Examining the Effectiveness of Online Educational Technological Tools for Teaching and Learning and the Challenges Ahead

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The purpose of this study was to examine the effectiveness of educational technological tools for online teaching and learning, and the challenges that lay ahead. The key elements investigated include: the definition of online educational technological tools, advances made using online educational technological tools, advantages of using online technological tools, and the challenges of online educational technological tools. The results of the study show that online education has grown over the years and schools are working hard to keep up with the various Learning Management Systems (LMS).

INTRODUCTION

In the USA, internet is perceived as "the outgrowth of US Defense Department work and popular enthusiasts" (Guice, 1998, para. 1). Hence, both engineers and managers in the in the US Defense Department in the 60s through 70s became the driving force of the development of internet as they developed ARPANET (Guice, 1998, para. 8). Consequently, researchers, and academicians in other interdisciplinary fields started using the network.

As shown in the Appendix A at page 24 of this study, brief timeline of the internet technology from 1958 – 2007 is phenomenal as "President Eisenhower requests funds to create [Advanced Research Projects Agency] ARPA" (Brief Timeline of the Internet, para. 4). The president's request was "approved as a line item in Air Force appropriations bill" in 1958 (para.4). Moreover, in 1969 the defense department started using ARPA, which was consequently was used by universities (Internet Timeline, 2000). In 1970 ARPANET was established, but still limited to defense, universities, and regional networks. The NSFNET came into being where email, and other networking. In 1991, National Research and Engineering network (NREN) was established. In the recent years, access of internet to businesses, university students, technical professionals, primary and secondary students brought the use internet technology for teaching, and learning at the finger tips. By 1995 the public had access to internet, corporate advertising, and electronic commerce such as internet marketing by eBay, Amazon, PayPal, Billmelater, etc., had persistently taken hold of online trading (Guice, 1998). According to Hobbes' Internet Timeline 11 by Robert H'obbes' Zakon, in 1957 [United States Socialist Republic] USSR launched sputnik which was their first artificial satellite (Zakon, 1993-2014, para. 2; Hobbes' Internet Timeline: http://www.zakon.org/robert/internet/timeline/). In response to USSR's launch as shown above in 1958 USA started Advanced Research Projects Agency (ARPA), and the internet advancement continued (Brief Timeline of the Internet, 2007; See Appendix A, p.24 of this study). Apparently, the spread of internet technology hardware has opened varied ways of disseminating education through teaching and learning. In the mix teaching and learning has been simplified as the learning management

systems (LMS) compete for business in schools (Okamoto, Cristea, & Kayama, 2001; Sener, 2010; Fu, 2010).

METHODOLOGY OF THE STUDY

This study takes the interpretive/constructivist and narrative inquiry research paradigms. Deliberate reflections on online education were also applied in the study. With the interpretive/constructivist research paradigm document reviews, interpretation of human experiences and construction of reality as presented by varied by online education studies were applied (Mackenzie & Knipe, 2006; Creswell, Shope, Plato Clark, & Green, 2006; Mertens, 2005).

The study employed "narrative research" method, where online educational narratives were collected and the themes found in these narratives were analyzed (McQueen, & Zimmerman, 2006, p.475). Narrative Inquiry has been established as a research method, and according to Webster and Martova (2007) Narrative Inquiry is presented as "an up-to-date introduction to the topic, demonstrating the value and utility of employing a critical event approach to narrative as a research tool in a wide range of teaching and learning settings" (p.2).

The understanding of the narrative research method was enhanced by "meta interpretation" for the interpretation synthesis of online education by weaving together the discussions of the earlier studies, their findings, and the conclusions (Weed, 2005, para. 1).

Finally, the study took a deliberate reflection on varied resources on online or internet education, analyzed them, and identified patterns of online education and the use of varied technological tools to determine the effectiveness of online educational technological tools, and the challenges ahead (Del Carlo, Hinkhouse, Isbell, 2009).

Hence based on the above research methods the following research questions to guide the study were established: (1) what is the definition of the online educational technological tools? (2) What are some of the advances made using online educational technological tools for teaching and learning? (3) What are some of the advantages of using online technological tools for teaching and learning? And, (4) what are some of the challenges of online educational technological tools for teaching and learning.

REVIEW OF LITERATURE

The process of literature review was applied to determine the effectiveness of educational technological tools has on online education and the challenges that lay ahead. This objective was achieved by examining the definition of online education and educational technological tools, by showing some of the advances made using online educational technological tools for teaching and learning, by presenting some of the Technological Tools (Technologies) influencing online Teaching and Learning, and by providing some of the advantages of online education, and the challenges that lay ahead.

The Definition of Online Education and Educational Technological Tools

The online education could be viewed as an education that is received through the use of varied technologies; whereas, educational technological tools are perceived as the technology that drives the online education through internet as the main compelling instrument. Online education has embraced the use of technology as a tool in all its instructional and learning processes, and both faculty and students cultivate the technology intelligence to acquire the needed technological literacy and competencies to succeed in both teaching and learning (Moore, 2006; Purcell & Wilcox, 2007; Jenkins, 2007). Online education is distance education which utilizes internet based delivery, and it employs internet based technologies (Kaya, Kesan, & Izgiol, 2013; Cejda, 2010; Johnson, 2004; Ahern & Repman, 1994). In the internet based delivery, community colleges and universities have relentlessly embarked on online education where curriculum developers and course administrators have included varied courses in the course shells. Consequently, full time and part time faculty members are contracted to teach courses that may be already prepared, or the courses they collaboratively prepare.

In trying to understand what online education is, Milman (2010) shows other terms used to mean online education such as "distance education, distance learning, e-learning, online education, online learning, virtual education, or web-based instruction" (p.95; Kaya, et al., 2013). The online education platform comes as a powerful alternative to face to face learning, where courses at all levels could be delivered in an hybrid format - half time on-site and half time online, or completely delivered through internet based format.

Some of the Advances Made Using Online Educational Technological Tools for Teaching and Learning
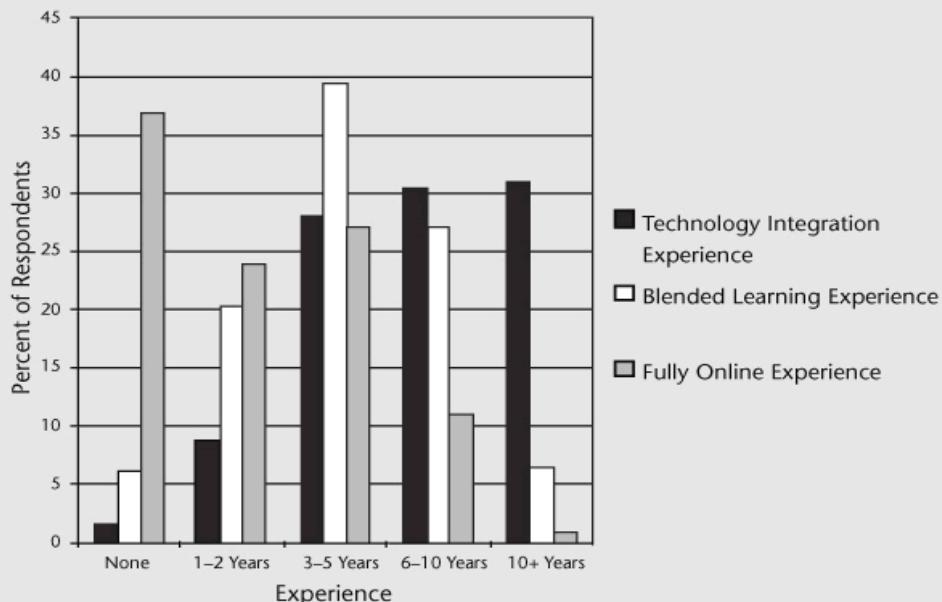*Teaching*

Teaching is a strong ingredient of online education which irresistibly has grown like a wild fire penetrating PK-12 education, colleges, and universities (Cejda, 2010; Sener, 2010). Although face to face teaching and learning is not totally wiped out of the face of the educational field, it is palpable that online education is rapidly expanding and its growth is "by leaps and bounds across all sectors of education, from corporate training to higher education to [P] K-12 education settings" (Milman, 2010, p.95). In the beginning, most colleges and universities did not think that online education will grow until recently when these public and private institutions embarked on online education by competing with those who had established themselves as pioneers of online education. In these days you can hardly open laptops, iPads, smart phones, or desk computers without seeing online education presented by myriads of private and public universities advertising their online educational programs. This is not a bad trend, but it comes with its own price of quality of education provided due to some of the schools just putting out programs out there without academic scrutiny only assured by accreditation institutions of education at the state and the national levels.

Pedagogy as we know it has been transformed in the online teaching platform. Faculty have brought into the online teaching and learning enhanced collaboration, case and problem based learning instructional strategies (Kim & Bonk, 2006). Faculty-student and, student-student discussions and dialogues as teaching and learning methods have successfully been carried out by using online education. Consequently, faculty effectiveness in meeting students' learning needs has improved, and students' critical thinking and problem solving skills have been enhanced by the use of online technology. When online education is well established and the Learning Management Systems are up to date, discussion board, faculty virtue office, and student lounge are provided to enhance teaching and learning. Online teaching faculty are able to meet students' felt learning needs in the virtue office, and students are able to communicate and provide feedback to their fellow students in the student lounge. What a benefit these technological tools are to online teaching and learning!

Studies demonstrated that by 2004, we had 2.35 million students taking their courses online, the concern for quality online education was amounting, some of the ways of increasing quality of online education was to train and support full time faculty and part time faculty involved in online teaching (Kim & Bonk, 2006). Figure 1 shows the teaching experience of faculty after taking a survey seeking to understand years of experience with online teaching.

Allen and Seaman (2008) in their study found that by 2007 the increase of online education had grown from the 2.35 million online students to "Over 3.9 million students" who were taking online classes (p.2). This study continued to show 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.2). The obvious result of this growth lead to competition over online students by public, private nonprofit and private for-profit learning institutions as provided in the following table 1 (Allen & Seaman, 2007).

Figure 1

Years of Experience with Online Teaching

Source: Kim & Bonk, C. J. (2006). *The future of online teaching and learning in higher education: The survey says.* In this 2006 study which included surveying professors, instructors, or lecturers, administrators or instructional designers showed that more than 53% of online teaching were women more than anticipated, and the reason might have been that "Perhaps female instructors had become more comfortable teaching and sharing activities online during the few years that elapsed between surveys, or perhaps support for instructors had improved on college campuses, or both" (Kim & Bonk, 2006, para.13).

TABLE 1
ONLINE ENROLLMENTS

Public	74.00%
Private, nonprofit	62.00%
Private, for-profit	69.20%
Doctoral/Research	64.20%
Master's	76.70%
Baccalaureate	57.70%
Associate's	75.60%
Specialized	56.10%
Under 1500	62.90%
1500 to 2999	66.70%
3000 to 7499	78.70%
7500 to 14999	76.50%
15000+	69.10%

Currently the number of students taking online courses has grown with substantial increase from 3.9 million online students in 2007 to 6.7 million in 2013 (Allen & Seaman, 2013).

Learning

The belief that technology brings positive influence on student learning has aroused interest among the schools, curricular preparers, parents, business people, and consequently government programs all over the world have been created to embrace the learning benefits of online education (Hew & Brush, 2006). Online learning was not only a challenge to institutions and faculty, but to students too. Students' experiences of online education and the learning processes was alien as contrasted with the long-felt blessings of face to face learning experience. As lifelong learners, faculty and practitioners in the higher education, we can testify of the real blessings of teaching and learning in the face to face model. The discussions and the collaborative learning strategies were extremely appealing. In my classrooms, discussions and dialogues with my students demonstrated that their levels of satisfaction in the four block classrooms were very high.

Nevertheless, the promising blessings of learning when at home or anywhere in the world with the help of computers, laptops, ipads, note books, tablets, etc., are charming and both faculty and students have very quickly adapted to the new technologically rich learning environment. Therefore, with the acceptance of the online education today students in colleges and universities enjoy learning in the hybrid or totally online learning environments. In the process, students have become better and better in using online technologies in their learning and as demonstrated in the recent studies e-learning has positively affected teaching and learning (Yuan-Hsuan, Waxman, Jiun-Yu, Michko, & Lin, 2013, Tella, 2011). Sener (2010) predicting the growth of online education showed that "online education will reach full scale" with the characteristics of being a routine, becoming a significant facet of students' learning experiences, accepted at the collegiate level to the university, blended learning becoming a norm, and growth of online education breeding more growth (p.4).

The most appropriate question at this point to ask is, if online education has grown this rapidly does it assure that the learning outcomes have increased when compared to face to face learning? The study by Allen and Seaman (2013) provides an adequate answer to this question by showing that "In the first report of this series in 2003, 57.2 percent of academic leaders rated the learning outcomes in online education as the same or superior to those in face-to-face. That number is now 77.0 percent" (2013, p.5). However, as shown in the same study a small number of 23% of academic administrators hold on to the inferiority of online education compared to face to face teaching (p.5).

Some of the Effective Technological Tools (Technologies) Influencing Online Teaching and Learning
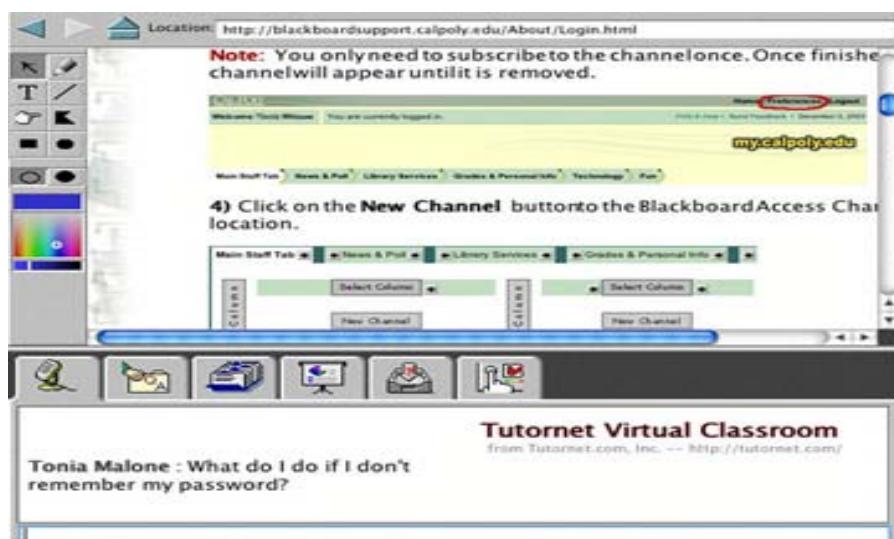
There are several technologies which have proven effective in driving teaching and learning to higher heights in higher educational learning environments. Some of these include the blackboard, ecollege - classlive pro, moodle, Desire 2 Learn, Angel, webCT, skype, moocs, and webex. These technologies also known as the Learning Management Systems could be used interchangeably to enhance effective teaching and learning.

These technologies are part of the information communication technologies (ICT) which has constituted e-learning and at the same time enhancing teaching and learning in higher education where universities and colleges are competing for student enrollment. In the beginning private universities and colleges seemed to be in the forefront of the use of e-technology in teaching and learning, but in these days all universities and colleges, state governed or non-state governed are using ICT in their course delivery (Sander & Gale, 2012; Tella, 2011) "to support learning" (Tella, 2011, p.56; Lai & Savage, 2013). Hence, ICT has become "a central construct that enables and/supports the process of e-learning" and has made great gains in the last thirty years (Tella, 2011, p.56). In order to effectively utilize e-learning in teaching, faculty and program care takers have used course management system (CMS) using software program(s) which use web-based tools to create learning activities for students. These learning management systems (LMS) include Blackboard, e-college, iLMs, Canvas, etc.

Blackboard Learning Management System

The Blackboard Learning Management System   as shown in table 2 and table 3 is a "tool that allows faculty to add resources for students to access online," and it includes "PowerPoint, Captivate, video, audio, animation, and other applications are created outside of Blackboard and added into Blackboard courses for students to enhance teaching and learning efforts" (What is blackboard? Para.1).

TABLE 2
BLACKBOARD

Source: http://blackboardsupport.calpoly.edu/content/about/whatis.html

With the use of virtual classroom tool, students and teachers can chat, and teachers use the whiteboard, and blackboards collaborate to communicate and teach in real time experience. Using this discussion tool, students can post their research papers to each other for peer evaluation and feedback. This is a great tool because it can enhance cooperative and team learning strategies we want to develop in our students. See the Blackboard LSM in the Open House - LMS Comparison Demo: http://www.youtube.com/watch?v=aeF1xbyujkY

TABLE 3
COURSE DISCUSSION

Source: http://blackboardsupport.calpoly.edu/content/about/whatis.html

Benefits of Blackboard Learning Management System

As describe by Bradford, Porciello, Balcon, and Backus (2007), some of the noticeable benefits of blackboard learning management system (LMS) include: increased availability, quick feedback, and improved communication in terms of announcements, discussions, virtual classroom, and email, tracking students learning activities, skill building in terms of organization, and time management (p.2-3).

Drawbacks of Blackboard Learning Management System

Although the blackboard LMS has shown growth, its drawbacks are a great concern. These drawbacks involve: (a) the software is harder to learn than expected; (b) Certain options may be restricted to specific operating systems; (c) there are inefficiencies in bandwidth use when materials have to be downloaded every time access is sought; and (d) cost.

e-College Learning Management System

e-college by Pearson is one of their learning management systems (LMS) in teaching and learning, and it has improved since its inception to include course management tools such as course home and its pertinent elements, units of study, course administration, gradebook, email, live, doc-sharing, dropbox, webliography, technical support, ClassLive Pro etc. The Person e-college LSM video explains it better: http://www.youtube.com/watch?v=yiwVlfYirFg. Also, see course home sample in this video: https://www.youtube.com/watch?v=9zZ4J-f7uHU.

However, e-college has two noticeable weaknesses, and these include, (a) using a borrowed blackboard collaborate for ClassLive Pro learning experience, and (b) the help desk assistance is not available when you most need it.

iLMS – Inspired Learning Management System

The iLMS is a platform that is used to manage "both online and instructor-led training" (http://www.ilms.com/?gclid=CJDQ6NHU2bwCFQ-DfgodtG4Acg). The compatible tools used by iLMS for eLearning include: Adobe Captivate, Articulate Presenter, TechSmith, Camtasia, Integrated iComposer (http://www.ilms.com/authoring-tools). See iLMS Instructor led training video: http://www.inspiredelearning.com/lms/lms_tutorials.htm#10

Canvas Learning Management System

Many universities and colleges have eyed on the Canvas LMS. With rapid growth and competition of which Learning Management System can best deliver educational programs, and the fact that the old systems give way to the new, Canvas LMS is appealing to college professors and students. Its layout is much better and appealing to the eye, assignments are in the grade tab and this impresses students because they are able to see the assignments to be graded, and it is stable than other Learning Management Systems (The Breeze, http://www.breezejmu.org/opinion/article_bddd22a6-8243-11e3-ae9b-0019bb30f31a.html).

Other Learning Management Systems (LMS)

There are many other Learning Management Systems, and some of these include: moodle, desire2learn, sakai, jenzabar, angel learning, cengage learning/mindtap, loudcloud, adrenna, McGraw-Hill connect, absorb, active learner, blue volt, cerPoint, coggno.com, conductor, consensus, dita solutions, DuPont, education director, Ed LCMs, ethosCE, eTrainerCenter, exceed, gyrus, halogen, informetic, inquisiqr3, intralearn, joomla, knoodle, knowledge net, oeritel, litmos, etc. http://www.longsight.com/technologies/sakai-technology-comparison; http://www.leftbrainmedia.com/2.1_lms_systems.html).

Moreover, the most popular LMS software solutions include: moodle, edmodo, skill soft, cornerstone, schoology, desire2learn, sumtotal system, net dimentions, collaborize classroom, interactyx, docebo, instructure, meridian knowledge so, latitude learning, eduneering, mziga, epsllen, and inquisiqr3 (http://edudemic.com/wp-content/uploads/2012/10/top-20-lms-software-solutions.png).
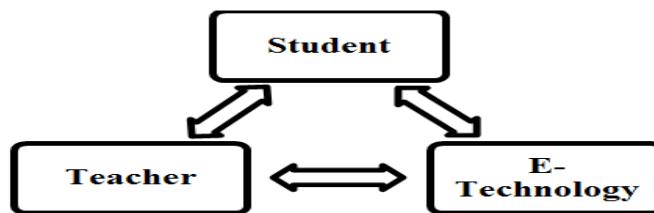
The Advantages of Online Education

In a traditional classroom, the teacher – student relationship is linear, one way, and the teacher knows everything and passes knowledge to students who are relatively passive. In this model, the teacher owns knowledge and doesn't care to provide feedback to students' work informing them of the review and the results of their work (Fu, 2010). Students have difficulties trying to understand the teacher, and they are prone to not develop thinking skills. On the other hand, students do not provide feedback to the teacher, and the teacher doesn't know whether he is effectively teaching or communicating to students which is necessary in enhancing learning in and outside the classroom. This relationship could be best illustrated in Figure 2.

FIGURE 2
TEACHER – STUDENT ONE SIDED RELATIONSHIP

With the advent of technology, teaching has dramatically changed and students have an added learning aid in technology. Here, the teacher receives feedback from students, and students likewise are able to receive feedback from their teachers. This is best demonstrated in figure 3.

FIGURE 3
TEACHER – STUDENT – E-TECHNOLOGY RECIPROCAL RELATIONSHIP

In this triangular teacher – student relationship, effective teaching and learning is the outcome which irrefutably provides a healthy and democratic learning environment. Students are at the center, and they benefit from both the teacher and the e-technologies. Hence, e-technologies have considerably transformed the way students learn, and what they learn. At the same time teachers of the 21century are the beneficiaries of internet assisted teaching and learning. Moreover, Fu (2010) shows that "Based on constructivism, a teacher is a helper, an assistant, and a facilitator in the process of the students' meaning construction" (p.414). Students do not wait for a week before teachers respond to their questions because teachers can respond and provide feedback on students' work in a twinkling of an eye through ipads, smart phones, iphones, or laptops. Likewise, students are able to submit their questions, and class assignments to their teachers on a timely manner as opposed to the 20th century learning environments which were surrounded by problematic type writers, and printers. The five notable advantages of using e-learning include:

- Convenience.
- Time efficiency.
- Accessibility.
- Dynamic interactions.
- Creativity. (http://www.webanywhere.org/blog/top-5-advantages-of-using-e-learning-for-schools/)

The Challenges Ahead

In the same way mobile learning has developed and faces daily challenges such as affordability by all students (Mbuva, 2012), internet technology has progressed and has been used in the educational and business arena, but there are current and foreseeable challenges that technology users ought to consider and tackle in their way forward. Some of these challenges include:

- Equity and accessibility to technology.
- Improving achievement.
- Delivering value & Affordability.
- Hidden costs problem.
- Computer literacy.
- Major self-discipline is required.
- Not fit for every style and kind of learning.
- Minimal social interactions.
- Staying motivated.
- Difficult to improve oral communication.
- Technical problems.
- Lack of essential online qualities.
- Lack of adequate training for faculty and online administrators (Whitehead, 2005, para. 3-6; Salsbury, (n.d), para. 1-4; Weaknesses of Online learning, para. 1-5).

CONCLUSIONS

The study found that online education or internet based delivery, distance education, use varied learning management systems to enhance both teaching and learning. Both colleges and universities have embarked on hybrid and totally online educational system which is growing like wildfire.

The success of the effectiveness of the online education we have achieved over the years in terms of teaching and learning technologies are overwhelming. Some of the learning management systems developed by Blackboard, e-college, iLMS, Canvas, and the like have attracted e-teaching and e-learning immensely. More fine-tuning and springing up of more technologies of online education are inevitable. Undoubtedly the advantages of online teaching and learning to both students and faculty extends from a virtue classroom, to convenience, time efficiency, accessibility, dynamic interactions between students and teachers, and students and students, and the immensity of creativity generated in the process. Evidently these learning management systems perceived as online educational technological tools have enhanced online education in general, and have made online teaching and learning more meaningful and easily communicated than before. And, this is an authentic attestation of the effectiveness of educational technological tools.

However, the challenges of online education such as equity and accessibility to technology by all students, improving achievement, delivery value and affordability, hidden costs problem, computer literacy, requirement of self-discipline, online education not fitting all learners, minimal social interactions, adequate faculty training, and staying motivated must be addressed to enhance sustainability.

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APPENDIX A

BRIEF TIMELINE OF THE INTERNET TECHNOLOGY FROM 1958-2007
HTTP://WWW.WEBOPEDIA.COM/QUICK_REF/TIMELINE.ASP

1958	. President Eisenhower requests funds to create <u>ARPA</u>. Approved as a line item in Air Force appropriations bill.
1961	. Len Kleinrock, Professor of Computer Science at UCLA, writes first paper on <u>packet switching</u>, "Information Flow in Large Communications Nets." Paper published in RLE Quarterly Progress Report.
1962	. J.C.R. Licklider & W. Clark write first paper on Internet Concept, "On-Line Man Computer Communications." . Len Kleinrock writes Communication Nets, which describes design for packet switching network; used for ARPAnet
1964	. Paul Baran writes, "On Distributed Communications Networks," first paper on using message blocks to send info across a decentralized network<u>topology</u>(Nodes and Links)
Oct. 1965	. First Network Experiment: Directed by Larry Roberts at MIT Lincoln Lab, two computers talked to each other using packet-switching technology.
Dec. 1966	. ARPA project begins. Larry Roberts is chief scientist.
Dec. 1968	. ARPANet contract given to Bolt, Beranek & Newman (BBN) in Cambridge, Mass.
Sept. 1, 1969	. First ARPANet <u>node</u> installed at UCLA Network Measurement Center. Kleinrock hooked up the Interface Message Processor to a Sigma 7 Computer.
Oct. 1, 1969	. Second node installed at Stanford Research Institute; connected to a SDS 940 computer. The first ARPANet message sent: "lo." Trying to spell log-in, but the system crashed!
Nov. 1, 1969	. Third node installed at University of California, Santa Barbara. Connected to an <u>IBM</u> 360/75.
Dec. 1, 1969	. Fourth node installed at University of Utah. Connected to a <u>DEC</u> PDP-10.
March 1970	. Fifth node installed at BBN, across the country in Cambridge, Mass.
July 1970	. <u>Alohanet</u>, first packet radio network, operational at University of Hawaii.
March 1972	. First basic <u>e-mail</u> programs written by Ray Tomlinson at BBN for ARPANET: SNDMSG and READMAIL. "@" sign chosen for its "at" meaning.
March 1973	. First ARPANET international connections to University College of London (England) and NORSAR (Norway).
1974	. <u>Intel</u>releases the 8080 <u>processor</u>. . Vint Cerf and Bob Kahn publish "A Protocol for Packet Network Interconnection," which details the design of <u>TCP</u>.
1976	. <u>Apple Computer</u> founded by Steve Jobs and Steve Wozniak. . Queen Elizabeth II sends out an e-mail. . Vint Cerf joins ARPA as program manager.

1978	. TCP split into <u>TCP and IP</u>.
1979	. Bob Metcalfe and others found <u>3Com</u> (Computer Communication Compatibility).
1980	. Tim Berners-Lee writes program called "Enquire Within," predecessor to the <u>World Wide Web</u>.
1981	. IBM announces its first Personal Computer. <u>Microsoft</u> creates <u>DOS</u>.
1983	. <u>Cisco Systems</u> founded.
Nov. 1983	. <u>Domain Name System</u> (DNS) designed by Jon Postel, Paul Mockapetris, and Craig Partridge. .edu, .gov, .com, .mil, .org, .net, and .int created.
1984	.William Gibson writes "Neuromancer." Coins the term "<u>cyberspace</u>". . Apple Computer introduces the Macintosh on January 24th.
March 15, 1985	. Symbolic.com becomes the first registered domain.
1986	. 5000 <u>hosts</u> on ARPAnet/<u>Internet</u>.
1987	. 10,000 hosts on the Internet. . First Cisco <u>router</u>shipped. . 25 million PCs sold in US.
1989	. 100,000 hosts on Internet. . McAfee Associates founded; anti-virus software available for free. Quantum becomes America Online.
1990	. ARPAnet ends. <u>Tim Berners-Lee</u> creates the World Wide Web.
1992	"Surfing the Internet" is coined by Jean Armour Polly.
1993	. <u>Mosaic</u> Web browser developed by Marc Andreesen at University of Illinois, Champaign-Urbana. . <u>InterNIC</u>created. . Web grows by 341,000 percent in a year.
April 1994	. <u>Netscape Communications</u> founded. . Jeff Bezos writes the business plan for Amazon.com. . <u>Java</u>'s first public demonstration.
Dec. 1994	Microsoft licenses technology from Spyglass to create Web browser for <u>Windows 95</u>.
May 23, 1995	. <u>Sun Microsystems</u> releases Java.
August 24, 1995	. Windows 95 released.
1996	. Domain name tv.com sold to CNET for $15,000. Browser wars begin. Netscape and Microsoft two biggest players.
1997	. business.com sold for $150,000.
January 1998	. Microsoft reaches a partial settlement with the Justice Department that allows personal computer makers to remove or hide its Internet software on new versions of Windows 95. . Netscape announces plans to give its browser away for free.
1998	. US Depart of Commerce outlines proposal to privatize DNS. <u>ICANN</u> created by Jon Postel to oversee privatization. Jon Postel dies.

1999	. AOL buys Netscape; Andreesen steps down as full-time employee. . Browsers wars declared over; Netscape and Microsoft share almost 100% of browser market. . Microsoft declared a monopoly by US District Judge Thomas Penfield Jackson. . Shawn Fanning creates Napster, opening the possibilities of peer-to-peer file sharing and igniting a copyright war in the music industry.
2000	. Fixed wireless, high-speed Internet technology is now seen as a viable alternative to copper and fiber optic lines placed in the ground. . The Dot-Com Bubble bursts. A majority of the dot-coms ceased trading after burning through their venture capital, often without ever making a net profit.
January 10, 2000	. AOL Merges with Time-Warner. AOL shareholders take 55% stake in newly formed company.
February 2000	. A large-scale denial of service attack is launched against some major Web sites like Yahoo! and eBay, alerting Web sites to the need for tighter security measures. . 10,000,000 domain names have been registered.
September 2000	. There are 20,000,000 websites on the Internet, numbers doubling since February 2000.
July 2001	. A federal judge rules that Napster must remain offline until it can prevent copyrighted material from being shared by its users. . The Code Red worm and Sircam virus infiltrate thousands of web servers and email accounts, respectively, causing a spike in Internet bandwidth usage and security breaches.
November 2001	. The European Council adopts the first treaty addressing criminal offenses committed over the Internet. . First uncompressed real-time gigabit HDTV transmission across a wide-area IP network takes place on Internet2.
January 2002	. name begins resolving
January 2003	. The SQL Slammer worm causes one of the largest and fastest spreading DDoS attacks ever, taking only 10 minutes to spread worldwide. . The Internet celebrates its 'unofficial' 20th birthday.
September 2003	. The RIAA sues 261 individuals for allegedly distributing copyright music files over peer-to-peer networks
December 2003	. The Research project "How much information 2003" finds that Instant messaging generates five billion messages a day (750GB), or 274 Terabytes a year and that e-mail generates about 400,000 terabytes of new information each year worldwide.
2005	. YouTube.com launches
2006	. There are an estimated 92 million Web sites online
May 2006	. A massive DDOS assault on Blue Security, an anti-spam company, is redirected by Blue Security staff to their Movable Type-hosted blog. The result is that the DDOS instead knocks out all access to over 1.8 million active blogs.
August 2006	. AOL announces that they will give for free virtually every service for which it charged a monthly fee, with income coming instead from advertising.
October 2006	. There are an estimated 92 million Web sites online (some stats say over 100 million) . Google Inc. acquires YouTube for $1.65 billion in a stock-for-stock transaction.

January 2007	. Microsoft launches its various consumer versions of Microsoft Vista.
February 2007	. Apple surpasses one billion iTunes downloads.
March 2007	. 1.114 billion people use the Internet according to Internet World Stats.
April 2007	. Search engine giant Google surpasses Microsoft as "the most valuable global brand," and also is the most visited Web site.