E-learning
Past, Present, and Future

Joseph Rene Corbeil and Maria Elena Corbeil

Introduction

Throughout the history of human communication, advances in technology have powered paradigmatic shifts in education.

—Frick (1991)

Predicting the future is a risky business, but the advantages make the risks worthwhile (Gentry & Csete, 1995). For e-learning practitioners, studying the history of distance education provides a sense of identity and belonging, as they become modern-day explorers, imagining new and better ways to deliver instruction through emerging practices and communication technologies.

While we may live in the present, we plan for and dream about the future. History enables us to understand ourselves, as well as the hopes and aspirations of our predecessors. If we were to consider the motivations of those who contributed to the early development of distance learning, we would recognize the same motivation in them that we hold today—making education accessible to a broader audience of learners who strive to advance their education and professional development while juggling family and work responsibilities.

This chapter will present a timeline, by decade, of the most influential people, events, and trends, impacting the development of e-learning from its origins to the present. Studying the history of e-learning enables us to forecast future directions for short-term and far-term trends.

E-learning Defined

In 1997, Khan laid the groundwork for e-learning through his book Web-Based Instruction, which focused international attention on web-based learning and “paved the way for the new field of e-learning” (Khan, 2013, para. 1). He defined e-learning as “an innovative approach for delivering electronically mediated, well-designed, learner-centered, and interactive learning environments to anyone, anyplace, anytime by utilizing the Internet and digital technologies in concert with instructional design principles” (Morrison & Khan, 2003, para. 3). His work on web-based instruction led to the development of A Framework for E-learning (Khan, 2012),
whose eight dimensions “provide guidance in the design, development, delivery and evaluation of flexible, open and distance learning environments” (Khan, 2012, para. 3).

As advancements in technology developed at a seemingly lightning speed in the late 1990s, access to information became readily available to exponentially larger audiences and changed the landscape for training and workplace learning. One of the first definitions of the evolving forms of learning via the Internet is attributed to Elliott Masie, who in 1997 observed, “Online learning is the use of network technology to design, deliver, select, administer, and extend learning” (as quoted in Cross, 1999, p. 104). It was then that Jay Cross began making the case for the need to redefine learning in order to meet the fast-paced, changing global needs of business. In doing so, he coined the term e-learning in 1998 (Cross, 2004). Since then, e-learning definitions have continued to evolve.

Cross (2004) emphasized that e-learning had less to do with formal learning in academic realms and more to do with learner control and workplace performance. He defined e-learning as “learning on Internet Time, the convergence of learning and networks” (p. 104). Noting its potential, he added, “e-learning is a vision of what corporate training can become” (p. 104). A year later, researchers at Cisco Systems built upon previous definitions, noting, “eLearning is Internet-enabled learning. Components can include content delivery in multiple formats, management of the learning experience, and a networked community of learners, content developers and experts” (Cross, 2004, p. 104). In 2004, Jeurissen (as cited in Moeng, 2004, para. 4) further defined e-learning as “the use of innovative technologies and learning models to transform the way individuals and organisations acquire new skills and access knowledge.” Different from the first conceptualizations in the late 1990s, Jeurissen’s definition no longer referenced the Internet. Instead of becoming more specific, subsequent definitions became broader to include both a wider range of technologies (some not even developed at the time) and the impact the technologies have had on learning itself.

Even today, 16 years after the debut of e-learning, its definitions are as varied as its applications. Each stakeholder (e.g. business, education, communications technologies, computer information systems) assigns the technologies, as well as the magnitude of their reach and intentions, differently. Consequently, in their 2012 study, Sangrà, Vlachopoulos, and Cabrera sought to build an all-inclusive definition of e-learning by conducting a comprehensive review of literature and a Delphi survey of experts in e-learning from different specializations. The results of their study revealed four categories by which e-learning definitions are classified: “(1) technology-driven; (2) delivery-system-oriented; (3) communication-oriented; and (4) educational-paradigm-oriented” (Literature Review, para. 4). The definition developed from these categories and the survey of experts from their study is used to define e-learning in this chapter:

E-learning is an approach to teaching and learning, representing all or part of the educational model applied, that is based on the use of electronic media and devices as tools for improving access to training, communication and interaction and that facilitates the adoption of new ways of understanding and developing learning.

(Sangrà et al., 2012, Survey of Expert Opinions, para. 12)

Since Khan, Masie, Cross, and other visionaries first made their marks in history over 15 years ago, e-learning has taken a foothold, making learning truly time and place independent. The following section delineates the history of e-learning by decade from the 1980s to today. It is an exciting time for learning, both in workplace and academic settings, as new technologies and global marketplace demands drive innovations in learning and workplace performance.
The History of E-learning

E-learning in the 1980s

Although the term e-learning was not coined until the late 1990s, Internet-based distance learning was being developed in universities and organizations around the world as early as the 1960s. Prior to the invention of the Internet, distance learning was offered through a variety of formats, including correspondence, telephone, video and audio tapes, radio, and television.

Rooted in behaviorist theory of the 1920s and programmed instruction of the 1960s, the predecessor to Internet-based distance learning was computer-based training (CBT) of the early 1960s and 1970s. Through programmed instruction, learners worked through lessons by themselves and at their own pace. At the end of each lesson, they were tested for comprehension and immediate automated feedback was given. Programmed instruction made the leap from paper-based to computer-based instruction with the introduction of the computer.

PLATO (Programmed Logic for Automated Teaching Operations), originally developed at the University of Illinois through the 1950s and 1960s, and later transferred to Control Data Corporation (CDC), was one of the first computer-based training programs (K Alliance, n.d.). Developed six years before the launch of the Internet, it offered instruction to university students and local school children. The PLATO system used a “drill-based approach to training and allowed students to skip lessons they already knew” (K Alliance, n.d., para. 2). Although the program ended in 2006, its contribution to computer and web-based instruction is significant for its pioneering use of a host of online communication tools, including message boards, discussion forums, chat rooms, instant messaging, and remote screen sharing. These tools are now standard features in most of today’s learning management systems.

As far as institutions of higher education leading the development of distance learning models, in the 1960s, the University of Wisconsin-Madison built a system, that others later modeled worldwide, that incorporated a myriad of communication technologies to increase access to off-campus students. The program “provided much more rapid and modern way to share information and education with students who could not attend traditional courses” (Distance Learning Net, n.d., para. 4).

One of the first documented online programs, however, was not until twenty years later, when CYCLOPS was developed in the early 1980s at Britain’s Open University. The CYCLOPS system enhanced the teleconferencing method of distance education delivery through the use of a shared whiteboard that allowed for real-time annotation of downloaded graphics. Supplemental instructional resources to support the live discussions were distributed to learners through cassettes tapes (McConnell & Sharples, 1983).

With the birth of the modern Internet in 1982, and the development of the World Wide Web in 1989, web-based distance learning was set to explode. Acceptance of web-based distance education was accelerated with the introduction of Mosaic, the world’s first Web browser, in 1993. Using a mouse to point-and-click on hyperlinked text and graphics enabled users to navigate the Web effortlessly, making it user-friendly and accessible to the average person.

Yet, e-learning, as we know it today, would not have been feasible without the availability of affordable and portable computers users could set up and use from home. While computers were available on university campuses and in schools in the early 1970s, it was not until the microcomputer, also known as the personal computer or PC, became widely adopted by consumers, that e-learning took off.

Although Hewlett-Packard is credited with inventing the first programmable microcomputer in the early 1970s, the Xerox Alto was the first desktop computer to include a monitor, keyboard,
and mouse. The Alto also had a simple graphical user interface that became the inspiration for Microsoft and Apple’s graphical operating systems. In 1977, the Commodore PET was the first computer adopted for personal use, proceeded by the Apple II and TRS-80 (PC World, 2006).

Since their introduction, personal computers have increased in power and speed, while becoming smaller and lighter. By 1975, laptop computers made the personal computer portable. Since then, laptops have assumed different form factors, also becoming thinner, lighter, and more powerful. Today, high-end sub-notebooks, called Ultrabooks, pack the processing power of full size PCs into devices that are less than an inch thick and weigh less than three pounds, enabling e-learners to become mobile learners.

The rapid commercialization of the Internet, coupled by the speedy advancements in computer technology and the rapid decline of computer prices of the 1980s, made the Internet and web-based distance education accessible to the masses. As the 1980s came to a close, the stage was set for the emergence of web-based instruction.

**E-learning in the 1990s**

Throughout the 1980s, the publishing, electronics, television, computer, information services and telecommunications industries developed in isolation of one another. In the 1990s, these industries converged and became almost indistinguishable (McGreal, 1994). If the 1980s were the decade of the Internet and the personal computer, the 1990s could easily be recognized as the era of the learning management system.

One of the first distance education networks to employ a learning management system was the TeleEducation network of the Province of New Brunswick (TeleEducation NB). Established in 1993, its open distributed network was implemented through a primitive DOS-based learning management system that included an electronic blackboard, audio conferencing, and screen and software sharing. By 1995, it had more than 100 public and private sites throughout the province (McGreal, 1994).

Jerrold Maddox (1997), a professor of art at Penn State University, is credited with teaching the world’s first fully web-based course in the spring of 1995 (Maddox, n.d.). The course, titled Commentary on Art, consisted of a series of web pages, including: Syllabus, Tools, Class Members, and FAQs, linked together through a common menu located at the top of each page. Also included in the menu was a link to the Penn State Library Catalog, Yahoo search tool, and the online Encyclopedia Britannica. Communication was facilitated through e-mail, a live chat client, a listserv, and a bulletin board (Maddox, 1997).

Also in 1995, Murray Goldberg, a Computer Science professor at the University of British Columbia, began working on a new platform for constructing web-based learning environments (The Ernest C. Manning Awards Foundation, 2004). Through prior experience, he discovered that building online courses from scratch was very expensive and time consuming. This experience provided the inspiration for Web Course Tools, or WebCT, a user-friendly program to facilitate the rapid development of online courses. Goldberg launched WebCT in early 1996.

Shortly after the release of WebCT, Daniel Cane, an undergraduate student at Cornell University, began writing automated scripts for instructors who wanted to integrate technology into their classes (Bradford, Porciello, & Backus, 2006). In August 1997, he and Stephen Gilfus founded CourseInfo LLC and released the Teachers Toolbox. Among the programs included in the toolbox were tools to generate course sites, announcements, quizzes, and surveys (Nagler, 1997). In June 1998, CourseInfo LLC merged with Blackboard Inc., a consulting firm founded by Michael Chasen and Matthew Pittinsky. Their learning management system, dubbed
While Goldberg and Cane were developing their learning management systems, University of Texas at Brownsville professor Badrul H. Khan set out to write the definitive text on web-based distance education. His groundbreaking book, titled *Web-Based Instruction*, included discussions from nearly 100 authors on the most significant aspects of web-based instruction. Published in 1997, it was translated into multiple languages and quickly became a worldwide best seller. In response to the book’s immediate success, working with his Educational Technology graduate students, Khan developed the university’s first fully online course. Although beta versions of various learning management systems were available to universities for testing, they did not become commercially available for at least two years. Therefore, Khan’s online course consisted of content pages coded in HTML, a third-party web-based discussion forum and an online quiz generator. The user interface, which resembled a modern-day LMS, was divided into three sections: a horizontal title bar, a vertical menu located in the left frame, and a main content frame where the individual pages of the course appeared. The course was developed to serve as a model of effective web-based instruction as described in the book. It became a template for additional courses in the program, and positioned the Master of Education in Educational Technology to become one of the first fully online programs for the fledgling University of Texas TeleCampus, established in 1998.

Toward the end of the 1990s, universities across the United States and abroad started to experiment with web-based distance education. Founded in 1993, Jones International University became the first fully online university, with the first courses for a Master of Arts in Business Communications offered in 1995 (Jones International University, n.d.). On March 5, 1999, Jones International University made history again by becoming the first fully accredited, fully online university in the United States (Jones International University, n.d.).

Another development of the 1990s that paralleled the growth of the Internet was the advancement of audio and video as an instructional medium. With the introduction of the MPEG audio and video compression standard in 1993, full motion video could be recorded onto compact discs, also known as CDs, and distributed to students (Tudor, 1995). In the early days of dial-up Internet service, audio and video took a long time to download. Therefore, some university programs supplied CDs to students to supplement digital content of their online courses.

As Internet speeds increased, so too did the proliferation of web-based multimedia for instruction. With the development of video streaming in 1995, short audio and video broadcasts could be added to e-learning content, making audio and video streaming practical and affordable. While Internet speeds for consumers were gradually increasing throughout the 1990s, video streaming permitted multimedia to begin playing before the download was complete, thus reducing wait time (Hood, 2012). With increased usability, video on demand became a staple of technology-enhanced and web-based classes.

Although e-mail predates the modern Internet by at least a decade, the incredible growth of personal computers and the Internet through the 1980s and 1990s, drove the rapid expansion of e-mail from privately owned governmental and corporate systems to commercially available public services. Invented in 1971 by Ray Tomlinson, a computer engineer working for a company contracted to build ARPANET, the precursor to the Internet, e-mail was conceived as an efficient way for programmers to leave messages for each other (Campbell, 1998). According to Tomlinson, the @ symbol was chosen to designate the location of the sender’s mailbox on a particular server. The first official e-mail message was from Tomlinson to other networked users.
to announce its existence (Campbell, 1998). E-mail became extremely popular and within two years, 75% of all traffic on ARPANET was e-mail (Campbell, 1998). Because of its low cost, availability, and ease of use, e-mail quickly spread across multiple industries and became an essential communication tool in education and web-based instruction.

As the 1990s came to a close, the first generation of digital natives was coming of age (Palfrey & Gasser, 2008). This new generation of learners, immersed in digital technologies from birth, was a major catalyst for a shift in pedagogy in the late 1990s, from teacher-directed to learner-centered instruction (Tapscott, 2009, as cited in Jones, 2010). “In order for schools to adapt to the habits of Digital Natives and how they are processing information, educators need to accept that the mode of learning is changing rapidly in a digital age” (Palfrey & Gasser, 2008, p. 239). One of the biggest changes involved how digital natives conducted research. Instead of making a trip to the library, Palfrey and Gasser opined, “they are more likely to check Wikipedia” (p. 239).

The rapidly changing educational environment brought on by the digital natives, combined with an infusion of new digital communication technologies and the introduction of the learning management system, accelerated the growth of the e-learning movement through the 1990s and positioned it for massive growth in the coming decade. In the closing months of 1999, two new learning management systems appeared on the digital scene, Desire2Learn, an integrated and user-friendly system designed from the ground up, and Moodle, the world’s most successful and fastest growing open source LMS. While the 1990s were a period of creativity for emergent learning management systems, the 2000s were a period of intense growth and competition, characterized by Blackboard’s growth through acquisitions and an attempt to corner the market by patenting the LMS.

**E-learning in the 2000s**

Since 2000, the world has witnessed an explosion in e-learning opportunities for learners of all ages. The National Center for Education Statistics (2003) reported that from 2001 to 2002, over 50% of institutions that awarded degrees offered distance education to all levels and types of learners, causing enrollment to skyrocket to over 3 million. In 2007, Allen and Seaman (2008) noted that “the 12.9 percent growth rate for online enrollments far exceeds the 1.2 percent growth of the overall higher education student population” (p. 1). Accessibility, and the tools that allowed for the increased access were the catalysts for this phenomenal growth in e-learning.

The evolution of technical advancements that led to this phenomenon began with the proliferation of web conferencing. Prior to the 2000s, web conferencing was reserved mainly for business users or those who could afford expensive high-speed Internet and costly equipment. Web conferencing, as we know it today, provided e-learning with new capabilities that were not previously possible. According to Roberts (2004), although video conferencing played a role in the history of e-learning, its features were limited. Web conferencing, on the other hand, “is the total package” (para. 1). It provides not just the opportunity to chat and communicate via webcam so that you can see each person in your conferencing link, but to exchange documents, share applications, access shared desktops, use PowerPoint, whiteboards and other presentation features and even poll participants.

(Roberts, 2004, para. 1)
Like most technologies, web conferencing evolved over several decades, but did not come into fruition until recent years with the increased affordability of personal computers and the emergence of peer-to-peer (P2) Internet file sharing.

With these advancements, along with the development of Voice Over Internet Protocol (VoIP), distance learning programs began utilizing web conferencing to increase interactivity and real-time collaboration in higher education learning environments (Nefsis, n.d., para. 22). Since then, a wave of free and subscription services, as well as web conferencing-enabled tablets and smartphones, have exploded onto the scene, putting the capability of mobile web conferencing into the hands of millions of users.

The introduction of MP3 players, like the iPod, made possible new ways of easily sharing audio files, known as podcasts. Podcasts are digital audio files that can be easily shared, downloaded, and created. Due to their affordability, accessibility, and flexibility, podcasts, and a few years later, vodcasts (video versions of podcasts) became popular e-learning tools. Rohrer (2006) observed, “One of the exciting features of podcasts and vodcasts is the ability to ‘subscribe’ to them” (para. 6) using RSS (Really Simple Syndication). The RSS software checks all podcasts a user is subscribed to and automatically downloads them to the designated device. Such was the impact of these developments on e-learning that in 2006, Cebeci and Tekdal noted, “Currently, podcasting is being debated as a new promising e-learning tool that will possibly change mobile learning” (para. 1). These advancements not only facilitated the way people accessed content, but they also freed up learners to review it on their own time and in a location of their choice—even while on the go. It also exponentially increased the availability and variety of content.

In 2005, Chad Hurley, Steve Chen, and Jawed Karim revolutionized the online sharing of videos with the launch of YouTube (Wikipedia, History of YouTube, n.d.). This new service allowed for proprietary videos to be easily published and shared online, thereby reaching worldwide audiences. According to YouTube Statistics (Viewership, n.d.), today, “More than 800 million unique users visit YouTube each month; over 6 billion hours of video are watched each month; 80% of YouTube traffic comes from outside the US.” YouTube and the expansion of web-based multimedia spawned a host of educational sites, including Khan Academy, founded by Salman Khan in 2006 (khanacademy.org, n.d.), and TED Talks, launched in 2007 by the Chris Anderson Sapling Foundation (Ted.com, n.d.).

The growth of on-demand audio and video would not have been possible without Wi-Fi (Wireless Fidelity). “Wi-Fi refers to wireless networking technology that allows computers and other devices to communicate over a wireless signal” (TechTerms.com, Wi-Fi, n.d.). For e-learning, Wi-Fi (which caught on with mainstream consumers in 2001) meant access to all of the resources afforded by the Internet on Wi-Fi-enabled devices (desktop computers, tablets, laptops, smartphones, videogame units, digital audio players, e-book readers, etc.) without the need for a physical, wired connection.

Another leap in the advancement of e-learning came with the growth and popularity of online virtual worlds, as they showed potential for exposing learners to a greater diversity of people and experiences, as well as developing problem-based learning opportunities. This was especially relevant for education and training in professions such as teacher education, health, information systems, and criminal justice. Cartelli, Connolly, Jimoyiannis, Magalhaes, Maillet, and Stansfield (2008, para. 1) observed, “The demand for higher education is expanding exponentially throughout the world with the majority of Universities now offering an array of e-learning programs and modules to students from a wide range of different backgrounds and geographical locations.” E-learning programs have responded by creating virtual learning
environments in popular online services, such as Second Life. It is through these virtual learning environments that “students can gain access to a range of educational experiences and resources” (Cartelli et al., 2008, para. 1). Although the origin of virtual worlds can be traced to early literature and cinematography, when Second Life was launched in 2003, it put virtual reality into the hands of millions of users worldwide.

**E-learning Today**

Web conferencing, podcasts, VoIP, Wi-Fi, and virtual worlds represent only a segment of the e-learning technologies available today. Perhaps the most notable difference between e-learning in previous decades and today is that e-learning has gone mobile. Partridge (2012) observed that in particular, the touch screen in mobile devices has changed the way learners interact with content. He noted,

> The practical reality here is that touching things makes us feel differently about those things. This is the core idea behind interface differences in mobile. We paint associative pictures in our minds and the things we touch and handle directly.

(para. 4)

This improved way of interacting with learning has spawned an impressive variety of technologies (e-books, augmented reality, social media) that facilitate users’ interaction with each other, the content, and now, even their environments and the objects in them.

Interactivity is a staple of today’s e-learning menu. For example, millions of e-books flood the market and many of them no longer resemble traditional textbooks. Today’s books are digital and integrate a wide variety of multimedia and interactive features, such as augmented reality (AR). Although AR can be traced back to the early 1900s when author Frank L. Baum wrote about a little boy whose goggles allowed him to see people’s true intentions (Willans, 2013), current versions of AR date to the 1990s with military developments, and later, in 2000 with the release of ARQuake, the first mobile augmented reality game (Willans, 2013). According to Asai, Kobayashi, and Kondo (2005), “AR enhances real scenes viewed by the user, overlaying virtual objects over the real world, and works to improve the user’s performance in and perception of the world” (p. 1). Handheld devices that put augmented reality into the hands of consumers are already available (e.g., smartphone navigation apps, such as Metro Paris Subway and London Bus; Nokia’s City Lens app; Yelp’s Monocle; Mattel’s i-Tag action figures; Wikitude Drive; and Layar’s browser for smartphones).

For e-learning, the benefits of augmented reality include interacting with real and virtual objects to obtain information from an authentic environment in several dimensions, including 3D (e.g., viewing the assembly instructions laid over a machine part); and viewing objects and landmarks from a different perspective, even one from the past (e.g., original architecture blueprints superimposed on a building) (Asai et al., 2005). It also brings a gaming quality to learning, putting the learner in control to solve problems in a way that is interactive and engaging. As such, technologies like augmented reality have changed the expectations for e-learning. Never has this been more evident than with the proliferation of social media tools, such as MySpace, Facebook, and Twitter.

Jane Hart (2009), social media and learning consultant, observed that for years, e-learning environments simply automated the traditional sage-on-the-stage learning model, making the learning independent of location, but also of people. She added that contrarily, in social and
workplace environments, people seek out new information and develop new skills by relying on a variety of sources—including each other. This has shifted the focus from formal to informal learning, which is facilitated by the numerous social media tools available today (Hart, 2009). Social media help people “search for and access all kinds of resources: videos, podcasts, blogs, etc., whenever they need them; they create their own resources and store them for easy retrieval” (Hart, 2009, slide 9). “They also make connections with like-minded people with whom they can communicate and share ideas, resources, experiences, and so on” (Hart, 2009, slide 10). Hart noted that formal learning environments are also capitalizing on these benefits, making them more “participative, social, and collaborative” (slide 12). Now that e-learning had gone social, it was poised to go massive.

Massive Open Online Courses, also known as MOOCs, hit the scene in 2008. They began as free, noncredit online courses that anyone with Internet access could take. Although most MOOCs have several thousand participants, some have had over 30,000 enrolled at one time. “The shimmery hope is that free courses can bring the best education in the world to the most remote corners of the planet, help people in their careers, and expand intellectual and personal networks” (Pappano, 2012, What Is a MOOC Anyway?, para. 7). The price of access, however, is limited faculty interaction. Participants, then, need to rely on themselves to view the content and interact with others in the course to complete the assignments. Although there are challenges, such as cheating and low completion rates, for e-learning, MOOCs are a game changer.

In a New York Times article titled “The Year of the MOOC,” Pappano (2012) interviewed several key players in the recent MOOC movement. They all concurred that MOOCs will change many of the ways higher education institutions manage formal learning. MOOCs have already started to change the way formal learning is perceived, as well as the criteria for hiring and promoting faculty. During the interview, Dr. Stavens, owner of Udacity, the first company to host MOOCs, noted, “They pick instructors not because of their academic research, as universities do, but because of how they teach” (Pappano, 2012, The Flavor of the MOOC, para. 6). He foresees “a day when MOOCs will disrupt how faculty are attracted, trained and paid, with the most popular ‘compensated like a TV actor or a movie actor’ … students will want to learn from whoever is the best teacher” (Pappano, 2012, The Flavor of the MOOC, para. 6). Similarly, MOOC innovators also predict major changes in the way that formal institutions accept and award academic credits. Are MOOCs here to stay? Only time will tell. However, the impact that they have already had will leave a lasting impression on the e-learning landscape.

The Future of E-learning

This chapter ends as it started, with an admonition and a promise. As Gentry and Csete (1995) cautioned, predicting the future is a risky business, but failure to plan for it is irresponsible. While we live in the present, we are being called to visualize and build the future. Looking to the future of e-learning, several possibilities present themselves based on trends we see unfolding today, including the ascension of mobile learning, the increase of social learning, the improved availability and quality and choice of online programs, the promise of universal translation for global learning, and the growth of personal learning environments. Each of these elements holds great promise over the next five years.

The New Media Consortium (NMC) Horizon Report, published every year since 2002, “is dedicated to charting the landscape of emerging technologies for teaching, learning, and creative inquiry in higher education globally” (Johnson, Adams, & Cummins, 2012, p. 9). Each year, the
New Media Consortium, through its Emerging Technologies Initiative, interviews hundreds of technology professionals and educational leaders and analyzes news articles, research studies, and white papers from around the world to generate a list of emerging technologies, trends, and challenges impacting higher education, K–12, and technology-related industries.

Each yearly report identifies the six most significant emerging technologies likely to impact education over the next five years. The report categorizes the six trends into three adoption horizons—near-term, mid-term, and far-term—based on their likelihood to experience widespread adoption within the next 12 months, two to three years, or four to five years (Johnson et al., 2012). Table 3.1 represents the six technologies to watch between 2012 and 2017. It is important to note that each of these emerging technologies exerts a significant impact on e-learning.

**Near-term adoption horizon.** The 2012 *New Media Consortium (NMC) Horizon Report* identified mobile apps and mobile computing as two of the fastest growing trends to impact e-learning and mobile learning in higher education, with the greatest likelihood of being adopted within the next 12 months. Johnson et al. (2012) noted:

> Always-connected Internet devices using 3G and similar cellular networks, imbedded sensors, cameras, and GPS have proved to be the feature set with hundreds of applications. Apps that take advantage of recent developments in these tools, along with advances in electronic publishing and the convergence of search technology and location awareness, made this category of software enormously interesting in the higher education context. (pp. 6–7)

App stores for IOS and Android smartphones and tablets feature thousands of apps covering a range of subjects, from math and science, to reading and writing, to music and foreign languages, to history and geography, for learners of all ages. Note taking, annotation, and content creation tools enable users to conduct research and gather data from anywhere at any time. Audio, video, and photography apps, combined with social networking and file sharing apps, facilitate the documentation and sharing of live historical events and natural phenomena, to make teaching, learning, and creative inquiry a continuous, lifelong process. Present-day language translation apps also offer great promise for the future of global e-learning.

Pedagogy, curriculum, and even learning environments can be tailored through portable devices to meet individual student needs and promote personalized learning. “Because of their portability, large display, and touchscreen, tablets are ideal devices for one-to-one learning, as well as fieldwork” (Johnson et al., 2012, p. 15). Presently, many institutions around the country
are distributing tablet computers to their students, preloaded with course materials, digital textbooks, and supplemental resources. The rapid adoption of tablets and smart phones is also hastening the ascension of mobile learning from proof-of-concept to real-world application.

**Mid-term adoption horizon.** The 2012 New Media Consortium (NMC) Horizon Report identified game-based learning and learning analytics as two technology trends that will see expected widespread adoption within two to three years (Johnson et al., 2012).

While scholars are still studying its effectiveness, game-based learning in higher education and K-12 classrooms has experienced considerable growth in recent years. According to the 2012 report, “The greatest potential of games for learning lies in their ability to foster collaboration and engage students in the process of learning” (Johnson et al., 2012, p. 7). This form of learning is strongly supported by social learning theory, which states that people learn better when working within social contexts. According to the 2010 U.S. Department of Education’s National Education Plan:

> Interactive technologies, especially games, provide immediate performance feedback so that players always know how they are doing. As a result, they are highly engaging to students and have the potential to motivate students to learn. They also enable educators to assess important competencies and aspects of thinking in contexts and through activities that students care about in everyday life. Because interactive technologies hold this promise, assessment and interactive technology experts should collaborate on research to determine ways to use them effectively for assessment.

*(2.0 Assessment: Measure What Matters, para. 6)*

Game-based learning teaches students a number of important skills, including how to work in teams to solve common problems, critical thinking and creativity, and communication and digital literacy. Gaming environments also provide safe realms for experimentation, and learning through trial and error, and even failure (Johnson et al., 2012). The type and level of social learning achieved through game-based learning make it a natural for collaborative e-learning.

The 2012 report also identified learning analytics as a significant mid-term technology with considerable potential for education. These data-mining tools provide faculty with the information they need to identify students’ learning needs and make instructional decisions for corrective action. According to Johnson et al. (2012), “Learning analytics loosely joins a variety of data gathering tools and analytic techniques to study student engagement, performance, and progress in practice, with the goal of using what is learned to revise curricula, teaching, and assessment in real time” (p. 7). The significance of learning analytics for teaching and learning are obvious, and would make them essential tools for online instructors, who, due to the limitations of classroom interactions, may not have access to all their students’ data, especially data normally obtained in traditional classrooms through direct observation. Data obtained through learning analytics could also impact course design, development, and quality.

**Far-term adoption horizon.** Two technologies identified by the 2012 New Media Consortium (NMC) Horizon Report for the far-term horizon, projected for widespread adoption in four to five years, are gesture-based computing and the Internet of Things (Johnson et al., 2012).

Gesture-based computing uses body motion, facial expressions, and voice recognition as input devices in place of the computer keyboard and mouse. With the introduction of touch screens on smart devices, voice recognition technology like Siri, and sensors that translate body movements on gaming systems, gesture-based technologies have already become commonplace. For years, users have been interacting with smartphones, tablets, and computers by tapping
or swiping their fingers across touch-sensitive screens, mice, and touchpads. Likewise, while gaming systems have been pioneering the use of motion sensing accessories for years, infrared sensors and accelerometer-based handheld controllers on newer machines have taken interactive video gaming to new levels, enabling players to move, jump, dance, or point to control their on-screen character’s movements. Combined with voice recognition, gesture-based computing has the potential to change how we interact with all of our devices, including our TVs, computers, and smart home appliances. These capabilities have implications for teaching and learning, both in our physical environments and in our interactions in virtual worlds. Although present-day examples of gesture-based computing in education are limited, as an assistive technology: “Gesture-sensing techniques are already having profound implications for special needs and disabled individuals. For example, devices with gesture control are already helping blind, dyslexic, or otherwise disabled students, reducing their dependence on keyboards” (Johnson et al., 2012, p. 27). The writers of the 2012 report recognize that while the desire to have a completely natural interaction with our devices has existed for many years, its full potential has yet to be realized (Johnson et al., 2012, p. 29).

According to Johnson et al. (2012), “The Internet of Things has become a sort of shorthand for network-aware smart objects that connect the physical world with the world of information” (p. 30). This concept, promoted by Vinton Cerf, known as “a father of the Internet” (Internet Society, n.d., para. 1), is the next step in the evolution of smart objects where the line between the physical item and digital information becomes blurred. While the Internet of Things is still more of a concept than a reality, some present-day Internet-enabled devices, including webcams, shared printers, telephones, and other office equipment, already exist. “In the classroom, IP-addressable projectors can already stream the slides or videos professors are sharing so that students who could not physically attend class can view the presentations and lecture materials from wherever they are” (Johnson et al., 2012, p. 31). As the Internet of Things technologies evolve into smart objects capable of transmitting digital information, students in e-learning (and traditional) learning environments will have access to real-time data on mobile devices and computers in a way that was never possible.

Summary

In summary, the 2012 New Media Consortium (NMC) Horizon Report for higher education has identified six emerging technologies experts and researchers have predicted to exert a significant impact on higher education within the next five years. Each of these technologies is also important for the growth of e-learning within the same time frame. As educators and trainers in e-learning, it will be incumbent upon us to be aware of these technologies and to begin to explore how they can be exploited to improve the quality of the e-learning experience.

To paraphrase Confucius, we study the past to define the future. This chapter presented a timeline, by decade, of the most influential people, events, and trends impacting the evolution of e-learning over the past 40 years. Studying past, present, and future trends in e-learning gives us a historical perspective from which to guide researchers, practitioners, professors, teachers, trainers, and administrators in making informed decisions and planning for the future.

References


