

# **A Survey of Technologies and Trends for On-line Communication, Teaching and Learning**

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## **Abstract:**

With so many technologies available today to help support and promote an institution's campus culture, students and instructors feel overwhelmed with what they should use for enhancing communication. Trends like "Facebook", "Twitter", "Google +", "Skype", "You-Tube" and "Line" are making the rounds in education, but what do these trends mean for instructors and students, and how are they affecting teaching and learning practices and communication? For example, if smart devices and applications are popular among students, which ones are most popular, and why does this matter? And if emails were all the rage in the last few decades, what are the new modes of communication in the coming years? From having a good social media strategy to planning for better communication, there are at least a dozen or more technologies that every Thai university campus should plan for immediately. Many of these technologies may seem simplistic, but they can get caught in the campus policies and politics if ICT teams are not careful; for example, providing high-speed 3G/4G networks that can support multiple devices, or offering 24x7 ICT support to instructor and students. Some of the other trends mentioned in this paper may seem like frivolous, such as a targeted social media or learning analytics, but they are not only critical for enhancing communication for teaching and learning but also relevant for attracting prospective students. Are there trends the Thai campuses are missing or perhaps trends they don't see necessary to invest and implement? This paper traces the history of various technologies and identifies different strategies for enhancing communication for teaching and learning.

**Keywords:** Communication, eCampus, Internet, Social Media

## **Introduction**

Communication is defined as the process of imparting or conferring, or delivering, from one to another person or people. Human communication is a means of expressing, exchanging feelings, thoughts and information by means of signals, visuals, speech, writing and behavior. Through centuries the evolution of human communication is well recorded. In this section the author has synthesized information from various web portals to provide important milestones. All sources for the facts and figures covered in this paper have been cited. Over centuries of evolution the modes of communication has undergone drastic changes. In the early days, the nomadic people

communicated through signs. As human civilization progressed sounds were used to communicate. For example, fast paced drums sound indicated that some dangerous creature is approaching or a rhythmic melodic sound indicated joy. Later humans found chalk, charcoal, pigments and other painting materials. With the help of animal scales, bones, charcoal and pigments, the Neanderthal man started painting. Different tribes communicated through the means of paintings and drawings. Over the centuries of evolution human beings invented scripts, languages, paper, printing, books (Figure-1) and news papers to share information within their habitats. In the middle of the 20<sup>th</sup> century, telephone, radio, television was born. In 1980 the birth of Internet revolutionized the modes of communication around the world.

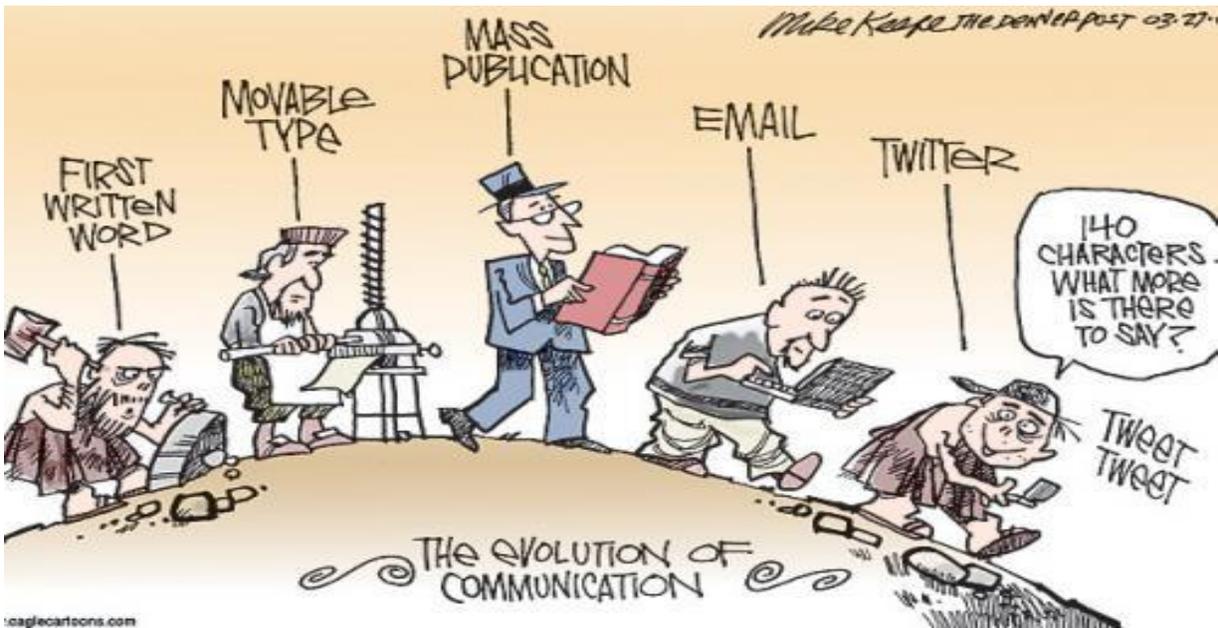


Figure 1: Evolution of Communication

(Source: <http://www.techandbrands.com/tag/android/>)

In this new century, Internet, Social media and smart phones have taken human communication to an altogether new level. Voice messages are now replaced by SMS and static voice calls are replaced with live video conferencing. People all over the world now use various applications such as Google Talk, Skype, Line, WhatsApp, Viber, Wechat and many other services for instant communication. Before we discuss the importance of modern communication technologies in teaching-learning let us look at the brief history of audio devices, starting with the invention of the telephone.

## A brief history of communication technologies

### *i. Telephone- a unicast medium for voice communication*

It was in 1876 Alexander Graham Bell invented the telephone giving a start to remote voice communication in USA. Western Union had first telephone line in operation between Somerville, MA and Boston, USA. In 1885 The Bell Telephone Company formed a new subsidiary, American Telephone & Telegraph (AT&T). In the next 60 years lots of development occurred in the field on engineering leading to modernizing of the telephone.

The first design of upright telephone popularly known as a candlestick Telephone No 150 (Figure-2) was introduced in the 1920s but some remained in service into the 1950s and even beyond. 1956 Bell System and the British Post Office inaugurated their services on a transatlantic telephone cable, TAT-1. Not quite what one would consider a mobile phone, the SCR-194 and 195 were the first portable AM radios, produced by the U.S. Army Signal Corps Engineering Laboratories in Fort Monmouth, N.J. USA? They were widely used for infantry intercommunication during World War II and now they are replaced by smart phones.

Mobile radio telephone systems preceded modern cellular mobile telephony technology. Since they were the predecessors of the first generation of cellular telephones, these systems are sometimes retroactively referred to as pre-cellular (or sometimes called Zero Generation= 0G) systems. These mobile telephones were usually mounted in cars or trucks, though briefcase models were also made. They were sold through WCCs (Wireline Common Carriers, AKA telephone companies), RCCs (Radio Common Carriers), and two-way radio dealers.

In 1973 with a prototype of the DynaTAC (DYNAMIC Adaptive Total Area Coverage) portable phone, former Motorola Vice President Martin Cooper made the first private, practical mobile phone call in a non-vehicle setting. 10 years later after the prototype, Motorola's DynaTAC cellular phone was made available to the public, weighing less than 2 pounds, but costing nearly \$4,000 (almost \$9,000 today)-which is why it was strictly for the wealthy of the world.



Figure-2: Evolution of Smart Phone

(Source: [http://www.samhallas.co.uk/collection/bakelite/150\\_auto.jpg](http://www.samhallas.co.uk/collection/bakelite/150_auto.jpg))

Next up was Motorola's MicroTAC, which introduced the first flip phone design. By 1999 one of the most popular mobile phones in history was the Nokia 3210, with over 160 million sold. It was one of the first to allow picture messages, but only preinstalled ones like "Happy Birthday" and was one of the first targeted toward young people. In 2007 Steve Jobs introduced the Apple iPhone, a revolutionary touch screen Smartphone. It wasn't the first Smartphone, but it was the first to get the user interface right, eventually adapting 3G technology which was already available since 2001. At this time in 2014 there are more than 100 companies worldwide which are manufacturing a wide variety of Smart phones. Most popular among them are Apple, Samsung, Sony, Blackberry and Nokia which is now owned by Microsoft.

ii. *Television- a broadcast medium for video transmission*

While the telephone revolutionized the mode of unicast communication another revolutionary broadcast technology called television got introduced in 1920s. The television has come a long way from its initial 1927 avatar, that of a radio with visual projection capabilities. Since then the black and white television (Figure-3) has evolved into a powerful global media. The first mechanical television station in America was called W3XK. This station was the brainchild of Charles Francis Jenkins, who is also remembered as the father of American television. The station aired its first broadcast on 2nd July, 1928. It was on July 1, 1941 when the first ever commercial broadcast took place in America. All broadcasts prior to this day were regarded as experimental by the FCC, thus making this day very important in American TV history. This day is also very special because the first American TV advertisement was aired. The commercial was for a Bulova Watch and lasted just for 10 seconds. It was aired on the NBC network in USA.



Figure-3 First Television (1934)  
Source: en.wikipedia.org

With the expansion of cable networks the television became the most powerful medium around the world. For more than 60 years TV remained a dominant global broadcast medium providing news, entertainment and information to enhance education at all levels. With the advent of Internet in 1992 communication technologies have taken a new path. Portals such as You-Tube

and many other steaming channels on the Internet are replacing television. Now anyone with a digital camera can record and upload a video on You-Tube and share it with people around the world in few minutes. Smart phones and various video conferencing applications such as ooVoo, Skype, Tango, Hangout, Peer, Wiber, Camfrog and Line are changing the ways we use multimedia for communication.

### Internet –A new medium for global communication

In 1992 World Wide Web, the brain child of CERN physicist Tim Berners-Lee was born. Later in that year first audio and video multicasts are broadcast over the Internet. After a year the first Internet browser MOSAIC was introduced at the University of Illinois. Expansion of the Internet led to creation of Netscape and later many other browsers such Internet Explorer, Firefox and Google Chrome.

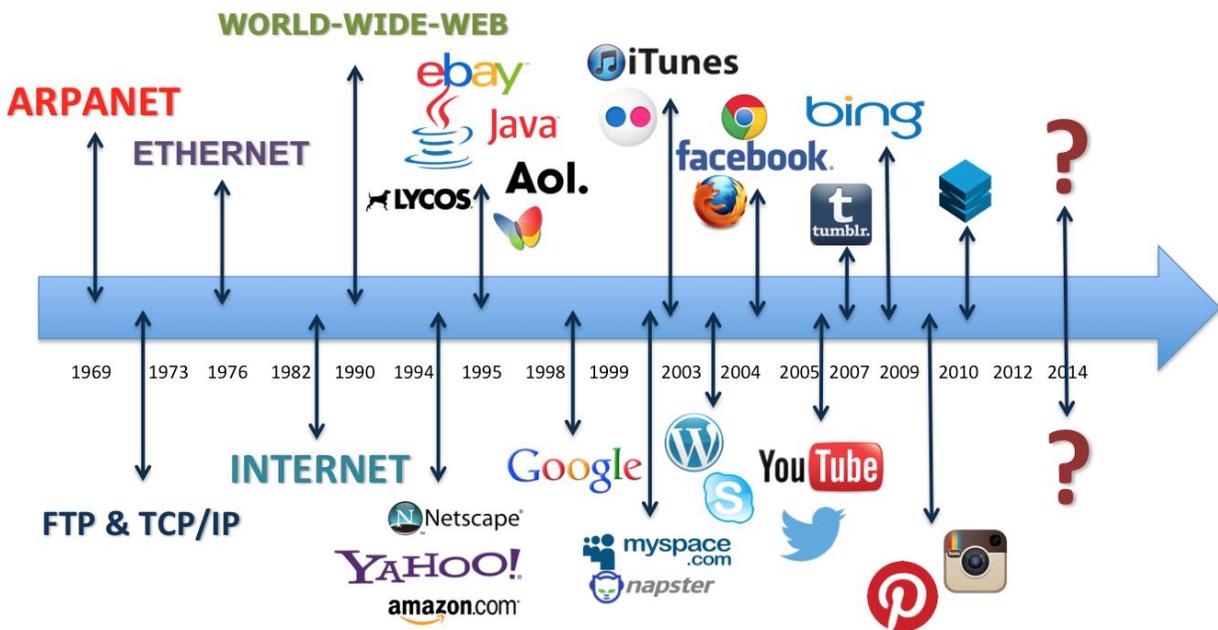


Figure-4: History of Internet- Time Line  
 Source: <http://malonemediagroup.com/>

In 1994 Real Audio was introduced to Internet which allowed one to hear in near real time. Radio HK, the first 24-hour Internet only radio station, started broadcasting. Now we have scores of 24 hour services such as iTune steaming audio on the Internet. A brief history of Internet is depicted in the Figure-4.

In this decade new technologies are growing at an unprecedented ways. New trends include Collaborative Environments, Mobile Applications, Social Networking, Augmented Reality, Learning Analytics, MOOCs, Personal Learning Environments (PLEs), Collective Intelligence Internet of Things (IoT), Natural User Interfaces and Wearable Technologies. All of these

technologies are directly or indirectly involved with enhancing quality of communication, teaching and learning. They are also playing an important role in enhancing quality of life.

### **New technologies and tools for enhancing teaching and learning**

Now let us examine the importance of communication in educational settings. Djukic (2011) emphasized the role of communication in both F2F classroom setting as well as in on-line learning environments. 21<sup>st</sup> century is marked with advances in portable devices and smart phones. Advancement in technologies certainly have enhanced enrollment in on-line programs. It is clear that rampant growth in the use of portable devices and smart phones have made it easier to communicate from any place at anytime. However, exactly how has technology changed and what are some of the implications for teaching and learning remains to be seen. Looking through the lens of the 4 Cs- 1) *Connectivity*, 2) *Communication*, 3) *Collaboration* and 4) *Content Management System* we can understand their increasing role in day-to-day communication as well as teaching and learning in schools, colleges and universities. Let us examine them one-by-one.

#### **1) *Connectivity***

In this new century improved connectivity to the Internet around the world has resulted in drastic improvement in communication. Connectivity (figure-5) is so much easier and faster due to advancements in the areas of broadband, virtual private networking (VPN) and expansion of 3G/4G wireless infrastructure. For example, it has been estimated that currently 90% of households in USA with a computer subscribe to broadband services. Broadband penetration has also increased in Thailand. Data shows that in 2013 there were more than 20 million Internet users in Thailand. According to Yuen (2014) these connectivity advances increasingly allow people to work from anywhere, and the greater bandwidth supports more data rich forms of communication.



Figure-5: Improved Connectivity

The creation of web based services such as Wikis, Blogs, Social Networking sites such as LinkedIn, Facebook, and cloud based services such as Google Docs, and workflow systems make it easier for ordinary people, students and professionals to collaborate from remote locations.

## 2) *Communication*

Effective communication is an essential part of education. Lack of clear communication is one of the biggest causes of misunderstandings. There's been an exponential growth in educational technology advancement over the past two centuries. Teaching and learning environment in the 18<sup>th</sup> century was dominated by traditional methods of F2F lectures and note taking. Within a span of 125 years the use of slates (Figure-6), blackboards, and overhead projectors have been replaced by portable digital devices such as iPads and dashboards. It is not only important to understand which new technologies are coming next but also know where it is all going to lead?



Figure-6: Tools of Teaching & Learning

As more and more educational institutions compete for enrollment, the on-line communication tools have become a key factor in their success. Using various tools and technologies can help an institution's visibility on the medium such as the pages of the prestigious Google, Bing or Yahoo search engine results. Social media is becoming increasingly important for communication. Social media is a classification for a wide variety of popular technologies that are open, facilitate interactivity, and encourage connectivity. In the broadest terms, social media spaces exist as virtual places where people share; everybody and anybody can share anything from anywhere anytime.

Khalil (2013) demonstrated that using social media increased retention of minority students in his Visual Basic courses. Djermanov, et al (2011) based on their empirical studies concluded that qualitative progress from techno-centric to more reflexive, innovative and creative use of technology is happening in higher education. Tsai & Shen (2014) suggest that teachers who do not have the knowledge or skills to build a course website or record digital content could now easily provide existing online materials (such as MOOCs) for their students to improve their learning. Khan Academy ([www.Khanacademy.org](http://www.Khanacademy.org)) is one of the best examples of a world-class free portal available to enhance teaching and learning in science and mathematics.

Joosten (2012) noted that since many social media tools are not institutional enterprise systems, educators are concerned about using them in the classroom. As a result of rapid increase in the use of social media many new tools have emerged to serve the local population. As an there are more than 20 million users of LINE (Figure-7) in Thailand.

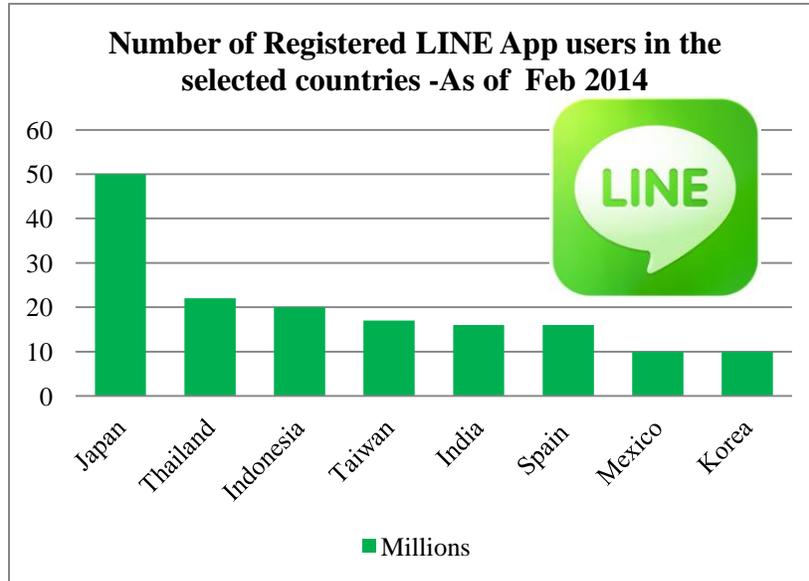


Figure-7: LINE Users in Thailand

Thailand Facebook demographics (Figure-8) are another statistics that indicates the increasing use of social media for personal communication. The largest age group of Facebook is currently 18-24, followed by users in the age group of 25-34.

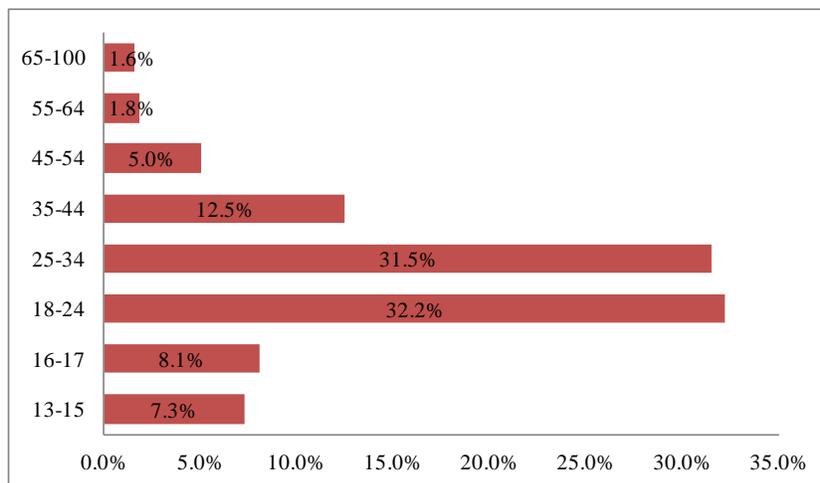


Figure 8: User Age Distribution- Facebook

Source: (Source: <http://www.socialbakers.com>)

There are many advantages of using social media in teaching and learning. Communication among the group members is much faster and cheaper than phone conversations. The communication data in social networks is easily stored and used for retention; it is also easy to monitor. Few other examples of various types of social media being used in Thailand are shown in Figure-9. A magazine advertisement may reach one person one time only. However, if students become fan in any social media the schools, colleges and universities can send a message to students over and over again. Traditional media is one way communication but social media is interactive. Social media makes it very easy to share content so the recipients can easily share messages with their network members. The effects of social media can be seen right away where in traditional media it may take months to see any media effect. Producing content is also faster in social media. It costs money to create a TV program or a radio program but maintaining a YouTube channel or a Facebook page does not cost much. The behavior of recipients in social media can be easily monitored hour by hour, day-by-day (such as likes, shares, views, comments, etc.).

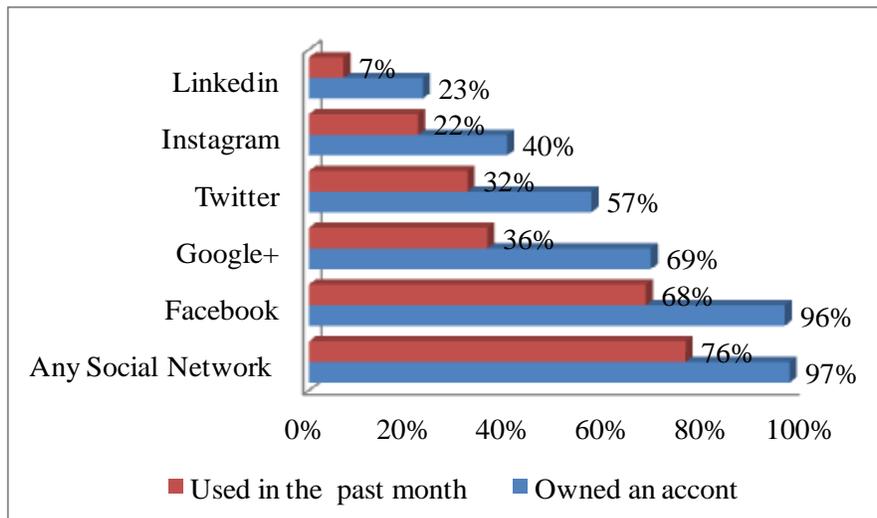


Figure 9: Thailand: Social Media Use

(Source: <http://globalwebindex.com>)

The surge in digital literacy (Hargittai 2005) indicates potential diversity and adoption of new devices affecting online behaviors. Growth of online content has enhanced the domains of social cohesion personal relations, group level interactions and macro social structures across the globe. There are 49% male users and 51% female users in Thailand, compared to 49% and 51% in France and 53% and 47% in Italy.

### 3) *Collaboration*

Silveira (2012) in his study found that learning changes with the construction of knowledge that is dynamic and shared, enabling new forms of practices which may enhance students' skills through cooperation and collaboration (Figure-10).

According to Robert (2005) improved connectivity and communication has also increased prospects of collaboration across national boundaries. To be collaborative is to disclose and make known both your knowledge and your perspective. An efficient collaborative partnership can honor, celebrate and embrace others for their contributions and lead to production of new knowledge. Collaboration knows no boundaries. We should also accept the fact that in social media collaboration will happen with strangers too. To yearn is to feel collaboration is an absolute necessity in education. Since the beginning of the Internet in 1997 various technologies and on-line services have been created to enhance collaboration among various organizations including schools, colleges and universities. In this decade, the expansion of Cloud Computing is providing a very powerful and cost effective framework for on-line collaboration.

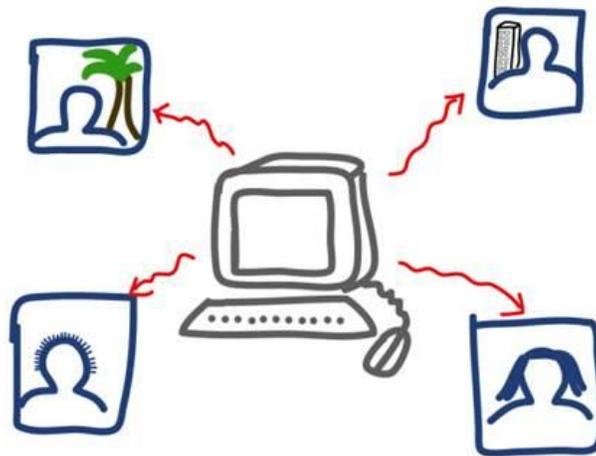


Figure-10: On-Line Collaboration

Various interactive, real-time collaboration tools that are available today make work easier- no matter where the people are located. Some of these tools are created specifically for designers, some serve as concept crafting whiteboards often with tools to make simple annotations, and some are all-in-one web applications that include facilities for project management. There are collaboration tools, from concept drafting and brainstorming to working on mock-ups and live project. Let us look at some of these tools. For example, *Yammer* is a social network for businesses owned by Microsoft. It provides a platform for anyone to communicate and collaborate privately with their colleagues. People sign in with a company email address and can use the platform via web, desktop or mobile devices to chat openly or privately, and share documents. Other important tools for online collaboration include *GoVisually* which allows

people to comment, annotate, and discuss; *Mindmeister* is a collaborative mind-mapping tool; *ConceptBoard* is an instant whiteboard tool for teams and projects; *Scribblar* is more like a chat room- it even has audio available- and as such it is very useful tool indeed; *BinFire* is an all-round project management tool, it is designed for team project follow-ups and collaboration; *Basecamp* has been around for over 10 years and is an approachable yet powerful project management tool; the latest version of *Concept inbox* features visual feedback and real time collaboration; *Canvasdropr* is a file sharing and annotating tool that supports many file types including MS Office documents, it's interface is very simple and easy to navigate. There are many more collaborative tools that are being used for in various businesses and academia.

**4) Content Management System (CMS)**

According to Sandeep (2013) Content Management Systems (CMS) at its heart is a front-end software platform. Let's say a school or college want to develop a learning website. The instructors need not possess technical knowledge of how web technologies work but must have very basic understanding of computing.

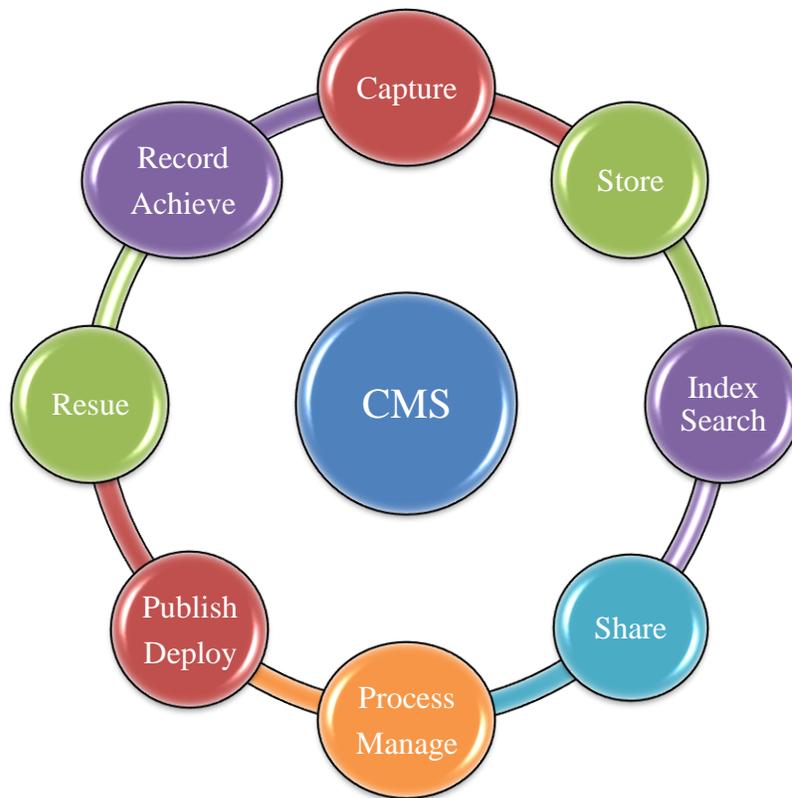


Figure-11: Content Management System

CMS are platforms (Figure-11) designed to manage the content of the web sites through an intuitive and easy to use interface Ion (2012). According to Svarre (2000) a Content Management System is composed of *Content Management Application - CMA* and *Content*

*Delivery Application - CDA*. As it turns out, that is all people need to design their website on CMS.

By using one, a user can upload images, format text, make navigation menus and more. In short, it gives an individual complete control over every aspect of their website, allowing them to add and remove features and functionalities without delving deep into code such as HTML, JavaScript, CSS, etc. That is not to say learning these languages is no longer important. But when time and lack of resources are a grim possibility, it pays to go for a CMS solution for personal as well as business needs.

### **eCampuses for better quality of communication, teaching and learning**

With large class size and increasing student expectations identifying effective feedback strategies and developing methods for providing feedback efficiently in courses remains a big challenge. Learning Analytics is new process to foster better pedagogy. According to - MIT Technology Review “big data and personal information are converging to shape the Internet’s most powerful and surprising consumer products. They’ll predict your needs, store your memories, and improve your life- if you let them.”



Figure-12: Mobile Devices

According to research, feedback on learning is a key factor in improved learning outcomes and student satisfaction. Kale (2013) examined pre-service teachers’ potential use of Web 2.0 technologies for teaching and found that giving effective feedback (Figure-12) can help drive students towards success in a course, while helping them to better understand the material.

However, feedback can also take a lot of time, so it is another factor to consider regarding faculty training and workload. Szatmary et al (2014) at the University of Washington, Seattle, USA found out that learning analytics automate data collection and mining and highlight areas that may need enhancement, repetition, or alternative strategies.

Denley (2012) has pioneered a wide variety of initiatives to improve college completion and students' academic success. These ideas stretch from institutional transformation and course redesign in a variety of disciplines, to the role of predictive analytics and data mining in higher education.

## **Conclusion**

The greatest challenge for educators who are trying to use Internet tools and technologies for enhancing communication is not falling prey to its ill advised failings, shallow comprehension, trivialization, passivity and lowered mental effort. It should be noted that task oriented, purpose based communication, where tools and technologies such as chats, forums, and social media are powerful means to cognitively engage them. Because of the immense capabilities of the Internet use of the right tools can generate interest and motivation to learn and explore a subject matter in greater depth. One approach to cultivating better communication for optimal learning outcomes is to develop a set of learning activities based on clear objectives. Consistent with research findings and suggestions put forth in this paper, using web based communication tools offer a promising approach to raising student's overall performance in an academic program or a courseware in F2F or on-line learning environment. So in a nutshell, the issue is how can we make communication more effective? Many instructors struggle to engage students in a F2F environment. Can some of the online communication tools discussed in this article enough to engage students? The reasons for low level of communication can sometimes be attributed to cultural factors, diversity of devices and other limitations such as language barriers that can hamper overall learning process. It is also clear that there is an ongoing surge in the use of social media. Success of WhatsApp, Line, Google Talk, Microsoft Skype, Cisco WebEx and You-Tube indicates that quality of communication can be very instrumental in enhancing the quality of teaching and learning. Age of digital communication requires that every institution invest all its resources into creating its own portal and transform themselves into eCampuses. Engaging students with better communication tools will yield better learning.

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