons are intended to provide useful context for the body of the report

that follows. Twelve key technologies are profiled, each on a single page outlining the educational relevance and pointing to several examples of the technology being applied in practice, and ending with a short list of additional reading materials for those interested in learning more.

The sections of this report are intended as references and guides for educators, researchers, administrators, policymakers, and technologists. The underlying goal is to assist the decision-making process in selecting from the plethora of emerging technologies with the potential to improve, support, or extend teaching, learning, research, and information management.

Time-to-Adoption Horizon: One Year or Less

Cloud Computing

Cloud computing first appeared on the near-term horizon in the *NMC Horizon Report: 2009 Higher Education Edition*. Since then, its use for supporting collaboration, file storage, and access to software updates, and the number of available applications that rely on cloud technologies, have grown tremendously. Cloud computing has become the unifying factor between content and applications on the many devices people use in everyday life. This ability to access services and files from any location and on any device is driving the development of cloud computing applications in the consumer space. The broad implementation of cloud computing depends to a great extent on available bandwidth, both within organizations and at the national level. These difficulties are compounded by a certain degree of reluctance on the part of higher education institutions that view cloud computing as analogous to a loss of control over their services and content, which pass into the hands of third parties.

Relevance for Teaching, Learning, Research, or Information Management

- Access to data from a range of sources allows the creation of mashups, which enrich the learning process through the integrated presentation of content from different sources and in different formats.
- The adoption of cloud-based platforms and services provides a more flexible means of adjusting an institution's infrastructure and technology portfolio to the needs of the moment.
- Online access to documents and applications facilitates greater flexibility, enabling students and teachers to create and edit their own materials and to consult and review information wherever and whenever they need it.

Cloud Computing in Practice

- The project "La Sabana Vive en la Web" defines a new management model that allows users to communicate, construct, and share knowledge via the web: http://www.unisabana.edu.co/enlaces-rapidos/sabana-web/secciones/inicio/
- The Teaching Centres System of the Cuban Ministry of Higher Education has incorporated cloud computing services into the management of its Editorial Universitaria portal and the EcuRed Digital Library 2.0: http://cinfo.idict.cu/index.php/cinfo/rt/metadata/352/0
- The Universidad Miguel Hernández (Spain) integrates Google Apps into its range of services for the university community: https://sites.google.com/a/goumh.umh.es/goumh-going-google/home/moving-to-google-apps

Further Reading

Computação em Nuvem: Conceitos, Tecnologias, Aplicações e Desafios *(Cloud Computing: Concepts, Technologies, Applications and Challenges)*
http://www.es.ufc.br/~flavio/files/Computacao_Nuvem.pdf

(Sousa, F.R.C.; Moreira, L. O.; Machado, J.C.: *ERCEMAPI'09*, chap. 7, 2009.) This article presents the key concepts of cloud computing and a diverse selection of cloud-based platforms and technology solutions.

What is Cloud Computing?
http://www.acis.org.co/fileadmin/Revista_112/tres.pdf

(Rueda, F.: *Revista Sistemas*, 2011.) This article outlines the basic concepts of cloud computing.

Time-to-Adoption Horizon: One Year or Less

Collaborative Environments

Collaborative environments are online, often cloud-based spaces where the focus is on making it easy to collaborate and work in groups, no matter where the participants may be. The key attribute of all technologies that fall into this category is to make it more seamless for people to share interests and ideas, work on collaborative projects, and monitor collective action. Such tasks are implicit in academic study, research, collaborative teaching, writing and editing, the development of educational proposals and many more areas. From a technical perspective, there are only minor obstacles to the widespread adoption of collaborative environments, since the software that supports collaborative work is typically inexpensive or free and can be accessed via a standard web browser. As such, the major challenges to their broader implementation are the lack of a consolidated culture of collaboration in the education sector and the need to change the general mindset with regard to what the learning process is.

Relevance for Teaching, Learning, Research, or Information Management

- Collaborative environments form part of a wider trend that sees us moving increasingly towards interdisciplinary, problem-focused models of collective knowledge construction.
- Educating students in teamwork, community participation, and the collective production of knowledge is a necessary task in preparing them to live and work in today's society.
- This general shift gives educators the chance to involve themselves in collaborative activities and research projects with colleagues across the globe.

Collaborative Environments in Practice

- The e-learning platform at the Universidad Técnica Particular de Loja (Ecuador) facilitates the analysis of social network-mediated collaborative learning: http://bit.ly/Kd83QP
- The Education Research Centre at the Universidade do Minho (Portugal) carried out a project to explore the potential applications of Google Docs to the teaching and learning of mathematics in vocational training courses: http://hdl.handle.net/1822/11723
- The Sinapsis Universidad project aims to create an ecosystem that fosters links between academia, business and research: https://sites.google.com/site/sinapsisuniversidad/

Further Reading

La Enseñanza Superior y las Promesas y los Peligros de las Redes Sociales *(HIgher education and the Promises and Dangers of Social networks)*

http://bit.ly/LkvOss

(Siemens, G.; Weller M.: *Universities and Knowledge Society Journal* (RUSC), 2011.) This is an introduction to the impact of social networks on teaching and learning, which presents a range of opinions on the potential uses of social networks in education.

Herramientas Colaborativas para la Enseñanza Usando Tecnologías web: Weblogs, Redes Sociales, Wikis, Web 2.0 *(Collaborative Tools for Teaching Using Web tools: Web Blogs, Social Networks, Wikis, Web 2.0)*

http://www.fernandosantamaria.com/descargas/herramientas_colaborativas2.pdf

(Santamaría, F., *fernandosantamaría.com*, 2005.) A review of the main web 2.0 collaboration tools, including appraisal of their potential for teaching and learning.

Time-to-Adoption Horizon: One Year or Less

Mobile Apps

There is a revolution taking place in software development that parallels changes in recent years in the music, publishing, and retail industries. Smartphones including the iPhone and Android platform have redefined what we mean by mobile computing, and in the past three years the small, often simple, low-cost software extensions to these devices — commonly known as apps — have become a hotbed of development. A popular app can see millions of downloads in a short time, and that potential market has spawned a flood of creativity that is instantly apparent in the extensive collections available in app stores, themselves a new way of delivering software that reduces distribution and marketing costs significantly. Mobile apps have become increasingly popular with the education sector, reflected in the advisory board's view that this technology can be situated in an imminent adoption horizon. This optimistic assessment, nonetheless, runs up against the lack of pedagogic strategies adapted to the unique ergonomics and functionalities of such devices, which poses a significant challenge to the widespread implementation of mobile apps in the educational sphere.

Relevance for Teaching, Learning, Research, or Information Management

- The development of mobile learning has led to the emergence of new models and methods for presenting learning content.
- On-demand access to information from any location makes for a flexible, personalized learning experience in which context becomes an important factor.
- The rapid adoption of smartphones has created a scenario in which both educators and students can harness their own devices as teaching and learning tools.
- Smartphones facilitate new teacher-learner dynamics and promote the development of collaborative practices.

Mobile Apps in Practice

- The Tecnológico de Monterrey (Mexico) has developed a science teaching app for iPhone, iPod Touch and iPad: http://bit.ly/K447Fn
- The Universidad Alfonso X el Sabio (Spain) has launched an app that delivers mobile access to its virtual campus: http://www.myuax.com/
- The Universidade de Coimbra (Portugal) offers its students a mobile app for accessing up-to-the-minute information on courses and university services: http://www.uc.pt/mobile/

Further Reading

MobilEduc: Um Modelo para o Processo Ensino Aprendizagem em Dispositivos Móveis (MobilEduc: a Model for the Teaching-Learning Process on Mobile Devices)
http://www.santoangelo.uri.br/stin/Stin/trabalhos/02.pdf

(Gleidson J. M.; Ellwanger, C.; Schneider, W; Zancan, G.: *III Simpósio de Computação Aplicada*, 2011.) This article presents an educational model for mobile-device-supported learning.

Monograph on M-learning in Spain, Portugal and Latin America
http://scopeo.usal.es/sites/all/files/scopeom003.pdf

(*SCOPEO*, 2011.) This document addresses the evolution of e-learning towards mobility-focused learning contexts.

Time-to-Adoption Horizon: One Year or Less

Open Content

The movement toward open content reflects a growing change in the way academics in many parts of the world are subscribing to the view that education should prioritize the learning process itself over the information conveyed. The adoption of open content is in fact a cultural, not technological, change. Open content embraces not only the sharing of information but also the sharing of pedagogical practices and experiences. Part of its appeal stems from the fact that open content also constitutes a response to both the rising costs of traditionally published resources and the lack of educational resources in some regions. There are two principal approaches to open content: on the one hand are those institutions that grant shared access to their materials; on the other are institutions looking to use open content facilitated by others. Each of these approaches presents their own specific set of challenges.

Relevance for Teaching, Learning, Research, or Information Management

- Free access to educational practices enables improvements to learning proposals and designs and leads to greater innovation in the development of pedagogic strategies.
- Open availability of learning content promises an exponential increase in the volume of information and knowledge to which students have access, in multiple formats.
- Open content promotes the sharing and collaborative creation of educational materials and provides teachers with a faster means of personalizing their courses.

Open Content in Practice

- The CONDIGITAL PUC-Rio initiative supports the production of multimedia educational content and the development of innovative Portuguese-language teaching methodologies and practices in the area of science and technology: http://condigital.ccead.puc-rio.br/condigital/
- The OportUnidad project explores the adoption of open educational practices in Latin American through support for the development of strategic institutional initiatives built on the principles of openness and reusability of educational content: http://www.oportunidadproject.eu/
- Over the past few years, the Universidad Nacional Autónoma de México has put considerable effort into the development of open access portals as part of an institution-wide strategic plan: http://www.cuaed.unam.mx/portal/index.php

Further Reading

Guidelines for OER in Higher Education
http://oerworkshop.weebly.com/guidelines-for-oer-in-higher-education.html

(Commonwealth of Learning, Unesco, 2010.) A UNESCO initiative that seeks to establish guidelines for the evaluation of open educational resources.

Recursos Educativos Abiertos en Ambientes Enriquecidos con Tecnología. Innovación en la práctica educativa *(Open Educational Resources in Technology-Enriched Environments. Innovation in the Educational Practice)*
http://bit.ly/K9Bqs1

(Ramírez, M. S.; Burgos, V.: *Tecnológico de Monterrey*, 2012.) This book examines research and innovation in the area of open educational resources.

Time-to-Adoption Horizon: Two to Three Years

Game-Based Learning

Game-based learning refers to the integration of games or game-based learning strategies into educational experiences. This topic has gained considerable traction over the past decade as games have proved to be effective learning tools, and beneficial in cognitive development and the fostering of soft skills among students. Most games that are currently used for learning across a wide range of disciplines share similar qualities: they are goal-oriented, have strong social components, and simulate some sort of real world experience that students find relevant to their lives. As game-based learning garners more attention in academia, developers are responding with games expressly designed to support immersive, experiential learning.

Relevance for Teaching, Learning, Research, or Information Management

- By minimizing the scope for fear of error, games foster the development of general skills through analysis, strategic thought, problem-solving and collaboration.
- Games provide highly immersive and interactive environments in which students feel motivated to experiment and learn.
- Game-based strategies can be implemented in a variety of educational and training environments to stimulate contextual user-oriented learning.

Game-Based Learning in Practice

- Creation of an educational video game for algorithm learning is being offered to students enrolled on the Programa Nacional de Formación en Sistemas e Informática (the Venezuelan national higher education program in computing and systems): http://bit.ly/L7VSnR
- The "E-Plant" simulator at the Universidad de Navarra in Spain is a serious game that gives students the chance to apply the theoretical concepts presented in class: http://www.ikasplay.com/web/wordpress/?p=307
- GREAT is an international initiative that seeks to transfer innovative methodologies in learning and training through game-based learning. Project partners include the Associação Portuguesa dos Gestores e Técnicos dos Recursos Humanos: http://www.projectgreat.eu/

Further Reading

Certezas e Interrogantes Acerca del Uso de los Videojuegos Para el Aprendizaje *(Certainties and Questions about the use of Video Games for Learning)*
http://bit.ly/jV3uVI

(Gros, B.: *Comunicación*, n.º 7, vol.1, 2009.) This article conveys the potential application of video games in education.

Game-Based Learning: What it is, Why it Works, and Where it's Going
http://bit.ly/ctJQnx

(Trybus, J., *NMI White Papers*, consulted June 2012.) This document outlines the advantages of game-based learning over traditional learning methodologies.

Time-to-Adoption Horizon: Two to Three Years

Geolocation

Every location on the earth's surface can be expressed with just two coordinates that can easily be read by mobile devices to determine where we are. We can record our coordinates when we take photographs, chat with friends, or post updates to social networking websites. The transparency of this group of technologies, which are increasingly embedded in all sorts of devices and technologies, is making them very much an essential part of our lives. The ease with which coordinates can be accessed has opened up a wide range of possibilities for working with geolocative data: it can be plotted on maps; combined with data about other events, objects, or people; graphed; charted; or manipulated in myriad ways. Indeed, such data are leading to entirely new forms of mapping. As the use of smartphones in learning rises and network costs fall, we may well see increased application of geolocation technologies in educational contexts.

Relevance for Teaching, Learning, Research, or Information Management

- Geolocalized information enables learners to establish and visualize correlations between different types of data, making it easier to identify patterns.
- The use of geolocation in m-learning projects promotes regionally relevant education and adds experiential value to the study of specific content or the development of concrete skills.
- This data also allow users to find people with similar interests in their local area and interact via geosocial networking services.

Geolocation in Practice

- EDULOC is a location-based learning environment that integrates GPS-enabled handsets into projects with a regional focus: http://fundacioitinerarium.org/eduloc/?lang=es
- The Learning While Moving project aims to create a geolocalized mobile learning environment: http://www.leandro.wives.nom.br/pt-br/Projetos/andamento/LWM.htm
- M-Learning en Ciencia is a project currently underway at the Universidad Nacional Autónoma de México (Mexico) piloting a high-mobility geolocalized learning environment for physics students: http://www.utpl.edu.ec/ried/images/pdfs/vol13N-1/mlearning_pisanty.pdf

Further Reading

Geolocalización en Aplicaciones Móviles (Geolocation in Mobile Apps)
http://pixelscode.com/mayo-2011/#/16/

(Cantero, N.: *Pixels&Code*, 2011.) General-interest article on the use of geolocation technologies in mobile apps, providing examples of specific proposals.

Mapas, Herramientas de Geointeracciones (Maps, Geointeraction Tools)
http://bit.ly/SDOIRh

(*Nicaragua educa*, 2010.) General presentation of the different educational applications of web mapping tools.

Time-to-Adoption Horizon: Two to Three Years

Personal Learning Environments

Personal learning environments (PLEs) support self-directed and group-based learning, designed around each user's goals, providing a significant capacity for flexibility and customization. The conceptual basis for PLEs has shifted considerably in the last year, as smartphones, tablets and apps have begun to emerge as compelling alternatives to browser-based PLEs and e-portfolios. This has been accompanied by a corresponding move away from centralized, server-based solutions to distributed and portable options. While the concept of PLEs is still fairly fluid, it is clear that a PLE is not simply a technology but an approach or process that is individualized by design, and thus different from person to person. As such, the principal challenges for the adoption of this technology are both technical and pedagogical.

Relevance for Teaching, Learning, Research, or Information Management

- PLEs evolve the traditional tasks of educators, placing greater focus on their role as mentors and experts who enrich the learning environment by facilitating access to broader sources and key connections between different content.
- PLEs offer a solution to the growing dispersion of knowledge, enabling students with different interests and preferred learning styles to take greater control over the knowledge they aggregate.
- Students become the central focus of the learning process and play a more active role in shaping their education.

Personal Learning Environments in Practice

- The DIPRO 2.0 project aims to train university teaching staff in the use of ICT-based environments to access learning materials and identify general guidelines and criteria for the evaluation of learning activities: http://tecnologiaedu.us.es/portal/
- The Universidade de Aveiro (Portugal) has launched Sapo Campus, an integrated Web 2.0 services platform designed to foster greater communication, idea exchange, and cooperation in content production and sharing: http://campus.ua.sapo.pt/
- The Universidad de la Sabana (Colombia) has conducted a case study on the use of an open web-based PLE as the platform for a postgraduate program: http://xurl.es/36m0e

Further Reading

Personal Learning Environments in Professional Development for Teachers
http://www.anep.edu.uy/anepdatosportal/0000044748.pdf

(Leal Fonseca, D.E. en *El modelo CEIBAL. Nuevas tendencias para el aprendizaje: Plan Ceibal, ANEP, 2011*.) This is a definition and analysis of the concept of PLE, including a study of its potential role in teacher training. Specific applied examples are also presented.

Los PLE en el Marco Europeo de Competencias Digitales *(PLEs in the European Framework for Digital Literacy)*
http://e-aprendizaje.es/2012/03/05/los-ple-en-el-marco-europeo-de-competencias-digitales/

(Álvarez, D. *[e-aprendizaje],* March 2012) Blog post reviewing different approaches to the integration of personal learning environments into skills-based learning.

Time-to-Adoption Horizon: Two to Three Years

Tablet Computing

Tablets (a form that is distinct from tablet PCs) have come to be viewed not just as a new category of mobile device but as a new technology in their own right: one that blends features of laptops, smartphones and earlier tablet computers with "always-on" Internet, and hundreds of apps with which to personalize the experience. As these new devices have become more widely used and understood, it has been acknowledged that they are independent and distinct from other mobile devices such as smart phones, eReaders, or tablet PCs. With significantly larger screens and richer gestured-based interfaces than their smartphone predecessors, they are ideal tools for sharing content, videos, images and presentations because they are easy for anyone to use, visually compelling, and highly portable.

Relevance for Teaching, Learning, Research, or Information Management

- Access to diverse formats coupled with the potential for teachers and students to create their own online multimedia content are important aspects of the cross-disciplinary learning required in the development of core digital skills.
- The connectivity, multifunctionality, and portability of tablets places them in a unique position between computers and other mobile devices, making them suitable as working tools by a significant number of users.
- Tablets are a highly useful medium for promoting off-campus learning outside of class hours.

Tablet Computing in Practice

- The Escuela de Organización Industrial (Spain) is developing an m-learning strategy that has included a series of tests with tablet devices: http://www.eoi.es/blogs/mlearning/m-learning-eoi/
- The Postgraduate School of the Universidad Peruana de Ciencias Aplicadas (Peru) uses tablet-based content management to facilitate wider access to teaching materials: http://bit.ly/LHK6l7
- The Universidad Bernardo O'Higgins in Chile has launched its tablet-based "UBO Pad" software, to support the academic work of its teaching staff: bit.ly/V8msU9

Further Reading

Mobile Learning infoKit
https://mobilelearninginfokit.pbworks.com/w/page/41122430/Home
(*JISCC InfoNet*, 2011.) This is a practical guide for education institutions, offering advice on how to plan the implementation of a mobile learning initiative.

Tablets en Educación. Oportunidades y Desafíos en Políticas Uno a Uno *(Tablets in Education. Opportunites and Challenges in One-to-One policies)*
http://www.oei.es/70cd/Tabletseneducacion.pdf
(Marés, L.: *Relpe*, April 2012.) An experience-based study notes the potential educational use of tablets and the limits of their applicability.

Time-to-Adoption Horizon: Four to FIve Years

Augmented Reality

Augmented reality (AR) systems generate images by blending real-time virtual data with what we see in the real world. Emerging augmented reality tools to date have been mainly designed for marketing, consumer and leisure applications, but new tools continue to appear as the technology for creating applications becomes less complex. One of the key features of augmented reality is the capacity to respond to a user's actions. This interactive potential is particularly suitable for learning and assessment, as students are able to construct a new type of understanding through interactions with virtual objects. Dynamic processes, large volumes of data and objects that are too large or too small to be easily manipulated can be integrated into a personal learning space on a scale at which they are easier to work with and understand. The major challenges for the broad adoption of AR in education are the need for extensive training and the importance of developing methodologies that clearly illustrate the potential of this technology for teaching and learning.

Relevance for Teaching, Learning, Research, or Information Management

- AR can provide contextual, discovery-based learning experiences outside the traditional classroom environment.
- In disciplines requiring a greater degree of practical training, AR allows students to visualize a particular process and observe details that would likely go unnoticed if viewed in a conventional learning environment.
- Mobile AR applications combined with collaborative software promote social construction of meaning and real-world interaction.

Augmented Reality in Practice

- EspiRA is a project that combines geolocation and augmented reality, enabling users to georeference locations on a map from the Layar AR browser on a mobile device: http://bit.ly/KtxX7A
- The International Program of the Faculty of Architecture and Design at the Pontificia Universidad Javeriana in Colombia oversaw an augmented reality project for viewing 3D models: http://www.youtube.com/watch?v=Eb1GApM0IK0
- The Universidad Tecnológica de Morelia in Mexico developed an augmented reality-based immersive learning experience for intelligent learning environments: http://bit.ly/Kty5Uy

Further Reading

Realidad Aumentada y Educación. Tecnologías Emergentes y Sus Posibilidades de Aplicación (Augmented Reality and Education. Emerging Technologies and Potencial Applications)

http://www.anep.edu.uy/anepdatosportal/0000044748.pdf

(Bongiovanni, P.: in *El modelo CEIBAL. Nuevas tendencias para el aprendizaje*, *CEIBAL-ANEP*, 2011.) An overview of emerging technologies is presented in the area of augmented reality and their potential application in education.

Realidad Aumentada: Una Nueva Dimensión Para la Formación (Augmented Reality: a New Dimension for Education)

http://bit.ly/xICleo

(Donadío, C.: *America Learning & Media*, 2011.) This article looks at different technological and educational perspectives on the application of augmented reality to the learning process.

Time-to-Adoption Horizon: Four to FIve Years

Learning Analytics

Learning analytics refers to the interpretation of a wide range of data produced by and gathered on behalf of students in order to assess academic progress, predict future performance, and spot potential issues. The goal of gathering, recording, analysing and presenting this data is to enable teachers to efficiently tailor educational opportunities to each student's level of need and ability in close-to-real time. Still in its early stages, learning analytics responds to calls for greater monitoring and accountability on campuses as a means of informing strategic decisions. It is also an effective way to harness the vast amount of data produced by students in academic activities.

Relevance for Teaching, Learning, Research, or Information Management

- Compiling records of learning activity allows teachers to take some of the focus off content and materials and turn their attention to the design and analysis of formative processes.
- The information collected by learning analytics can be used to personalize teaching strategies and build learning environments that more directly reflect the needs and interests of students and the preferred modes of teacher-learner interaction.
- Statistical records of teaching and learning activities shed light on problem areas in the education process and contribute to continual improvement.

Learning Analytics in Practice

- First-cycle students in Information Systems and Computing Engineering at the Universidad Técnica Particular de Loja in Ecuador took part in an online course that generated learning metrics for identifying patterns of interaction: http://reposital.cuaed.unam.mx:8080/jspui/bitstream/123456789/2702/1/priscila_valdiviezo_tecnicas_de_aprendizaje.pdf
- The Universidad Autónoma de Coahuila in Mexico used data mining techniques to analyze the learning patterns of computer science students: http://bit.ly/JIE169
- The Universidad Carlos III de Madrid in Spain used the outcomes of Moodle activity reports to establish new indicators for teaching assessment: http://bit.ly/ycH3cC

Further Reading

Cinco de los Mejores Software de Minería de Datos de Código Libre y Abierto (Five of the Best Open-Source Data Mining Softwares)
http://bit.ly/mP1wdC

(*El rincón de JMACOE*, April 2012.) A Blog entry looks at five examples of open-source data mining software.

Minería de Datos Para un Aprendizaje (Social) Más efectivo *(Data Mining for More Effective (Social) Learning*
http://www.dreig.eu/caparazon/2011/08/07/aprendizaje-aumentado/

(Reig, D.: *El Caparazón*, August 2011.) This article examines the potential of data mining as a future trend in education.

Time-to-Adoption Horizon: Four to FIve Years

Massively Open Online Courses

The term "massively open online courses" (MOOCs) refers to web courses that people can take from anywhere across the world, with potentially thousands of participants. The basis of each MOOC is an expansive and diverse set of content, contributed by a variety of experts, educators and instructors in a specific field and aggregated into a repository. A key component of the original vision is that all course materials and the course itself are open source and free, with the door left open for a fee if a participant taking the course wishes university credit to be transcripted for the work. The structure of MOOCs was initially designed along minimalist lines to allow participants to design their own learning path, but new models are now beginning to emerge. The fundamental goal is that participants can control how, where, and when they learn. MOOCs break instructional schemes and require a change on either side of the learning process, both in the design of programs by educators and in the learning aspirations of students.

Relevance for Teaching, Learning, Research, or Information Management

- MOOCs broaden access to quality learning opportunities for those who do not wish to be affiliated to a particular institution.
- MOOCs take a step beyond traditional open content models, freeing up not only the learning materials, but also the interactive processes through which they are consumed, which thus become the focal point of the learning process.
- The potential of MOOCs stems from their use of the Internet as a basic structure, aligned with an open conception of learning.

Massively Open Online Courses in Practice

- During 2010, universities in Colombia offered massively open online courses on a range of e-learning issues: http://bit.ly/NQSbJE
- The Fundación Centro Superior para la Enseñanza Virtual (Spain) is behind the creation of an Iberoamerican Community of Massively Open Online Courses that will offer MOOCs in Spanish through an agreement with MIT: http://www.csev.org/blog;jsessionid=B234868463E2FC426BE10EFA1075745A
- The Universidad Simón Bolívar (Venezuela) runs a massively open online course on the application of different research techniques for studying the social impact of the Internet: http://www.facebook.com/groups/impactosocialdeinternet

Further Reading

MOOC: el Modelo de Los Cursos Masivos Abiertos *(MOOC: the Model of Massively Open Courses)*

http://sinergianet.org/moocs-el-modelo-de-los-cursos-masivos-abiertos/

(Fossatti, M.: *SINERGIANET-INLATINA*, May 2012.) This article defines the principal characteristics of MOOCs.

Los MOOC: Un Entorno Posibilista para la Educación de un Futuro Presente *(MOOCs: a Possibilistic Environment for Education in the Near Future)*

http://internetng.dit.upm.es/los-mooc-un-entorno-posibilista-para-la-educacion-de-un-futuro-presente/

(Fumero, A.: *Teléfonica*, March 2012.) This blog from the Cátedra Telefónica offers a critical reflection on the potential role of MOOCs in tertiary education.

Time-to-Adoption Horizon: Four to FIve Years

Semantic Applications

Semantic-aware applications infer the meaning, or semantics, of information on the Internet to make connections and provide answers that would otherwise entail a great deal of time and effort. New applications use the context, as well as the content, of information to determine relationships between bits of data; examples like TripIt, SemaPlorer, and Xobni organize information about travel plans, places or email contacts and display it in convenient formats based on semantic connections. In simple terms, semantic applications harness user-generated actions and relationships to display the value of collective intelligence. Semantic searching is being applied for scientific inquiries, where it enables researchers to pinpoint relevant information. To optimize the benefits of semantic applications, the teaching and research communities must focus on creating and adopting specific ontologies to match search terms with relevant results.

Relevance for Teaching, Learning, Research, or Information Management

- Semantic applications aid research by enabling users to locate, share, and aggregate information available on the Internet.
- They also contribute to sense-making by simplifying information retrieval and management at a time when the volume of e-content available to users continues to grow exponentially.
- Used in combination with other technologies, such as personal learning environments, semantic applications have the potential to become powerful tools for personalized learning.

Semantic Applications in Practice

- The BABIECA project comprises a range of semantic web applications aimed at creating a collaborative environment fed by user opinions: http://www.aisti.eu/risti/RISTI%20N5.pdf
- The Gnoss Universidad 2.0 university-oriented social network seeks to enrich student learning through the integration of semantic applications and web 2.0 tools: http://www.gnoss.com/universidad20
- Meaningtool is a semantic engine, available in Spanish, that categorizes content and generates tag clouds consistent with users' specific categorization needs: http://www.meaningtool.com/

Further Reading

Inteligencia Competitiva y Web 3.0: Aprendizaje de Estrategias y Destrezas Informacionales en la Enseñanza Superior *(Competitive intelligence and Web 3.0: Informational Strategies and Skills Learning in Higher Education)*

http://campus.usal.es/~comunicacion3punto0/comunicaciones/040.pdf

(Alemany, D., *II Congreso Internacional comunicación 3.0*, 2010.) A methodological proposal integrates elements such as competitive intelligence and collaborative work with Web 3.0 to provide a range of novel information retrieval options.

La Web Semántica y Sus Posibles Aplicaciones en las Universidades *(The Semantic Web and its Possible Applications in Universities)*

http://acimed.sld.cu/index.php/acimed/article/view/41/20

(Uribe, A.: *Acimed*, 2010.) This is a classification of semantic applications according to their suitability for the different user profiles within a university community.

Top Ten Trends

The technologies featured in the *Technology Outlook for Iberoamerican Tertiary Education 2012-2017* are embedded within a contemporary context that reflects the realities of the time in the sphere of tertiary education. To assure this perspective, each advisory board researches, identifies, and ranks key trends that are currently affecting the practice of teaching, learning, research, and information management. These trends emerge through an extensive review of topical articles, interviews, documents and the most recent research, as well as in peer experience exchanges. Once identified, the list of trends is ranked according to how significant an impact each one is likely to have on education across Iberoamerica in the next five years. The following trends have been identified as key drivers of technology adoptions in Iberoamerica for the period of 2012 through 2017; they are listed here in the order each was ranked by the advisory board.

1) People increasingly expect to be able to work, learn, and study whenever and wherever they want. This trend clearly identifies the direction education must take to adapt to the pace and dynamics of modern life. One the one hand, everyday constraints make it vital to establish a balance between the demands of work, learning and family, generating considerable organizational and time management problems for students. On the other, the world of work requires an increasingly high degree of professional competence, meaning more advanced skills are needed to meet current demands. A learning approach that can be implemented on-demand, from any location and across multiple disciplines, as well as being easy to access and facilitating authoritative knowledge, is not merely desirable but now widely demanded by society in general. The power of the Internet as a gateway to information is allied with the potential of social networking sites, which serve as channels for collaborative interaction through which to better interpret and utilize the wealth of knowledge available. The implications for formal learning are profound, as are the notions of "just-in-time" learning, and "discovered" learning; both provide a means of optimizing the impact of the learning process, guaranteeing personal suitability and greater efficiency.

2) The abundance of resources and relationships made easily accessible via the Internet is increasingly challenging us to revisit our roles as educators in the processes of sense-making, coaching, and credentialing. Tertiary education institutions must consider the unique value that each person adds to a world in which information is everywhere. In such a world, sense-making and the ability to assess the credibility of information are paramount. While mentoring and preparing students for the world in which they will live remain central to the role of teachers, the integration of social technologies into educational contexts encourages greater participation of the students themselves. By assuming a more active role, students have the chance to select available resources according to their own preferences and needs, as well as contributing to the aggregation of new content and to knowledge creation in general. The changing configuration of the learning process entails new forms of certification, requiring universities to rethink their evaluation structures and their role in educational credentialing.

3) Changes in university teaching have led many institutions to view the training of educators as a strategic element in assuring the quality of tuition. Developments in the area of teaching and learning theories, continual advances in the design of flexible educational technologies, and the growing digital literacy of students are factors behind the rising demand for innovation in teaching. In response, universities are strengthening training programs for teaching staff to endow them with the necessary tools and expertise to face the growing complexity of the education sector. In some cases, this entails approaches that emphasize synergies between research, teaching and innovation, exploring alternative channels to the more conventional modes of teacher training, which are restricted to periodic courses and activities on specific

technologies or techniques. Thus, traditional expertise-building approaches such as discipline-specific research are complemented by new models oriented towards documenting the teaching and learning processes associated with reflective practice and the generation of improvements through the results of teaching experience.

4) The role of technology in the social and civic empowerment of young people must be programmed into the education system. Across the world, people in all sectors of society, in particular young people, are gaining a stronger voice in protests against the crisis in our political systems. This global mobilization has, to a great extent, been made possible by net-generation information and communication technologies. Increased social awareness and the broad desire for participation are finding their way into the education system through demands for improvements to the quality and types of training offered. The impact is also appreciable in the learning process itself, thanks to web-based and mobile technologies that promote collaboration, commitment and active involvement. New learning models are emerging in which classrooms open up to the web and learner groups are established along the lines of line with both formal, structured models and voluntary, motivation-based configurations.

5) We are seeing the rise of a general educational culture in which learning is fundamentally student-oriented and technology-based. This emerging culture empowers students to approach the learning process with a certain degree of autonomy, as well as greater responsibility. It changes the perceived role of the teacher and introduces a technology infrastructure that promotes participation and collaborative work across learning networks and practice communities. Students have a clear idea of what, how and with whom they wish to learn. Under this perspective, learners assume an active role in retrieving, analyzing, assimilating, generating and sharing knowledge.

6) Education administrators are increasingly willing to consider new ways of creating face-to-face/online hybrid learning models. Most universities are embracing blended learning strategies, which were created as a solution for older students with professional and family commitments, and for students living far from major towns and cities. In turn, we are seeing a rise in the number of "conventional" students opting for hybrid approaches and who consider online learning a viable mode of study. Education administrators are looking into ways to promote technology integration as a means of updating and extending the face-to-face model and as a solution to increasing class sizes.

7) The technologies we use are increasingly cloud-based, and our notions of IT support are decentralized. The acceptance and growing implementation of applications and services based on cloud structures is not only changing the way in which we set up and use software and data storage, but also how we conceptualize these functions. It does not matter where we store our work, but that our information is accessible, irrespective of where we are or the device we have chosen to use. We are growing increasingly accustomed to a browser-based software model that is not tied to a specific device. Although some challenges remain, particularly in the areas of confidentiality and control of information, the promise of considerable cost savings is a driving factor in the search for solutions of this type.

8) Students are increasingly keen to use their own devices for learning. As software and applications become more sophisticated, allowing for greater user customization, so too do devices supporting mobility, multiple formats and improved connectivity. Students are comfortable giving a presentation or carrying out a research assignment if the tools they use are more familiar to them and more productive. Mobile technology has become more and more affordable and widely adopted, to the extent that mobile devices now form part of our everyday lives. In the present reality, students' own devices are likely to be more advanced than those offered by educational institutions.

9) The growth in broadband availability is radically changing user behavior in teaching, learning and research. The advent of cloud computing has reduced local storage requirements for software, email services and other applications. Major resources are now only a browser click away and do not lead to system slowdown. Mobile devices like smartphones and tablets provide advanced accessibility and interaction options from any location, facilitating easier contact and interaction between students and teachers, faster transfer of files and information, and more straightforward creation and storage of content.

10) A new teaching paradigm referred to as the "flipped classroom" is gaining popularity in both secondary and tertiary education. This model, as the name suggests, represents an inversion of the traditional system in which study outside the classroom consists in reviewing material presented in class and face-to-face learning comprises the completion of tasks or analysis of problems together with fellow students. In the "flipped" approach, class time is freed up for clarifying complex areas of the course content or helping students to solve specific problems with tasks, exercises, or projects. The use of applications and content designed to function across multiple devices, platforms and operating systems, and the increased availability of open multimedia educational resources, are contributing to the wider adoption of the "flipped classroom" paradigm.

Top Ten Challenges

Along with the key current trends, the advisory board notes important technological challenges faced by the tertiary sector, especially those that are likely to continue to affect education over the next five years. These are drawn from a careful analysis of current events, papers, articles and similar sources, as well as from the personal experience of the advisory board members in their roles as leaders in education and technology. In making its selection, the advisory board considered the diversity of the Iberoamerican countries and ranked challenges in terms of their potential impact on teaching, learning, research, and information management.

1) Institutional structures must be changed to reflect the new models of the knowledge society. Many of the difficulties in integrating ICTs are related to current organizational models. Universities continue to implement traditional models that impede the creation of new ICT-based learning and communication environments. We must evolve our rigid, excessively bureaucratic structures and slow decision-making to develop a more streamlined and flexible model. New mechanisms are required to successfully combine leadership, participation, strategies and processes with shared values, flexible academic offerings and collaborative work, supported by intelligent use of technologies. A far-reaching transformation must be brought about, giving people greater space to learn and contribute value to the world they live in.

2) Technology must be efficiently and effectively integrated into teaching and research. Many researchers have not received training in the use of basic e-teaching techniques or are infrequent participants in professional development opportunities. This problem has a number of causes, including time constraints, lack of incentives, and shortcomings in the infrastructure needed to support this type of training. Research programs rarely encompass processes for professional development in this area, leading many to believe that a cultural change is needed if we are to witness the widespread adoption of more innovative organizational technologies. Others suggest that, as such tools develop, focus must be placed not on the technology itself but on the teaching strategies through which it can be leveraged.

3) Efforts to promote digital literacy are key to the development of the discipline and the profession. This challenge, which is directly related to the previous one, appears near the top of the list because despite widespread agreement on the importance of digital media literacy, training in the supporting skills and techniques is still very rare in teacher education. The lack of carefully structured formal training is being offset through professional development or informal learning, but we are far from seeing digital literacy as a norm. The challenge is to replace instrumental thinking focused on skills and specific tools with the notion of digital literacy as a knowledge-based, cultural phenomenon.

4) Flexible access to carefully planned open learning opportunities. Universities must be able to provide a satisfactory response to students at any time and from any location. Emphasis must shift from the planning of face-to-face sessions to the design of a broader learning experience. This represents a qualitative leap that revises the roles of teacher and learner, makes greater use of web resources, and reconciles physical, virtual, stationary and mobile spaces**.**

5) Technology and practices must reflect the demand for personalized and personalizable education. The demand for education that is customized to each student's unique needs is increasing. It has become clear that one-size-fits-all teaching methods are neither effective nor acceptable for today's diverse student population. Systems are being developed that support individual student choices about access to materials and content and to desired learning

pathways. We must continue to research and develop methodologies that support the development of technologies for customizing educational paths and content.

6) Mechanisms that promote ICT-driven teaching innovation must be identified. Progress must be made in the design of development plans that facilitate the dissemination and recognition of research results, teaching innovation activities, reflective practice and the creation of ICT-supported learning environments. The commitment of institutions and accreditation agencies is fundamental if we are to establish mechanisms for incentivizing and rewarding faculty-led actions to improve teaching.

7) Research is needed in the field of tertiary education. If teaching quality is to improve, the profession must be treated as a specialized area of research and experimentation, following the approach adopted in other disciplines. This should ensure that the outcomes of innovation initiatives built around the use of ICTs are reflected in course designs and find their way into the classroom. The exchange of duly documented good practices benefits both the individual teacher and the education community as a whole. One solution is to promote collaborative research across networks, in which the results of peers are examined and developed to progressively construct a rigorous body of knowledge on teaching, learning and the crucial role of technology in tertiary education**.**

8) Innovation must be assessed on the basis that technology is now a central component of the educational model. It is increasingly difficult to link specific tasks to specific tools. As such, discussion of technology in education inevitably centres on functional "concepts" rather than tools; for example, we commonly refer to personal learning environments, open education, virtual learning communities, etc. The overarching concept in innovation is not the "integration" of the tool but rather the change is brings about in educational culture. We are beginning to witness the long-awaited hybridization of technologies with educational functions, where the focus will be on the roles these technologies play.

9) Mechanisms must be sought to help education professionals update their digital knowledge and skills. Keeping up to date with developments in the digital world is a considerable challenge given the dizzying rate at which information, applications and devices multiply. While technological advances are often exciting and their potential to improve quality is extremely attractive, they can also become overwhelming. More than ever, there is a great need for efficient tools, filters and semantic devices that enable us to retrieve, organize and interpret relevant data that matches our individual requirements.

10) We must act to assure the competitiveness and sustainability of educational institutions. Economic pressures and new models of education are bringing unprecedented competition to the traditional models of tertiary education. Institutions must find the right formulas to control costs while continuing to offer a high-quality service, not least because student numbers are remaining stable or rising at the same time as funding and staff numbers fall. Consequently, creative institutions are developing new models with more flexible course structures and learning processes, through the strategic use of technology.

Methodology

The process adopted to conduct the research and draft the report *Technology Outlook for Iberoamerican Tertiary Education 2012-2017* is based on the methodology applied to the Horizon Project. All editions of the *Horizon Report* follow a carefully constructed process in both their primary and secondary research. Numerous technologies, meaningful trends and major challenges are examined for possible inclusion in the report each year and for every edition. All of the reports are based on the experience of an internationally renowned advisory board, which initially analyzes a wide range of technologies, challenges and emerging trends before examining each topic in greater detail, reducing this set to obtain a final listing of technologies, trends and challenges.

Much of this process takes place online and is documented in the Horizon Project wiki, where all work related to the project is archived. The Horizon Project wiki is the nexus for all of the collaborative work that has taken place over the project's lifetime and contains a complete record of all research conducted as part of each edition. The section of the wiki used in the report *Technology Outlook for Iberoamerican Tertiary Education 2012-2017* can be found at: http://ibero.wiki.nmc.org/.

The general procedure for selecting the topics to be included in the report incorporates a modified Delphi process refined over several years of producing Horizon Reports, beginning with the formal creation of the Advisory Board. The board as a whole is intended to represent a wide range of professional backgrounds, nationalities and interests, in which each member can contribute his or her particular experience. To date, hundreds of internationally recognized professionals and experts have participated in Horizon Project advisory boards: each year, one third of the members are renewed to ensure a constant flow of new perspectives.

Once the advisory board has been constituted for a given edition, its work begins with a systematic review of the literature — selected articles, reports, essays and other materials — on emerging technology. At the start of the project, the members of the advisory board are provided with a comprehensive set of introductory materials to the different topics. They are subsequently invited to comment on each one, identifying those topics that seem particularly worthwhile and adding others to the list. The group analyzes the emerging technology applications that exist at the time and contributes ideas for the incorporation of new topics. An essential criterion for the inclusion of a topic is its potential relevance to teaching, learning, research or education information management. A carefully selected set of RSS feeds, taken from relevant publications, ensures that the importance of preliminary resources does not wane as the project progresses, and they are used to keep participants informed throughout the process.

Following the literature review, the advisory board engages in the central part of the study, addressing the five research questions that are at the core of the Horizon Project. These questions were designed in order to elicit from the advisory board a comprehensive listing of interesting technologies, challenges and trends:

1. Which of the key technologies included in the Horizon Project list will be most important for teaching, learning, research, or information management in the next five years?
2. What key technologies are missing from our list? Consider the following questions:
    a. What would you list among the established technologies that some educational institutions are using today that arguably ALL institutions should be using broadly to support or enhance teaching, learning, research, or information management?

b. What technologies that have a solid user base in consumer, entertainment, or other industries should learning-focused institutions be actively looking for ways to apply?

c. What are the key emerging technologies you see developing to the point that learning-focused institutions should begin to take notice during the next four or five years?

3. What trends do you expect to have a significant impact on the ways in which tertiary education institutions approach their core missions of teaching, research, and service?

4. What do you see as the key challenges related to teaching, learning, research, or information management educational institutions will face during the next five years?

One of the advisory board's most important tasks is to answer these questions as systematically and broadly as possible, so as to ensure that it includes the full range of relevant topics. Once this work is done, the Advisory Board moves on to a unique consensus-building process using an iterative Delphi-based methodology.

In the first step of this approach, each member of the advisory board systematically ranks the answers to the research questions and places them into adoption horizons in a multi-vote system that allows participants to weight their choices. Each member is also asked to identify the time frame in which it considers that use of the technology will become generalized, which, for the purposes of this project, is defined as its adoption by 20% of institutions in the period under review (this figure is based on research by Geoffrey A. Moore and refers to the critical mass of adoption necessary for a technology to have a chance of entering mainstream use). These rankings are compiled as a collective set of responses, making it easy to identify those over which there is a greater consensus.

For more details on the project methodology, or to review the instruments, ranking or intermediate products on which the report is based, please visit http://ibero.wiki.nmc.org.

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