

Framework and Roadmap for E-Learning Industry: An Analysis

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ABSTRACT

E-Learning institutions today can benefit from a framework and roadmap on e-learning for them to be ready for challenges and issues they may encounter in the near future. As many new players are entering the market, both from the traditional academic institutions wanting to extend their services as well as the corporate organizations attempting to establish their learning organization concept, such a framework and roadmap would be very helpful. In this paper, we discuss the development of a framework for future e-learning applications. The framework was established by studying the visions, missions and goals of various e-learning players and combining them into one solid framework complete with the suggested future e-learning applications, by looking at least 8 years into the future (2007 to 2015). We believe with today's technologies coupled with the ubiquitous broadband via FTTx technologies, mobile broadband such as 3G and beyond, and the Next Generation Networks (NGNs), e-learning will become more liberalized.

Key Words: E- learning, framework, roadmap, sustainable growth

1. Introduction

In this paper, we attempted to foresee and evaluate a ten year (2007 - 2015) technology development in the e-learning environment. This will be achieved by the establishment of a framework looking specifically at the future e-learning applications for deployment of the e-learning players anywhere in the world. This framework also suggests new technologies for e-learning players to invest in the e-learning applications by looking at the current and the nascent technology discussed by many practitioners in the ICT industry.

The methodology used in the development of the framework is by studying the visions, missions and objectives of both e-learning players in Malaysia and internationally. Brief discussion of the common visions, missions and objectives and translating them into the framework and subsequently outlining the roadmap of e-learning for 2007 – 2015 is discussed in Section 4.

2. E-Learning Landscape in Malaysia and Other Countries

The e-learning in Malaysia was initiated by the government under the initiatives called Smart School and e-Learning for Life (ELFL) [1]. Smart School is a project initiated by the Malaysian government to develop and implement e-learning solutions to all schools in Malaysia. Contents have been developed at all levels and currently Science and Mathematics subjects are being converted to English. The second initiative is e-Learning for Life (ELFL), a joint initiative involving the Asia-Pacific Development Information Programme (APDIP), which is funded by the United Nations Development Programme (UNDP), Coca-Cola Corp and the Ministry of Education (MOE). ELFL aims to bridge the digital divide in Malaysia by providing information and communications technology (ICT) access to marginalised communities.

Malaysian government has initiative to assure the achievement of the e-learning in Malaysia. This has been highlighted in the 9th Malaysia Plan (2006-2010). This plan is actually the second phase of the Malaysia Vision 2020, which aim to make Malaysia as a fully developed country by the year 2020 [45]. It stated in the 9th Malaysia Plan that the use of Internet led to the growth in e-learning as a potential source of online education and training.

As a result, the Malaysian Institute of Microelectronic Systems (MIMOS) has developed the Malaysia Grid for Learning (MyGfL) which is to act as a repository and directory for sharing the digital content [43]. MyGfL is a national e-Learning initiative to promote and support the lifelong learning agenda in Malaysia to accelerate the growth of K-Society through the use of ICT. Beside MIMOS, the Multimedia Development Corporation (MDC) has also done a tremendous job, where a number of e-learning and smart school community projects have been implemented. These were essentially private sector-led initiatives to provide the requisite ICT infrastructure, and sponsorship of ICT facilities and training in selected schools. E-learning in schools was further aided with the use of smart school courseware and Internet access via the SchoolNet.

A National e-Learning Consultative Committee (NeLCC) was setup to provide direction and monitor initiatives pertaining to orderly development and adoption of e-learning practices. This is to ensure the coordination and coherent development of e-Learning initiatives in the public sector. Along with the growth of e-Learning in Malaysia, a report on e-Learning in Malaysia was done in 2005 (David, Abtar Kaur & Zoraini, 2005). Malaysia was on the Top 20 among the countries with highest number of internet users. It shows that the Malaysian has the initiative to be the part on the Internet world. The growth of Information, Communication and Technology (ICT) in Malaysia also shows

the positive impact, where Malaysia is ranked top five in terms of promoting ICT in Asia.

The report also includes the e-Learning readiness in Malaysia for the year 2004. It shows that Malaysia is moderately ready for e-Learning and among the countries in Asia-Pacific, Malaysia is at Top 8 for the E-readiness ranking. If we look at the stages of E-readiness within the ASEAN region, Malaysia is now currently in the Embedding stage which is one stage behind Singapore. The embedding stage contains the general acceptance of ICT by citizens, business and government, the incorporation of e-business requirements into policies, legislations and regulations and also the efforts taken to enhance the international standing.

E-Learning in Higher Educational Institutions has also shows the positive impact. A lot of research in e-Learning has been done and many seminars, conferences and workshops have been organized. Statistic in late 2004 shows almost 88% of the Institute of Higher Learning in Malaysia has implemented the e-Learning System.

At the tertiary education level, Malaysia have many successful key players in providing e-learning such as University Tun Abdul Razak (UNITAR), Open University Malaysia (OUM), Multimedia University (MMU), Universiti Malaysia Sarawak (UNIMAS) and few others. UNITAR started its operation on 18 December 1997 with the vision to be a premier university providing e-learning globally [4]. UNITAR uses a sophisticated system to support their teaching and learning called Virtual Online Instructional Support System (VOISS). VOISS consists of a series of functions such as e-mail, forum, FAQ, On-line Tutorial, Bulletin Board, Virtual Library, and Announcements that have been painstakingly developed to provide various kinds of support to students and teaching staff.

Multimedia University (MMU) uses E-Learning Campus Interactive System (ELCIS) to facilitate students' learning process and experience [11]. ELCIS offers the following features: Student and Class profile, Course Registration, Finance Information Kiosk, Academic Progress Report and Achievement, Virtual Library and Multimedia Learning System (MMLS) developed in-house by the Centre for Multimedia Education Development of the university. All the effort is to fulfill their vision of "innovations and inventions are the building blocks of developing a knowledgeable human society".

Open University Malaysia (OUM) was established on August 10, 2000 as the seventh private university in Malaysia [5]. To be a leader and innovator in open learning is their vision, and their operations are based on the three following missions: to be the leading contributor in democratizing education; to develop quality education through multi-mode learning technologies; and to develop and enhance learning experiences toward the development of a knowledge-based society. OUM adopts the motto "University for All" which is consistent with its philosophy on democratisation of education. This philosophy underlies the belief that education should be made available to all, regardless of time, place, age and social economic background. A system called Learning Management System (LMS) is used by OUM to manage their e-learning processes.

In the Asia Pacific regions, countries such as Singapore, China, India and Japan have implemented e-learning with many programs developed by their government and was used by many universities. Examples of the programs are: Asia E-Learning Network in JAPAN, NASSCOM in India, and CERNET in China.

In Singapore, the e-learning applications being used are based on technology such as LMS, LCMS, Synchronous Tools,

Authoring Tools, Video/Audio Tools, Simulation Tools, Collaboration Tools, Testing Tools. The following institute of higher learnings (IHLs) in the republic are the key players in e-learning: Nanyang Polytechnic (NYP), National University of Singapore (NUS), Ngee Ann Polytechnic (NP), Republic Polytechnic (RP), Singapore Management University (SMU), Singapore Polytechnic (SP) and Temasek Polytechnic (TP).

PurpleTrain.com, the global e-Learning provider, started out as Asia's first e-Learning provider in 1999 [46]. PurpleTrain.com is a 100%-owned venture of Informatics Holdings Limited, a leading training and education provider listed on the Singapore Stock Exchange. PurpleTrain.com is one of the most well-known players in providing a one-stop e-learning services for business and IT education programmes, corporate training courses and education-related services. It has many renowned customers in the world from universities and other corporate company to join forces with their e-learning services. In a more global scale, e-learning initiatives have also gaining quite a strong foothold in many countries. The following are some of the examples of well-known e-learning institutions in various countries around the world.

- United States of America: University of Maryland University College (UMUC) and University of Phoenix
- Canada: Athabasca University (Canada Open University) and University of British Columbia
- Argentina: Virtual University of Quilmes
- Australia: Deakin University, Edith Cowan University, and University of Southern Queensland
- Germany: FernUniversität, Bavarian Virtual University
- Spain: Catalonia Open University
- Netherland: Dutch Digital U (The Open Universiteit)
- United Kingdom: Open University
- Scotland: Interactive University

- Finland: Finnish Virtual University
- Switzerland: Swiss Virtual University
- Syria: Syrian Virtual University
- Israel: The Israeli Open University
- Turkey: Anadolu Open University
- South Africa: University of South Africa
- India: Indira Ghandi National Open University
- Hong Kong: Hong Kong Open University
- Thailand : Sukhothai Thammathirat Open University
- China: China Central Radio and TV University

3. Review and discussion of major telecommunication technologies and e-learning applications and services.

This section offers brief analysis and discussion on the major telecommunication technologies and e-learning applications and services that support the e-Learning Roadmaps to be described in Section 4.

3.1 Broadband via wired and wireless means

Broadband refers to telecommunication in which a wide band of frequencies is available to transmit information such as multiple voice, video or data channels simultaneously. Because wide band of frequencies is available, information can be multiplexed and sent on many different frequencies or channels within the band concurrently, allowing for more information to be transmitted in a given amount of time. This promise of broadband is for sure a big boon for the e-learning industry to grow much further and much faster.

Broadband can run on fixed or wired/cable as well as on wireless access. On the wired side, xDSL is the most widely used technology in accessing the Internet on speed of around 384Kbps to 2Mbps.

Another wired broadband access, FTTx is an access network infrastructure where an optical fiber runs from the telephone switch to the subscriber's premises - businesses or homes. x here stands for home, business or office, which will be translated for FTTh (fibre-to-the-home), FTTb (fibre-to-the-building), FTTc (fibre-to-the-curb) and etc. Fttx enables applications such as interactive access, pay-per-view, video on demand, subscription services as well as e-learning applications to be accessed must faster at lower costs.

WiFi or wireless fidelity is also known as wireless networking for hotspot zone, commonly using the IEEE 802.11b protocol within shorter distance. Hardware that displays the WiFi logo with 802.11b compliance should interconnect seamlessly, a way of transmitting information in wave form that is reasonably fast and is often used for notebooks. Today's and future computers certainly would be equipped with the WiFi ready processor.

WiMAX is a standards-based wireless technology that provides high-throughput broadband connections over long distances [38]. WiMAX can be used for a number of applications, including "last mile" broadband connections, hotspot and cellular backhaul, and high-speed enterprise connectivity for businesses. An implementation of the IEEE 802.16 standard, WiMAX provides metropolitan area network connectivity at speeds of up to 75Mbps. WiMAX systems can be used to transmit signal as far as 30 miles.

The 3G (Third Generation) is the extension of 2G that aims to provide universal, high-speed, high-bandwidth (up to 4Mbps) wireless services supporting a variety of advanced applications and that is beyond personal communications services. These networks must be able to transmit wireless data at 144Kbps at mobile user speeds, 384Kbps at pedestrian user speeds, and 2Mbps in fixed locations. In this

environment, a learner in the e-learning institutions could access his lecture notes and download it onto his mobile device at 384 Kbps while moving on foot, or if in stationary mode, he will be able to access it at a much faster rate of 2Mbps. 4G meanwhile could achieve the highest speed of data rates up to 20+ Mbps, which is also suitable for high-resolution movies and real-time video communications.

While wireless broadband Internet access using satellite transmission is not ubiquitous today, it could be a trend 3 years down the road especially with the government's intervention in bridging the digital divide between urban and rural areas. On top of that, the costs of getting broadband access via Internet potentially be reduced over time. It enables Internet access with download speeds of up to 512Kbps.

3.2 Next Generation Network (NGN)

Next Generation Network (NGN) is basically a packet-based network able to provide services including Telecommunication Services and able to make use of multiple broadband, QoS-enabled (Quality of Service) transport technologies and in which service-related functions are independent from underlying transport-related technologies [34]. It offers unrestricted access by users to different service providers. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.

The concept of a NGN (Next Generation Network) has been introduced to take into account the new situation in telecommunications, characterized by a lot of factors: open competition between operators due to the total deregulation of markets, explosion of digital traffic, e.g. due to the increasing use of Internet, increasing demand from users for new multimedia services, increasing demand from users for a general mobility, and etc.

A major goal of the NGN is to facilitate convergence of networks and services.

E-learning organizations could make full use of NGN in terms of enabling convergence of their networks and services in facilitating delivery of their e-learning contents, applications and services.

3.3 MPEG-7

MPEG-7, formally named "Multimedia Content Description Interface", is a standard for describing the multimedia content data that supports some degree of interpretation of the information's meaning, which can be passed onto, or accessed by, a device or a computer code [40]. MPEG-7 is not aimed at any one application in particular; rather, the elements that MPEG-7 standardizes support as broad a range of applications as possible.

MPEG-7 application in e-learning would enable e-learning organizations to have multimedia content or courseware that is searchable and also fully interactive.

3.4 Internet Protocol Version 6 (IPv6)

IPv6 is the next-generation Internet Protocol that is emerging from the standards process to carry web applications into the 21st century and to replace the current IPv4. The key difference between IPv4 and IPv6 is that IPv6 supports a 128-bit address space to allow for many more devices to be uniquely addressed as the Internet continues its exponential growth and expands into new types of devices such as telephones, automobiles, and so on. In this instance, home appliances of the future would be equipped with IP addresses that enable access to e-learning materials. For instance, students or e-learners could access their learning materials and LMS via their home refrigerator and etc.

3.5 Learning Management System (LMS)

Learning Management System (LMS) is a system that allows the local course administrator to assign privileges, link learning resources and modules to individual learners and groups of learners, monitor individual and group performance, collect assessment data and transfer it to the student management system for reporting and recording purposes. In other words, LMS allows the e-learning provider to manage their learning process.

Most of today's LMS are proprietary-built and can only operate proprietary contents. However, the trend is now moving towards an open standard LMS built using widely accepted standards such as Sharable Content Object Reference Model (SCORM), a series of e-learning standards that specify ways to catalog launch and track course objects. Another example of such open LMS standard is Moodle, a free open source software package designed to help educators create effective online learning communities.

3.6 Virtual reality and augmented reality

Virtual reality is an artificial environment created with computer hardware and software and presented to the user in such a way that it appears and feels like a real environment. To "enter" a virtual reality, a user dons special gloves, earphones, and goggles, all of which receive their input from the computer system. In this way, at least three of the five senses are controlled by the computer. In addition to feeding sensory input to the user, the devices also monitor the user's actions. The goggles, for example, track how the eyes move and respond accordingly by sending new video input. To date, virtual reality systems require extremely expensive hardware and software and are confined mostly to research laboratories. The term virtual reality is sometimes used more generally to refer to any virtual world represented in a computer, even if it's just a text-based or graphical representation.

Augmented reality is a special form of virtual reality and makes use of special head-mounted displays, or modified optical instruments to superimpose meaningful virtual images onto the user's view of the real world. The purpose of AR is to enhance the environment that provides learning by overlays and additional inputs of information and knowledge.

E-learning using this medium would certainly be beneficial to the students especially in learning abstract concepts or topics that require special form of simulation in order to further understand the concept. Seamless virtuality with real life over the network is the intended future of these technologies. Broadband technology for certain would enable this to be achieved.

4. Methodology of the E-Learning Framework & Roadmap

The methodology used in building the framework is by reviewing and synthesizing visions, missions and goals of various selected e-learning players and combining them into one framework together with instilment of possible future e-learning applications, by looking at least 8 years into the future (2007 to 2015).

This will later be injected with the possible future technologies and how the e-learning applications and services could be supported by these technologies. Brief reviews of each of the technology were offered in Section 3.

From the analysis made, e-learning universities and institutions highlighted in Section 2 have the same vision: that is to liberalize education via the means of technology that enable e-learning. Nevertheless, the finding is that none of the organizations stated their vision to outdo one another in terms of competition. They mostly welcome collaboration with other learning institutions and to grow

together. One would think that eventually as more and more such e-learning institutions exist, there will be more competition in getting students and learners.

One of the ways to care for this is to deploy the most advanced technology and keep in tab of technology-push that they could invest in and also to consider the market factor.

Hence, the roadmap that we offer below could help them in strategizing not only in terms of growth, but also to be at the forefront in this industry.

4.1 Framework of E-Learning

From a study of a various e-learning institutions in Malaysia and abroad, we can summarize their vision, mission and goals as shown in Table 1 below.

Table 1: Business Strategy of E-Learning Institutions

Vision	e-Learning as a service available for everybody in the world
Mission	e-Learning delivery using the latest technology
Goals	<p>§ The liberalization of e-learning to enable everyone to access it</p> <p>§ The technology is cheap enough to enable people to access it</p> <p>§ The Return On Investment (ROI) is realized through creative, modern applications that is accepted by many people</p> <p>§ Learning organization concept is achieved</p>

The business strategy given above will drive these e-learning institutions to achieve competitive advantage with a support from the e-Learning Roadmap being outlined and discussed in Section 5.

To further visualize the framework, we use the Figure 1 below to explain the framework in detail.

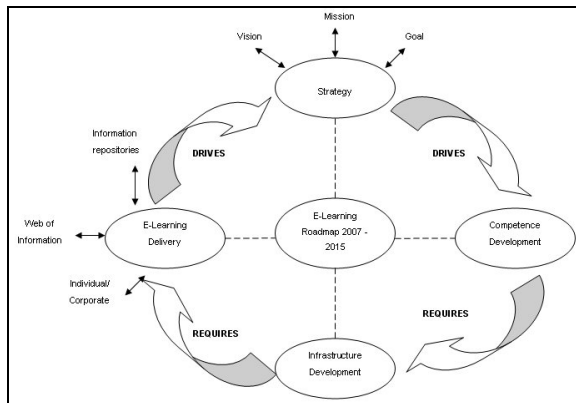


Figure 1: E Learning Framework

The framework was built with 4 major components, namely the Strategy, Competence Development, Infrastructure Development and the e-learning Delivery. All of these components will make the e-Learning Roadmap as the central focus for direction.

Strategy deals with the business direction set by the e-learning institution via the establishment of their vision, mission and goals.

Competence development addresses how the e-learning institutions would develop the competency of its resources such as the academic staff and also the administrators. This could be development programme for them to be well-versed in using technology to deliver education to the e-learners and the pedagogical aspects of teaching via the Internet. For the administrators, managing distributed resources and learners would certainly pose lots of challenges. To overcome these situations, the administrators must be adequately trained.

Infrastructure development highlights the development of solutions for the e-learning delivery. This could be investment in e-learning applications, tools and services. The solutions for telecommunication and

networking infrastructure must be considered here as well.

E-Learning delivery deals with the mechanism on how to deliver the e-learning experience to the learners together with the supporting materials and information from the Web and also other knowledge repositories.

In short, the key takeaways from the Framework above are as follows:

- Strategy drives E-Learning Delivery and influenced by the E-Learning Roadmap
- Strategy drives Competence Development of people (lecturers, administrators, etc) and influenced by the E-Learning Roadmap
- Infrastructure Development requires people who are competence to deliver e-Learning and influenced by the E-Learning Roadmap
- E-learning Delivery requires infrastructure being developed and influenced by the E-Learning Roadmap.
- **Therefore**, all aspects fall back to the E-Learning Roadmap to guide them to achieve the growth strategy (or other strategies) as required.

5. E-Learning Roadmap for 2007-2015

As can be seen below, the framework above is being strengthened further by the development of the e-Learning Roadmap for 2007 – 2015 (refer Figure 2 below). Coupled with the common vision, e-learning institutions can benefit from understanding on what needs to be done by looking at the framework.

While having a very ambitious and forward-looking vision is good, the survival of these e-learning institutions must also be supported by their understanding on the four main components on the roadmap:

- **Bandwidth:** as the future of telecommunications is dependent on both fixed and wireless broadband, which is further characterized by its different speed, we believe it plays a major role as the influencer in how e-learning institution would invest in terms of the other three subsequent components
- **Key technology:** underlying technologies that could be used in delivering e-learning to learners
- **E-Learning applications and tools:** the possible e-learning applications and tools that could be developed and deployed by e-learning institutions in delivering e-learning to learners
- **Market situation:** the probable scenario on e-learning market landscape, in terms of penetration of local and global market, market competitiveness and the possible market forces influencing e-learning expansion

It is hoped that the future investments of e-learning institutions could be aligned to the four components being highlighted in this paper as to enable sustainable growth in their business.

	2007 - 2009	2010 - 2012	2013 - 2015
Bandwidth	6 - 54Mbps	54Mbps - 540Mbps	540Mbps - 2Gbps
Key Technology	<ul style="list-style-type: none"> Modem, ISDN, Leased line Broadband via DSL Some extent of wireless broadband via Wi-Fi and 3.5G IPv6-based networks 	<ul style="list-style-type: none"> Cable/wired broadband via DSL, FTTH Wireless broadband via Wi-Fi, WiMax, and 4G Satellite IPv6-based networks NGN MPBG-7 	<ul style="list-style-type: none"> Higher speed cable/wired hyperbroadband via FTTH Wireless broadband via 801.11g, 801.11n, WiMax and Beyond 4G Beyond IPv6 Satellite NGN MPBG-7 Fixed Mobile Convergence
E-Learning Applications and Tools	<ul style="list-style-type: none"> Proprietary content & Proprietary LMS architecture Courseware Multimedia-based content Separate standalone e-learning components Computer-based 	<ul style="list-style-type: none"> Standard-based Content Open Architecture LMS (such as SCORM and Moodle) Virtual reality Game-based Simulation based learning Synchronous, real-time streaming Real-time collaboration, immersive tools Computer-based and mobile devices 	<ul style="list-style-type: none"> User Created & Dynamic Content Open Architecture LMS Integrated LMS with enterprise application suite (e-HRIS, ERP, CRM, etc) Augmented Reality Synchronous, real-time media streaming, real-time collaboration Mobile components Wearable e-learning computing Computer, mobile devices, wearable devices
Market Situation	Limited penetration of e-learning, Knowledge management is part of the culture	Regionally shared e-learning, learning as culture, e-learning organizations penetrating wider markets	Global competition of e-learning, many players & students, liberalized learning, knowledge society

Figure 2: e-Learning Roadmap for 2007 – 2015

6. Issues and Challenges of e-Learning

- Awareness

There is still a lack of awareness amongst the Malaysian people, especially the elder

one. It is quite difficult to prove the effectiveness of e-learning. Many people feel the traditional learning mode is better.

- Difficult to get online participation from learners

The successful of the e-Learning system is to get the learners participate actively. Learners itself must have a very high interest towards the online system. Otherwise, the e-learning system would not be successful.

- E-Learning readiness for the various learner groups are in different level.

Different group of people will have different perception of the e-Learning system. For the younger one, it is most probably they can accept the nature of e-Learning, while for the elder, would have problems in accepting the new concept of learning.

- Bandwidth Issues

The current content with multimedia components makes the downloading process a little bit slow, especially for those who use dial up for the Internet connection. This can create frustration among the learners and make them demotivated to get involved with the e-Learning system.

- Computer Literacy

Currently in Malaysia, there is still a group of people that is computer illiterate especially in the rural areas. This can delay the beginning and the implementation of the e-Learning systems at their areas.

- Language Barrier

Most of the e-Learning content is in English medium, and this can demotivate learners who are not fluent in English. The e-Learning content should take into consideration of using the multilingual content.

- E-learning will become more than "e-training."

Rosenberg (2006) mentioned that e-Learning must be reinvented [42]. Besides

continuing providing a viable instructional option in a formal learning setting, it must also move toward informational and collaborative solutions that focus more prominently on the specific jobs people do Rosenberg (2006).

- E-learning will move to the workplace. According to Rosenberg (2006), training organizations will have to become much more interdisciplinary and need to fuse many technologies and approaches that cut across formal and informal learning situations. Besides, they need to be involved directly in supporting work.

7. Conclusion

The current trend shows that learning has become more accessible. People can get information from almost anywhere without having to leave the comfort of their home. Equipped with just a computer (and in some instances, a television set), access to knowledge no longer as it seems a decade ago. It is pretty obvious too that e-learning is gaining wider acceptance in Malaysia, similar to other developed countries. With so many new e-learning players coming into the market, for them to position and to sustain business growth, they would require a solid e-learning framework and roadmap. This paper has presented an in-depth analysis of the proposed framework, roadmap and possible applications and infrastructure to support e-learning for at least 8 years into the future (2007 to 2015). The framework provides an insight into the essential components to run a successful e-learning institution, namely by having good strategy, development of various set of competencies of the people managing the academic and non-academic functions of the e-learning institution, infrastructure development as well as the delivery of e-learning to their e-learners. The e-Learning Roadmap we presented considers broadband (via wired or wireless access) as the major enabler by presenting it in terms of the bandwidth of the network, key underlying technologies, e-learning applications and tools as well as the market

situation for the next 8 years. The application of the framework and the roadmap is set to drive the e-learning players to achieve their goals, among others to sustain their growth strategy in this competitive e-learning industry.

References:

- [1] Hamid, S.. 2005, Recent Research Developments in Learning Technologies. preprint (FORMAT-609-5995-3)
- [2] Martin Potts Martel (November 2003). Strategic Roles of E learning, Realizing New Possibilities in Business Performance. Retrieved from SRI Consulting Business Intelligent.
- [3] Smart School Integrated Solution (SSIS), Retrieved May 2, 2005 from <http://www.tmsmartschool.com/>
- [4] Company profile, University Tun Abdul Razak. Retrieved January 3, 2005. from www.unitar.edu.my
- [5] Zaid Ali Alsagoff (2004). Open University Malaysia, e learning review. Retrieved February 15, 2005 from <http://elc.unitar.edu.my/modules.php?name=News&file=print&sid=90>
- [6] Pioneering E-Learning in UNIMAS. Centre for Applied Learning and Multimedia (CALM). Universiti Malaysia Sarawak, Retrieved 15 February 2005, from <http://www.unimas.my/centres/calm/elearningUnit.htm>
- [7] System of Education. The University of The Air Japan, Retrieved 18 February 2005 from http://www.u-air.ac.jp/eng/system/03_sys.html
- [8] Integrating Technology with the Learning Process (2004). Barrington University of Australia Retrieved 18 February 2005 from

<http://www.barrington.edu/index.cfm?Page=about&Tab=1&Nav=1>

[9] Tamil Virtual University (company profile).(2000) Retrieved 1 March 2005 from <http://www.tamilvu.org/coresite/html/cwintroudu.htm>

[10] Teaching by mobile Faculty, Online Education College of Renmin university of China Retrieved 12 March 2005 from <http://www.cmr.com.cn/cmrenglish/aboutuc2.htm>

[11] e-Learning campus. Multimedia University Retrieved 12 March 2005 from <http://e-univ.mmu.edu.my/>

[12] Programs, Courses, Teaching, Media & Assessments, The National Open University of Taiwan. Retrieved 2 June 2005 from <http://www.nou.edu.tw/>

[13] Online Degree Sources, Online Courses, University of Maryland University College. Retrieved 3 June 2005 from <http://www.online-degrees-source.com/university-of-maryland-online-graduate-degrees.htm>

[14] Strategic Documents, Annual Report 2004-2005, Athabasca University, Canada Open University, Retrieved 3 Feb 2006, from <http://www.athabascau.ca/>

[15] Distance Education and Technology, University of British Columbia. Retrieved 3 June 2005 from <http://www.ubc.ca/>

[16] The Virtual University Models and messages edited by Susan D'Antoni. Retrieved 2 June 2005 from <http://www.unesco.org/iiep/virtualuniversity/home.php>

[17] Online and Off Campus Learning, Deakin University Australia. Retrieved 3 June 2005 from <http://www.deakin.edu.au/>

[18] The profile, FernUniversitat, Bavarian Virtual University, Germany. Retrieved 1

June 2005 from <http://www.fernuni-hagen.de/>

[19] OUC's Mission, Catalonia Open University, Spain. Retrieved 1 June 2005 from <http://ccat.sas.upenn.edu/jod/texts/catalan.html>

[20] Digital University: Consortium of University, Dutch Digital U, Netherland. Retrieved 15 June 2005 from <http://www.digiuni.nl/digiuni/index.cfm/site/Internet/pageid/4F0F2DBB-508B-67D0-5E339E86FC68ECF8/index.cfm>

[21] About OU: Our Mission, Open University, United Kingdom. Retrieved 1 June 2005 from <http://www3.open.ac.uk/about/>

[22] A Global Community, Interactive University, Scotland. Retrieved 21 June 2005 from <http://www.interactiveuniversity.net/>

[23] Role and Tasks, University Liaison, Finnish Virtual University. Retrieved 21 June 2005 from http://www.virtuaaliyliopisto.fi/?node=vyfront_page_eng

[24] Consolidation Program 04-07, Virtual University, Switzerland. Retrieved 21 June 2005 from <http://www.virtualcampus.ch/>

[25] Vision/Mission Statement, Syrian Virtual University, Syria. Retrieved 21 June 2005 Syria from <http://www.syriagate.com/education/svu/07.htm>

[26] Shoham, The Centre for Information Technology for Distance Learning, The Israeli Open University, Israel. Retrieved 21 June 2005 from <http://www-e.openu.ac.il/>

[27] Anadolu Open University, Turkey. Retrieved 21 June 2005 from <http://www.anadolu.edu.tr/eindex.htm>

- [28] Vision and Mission, University of South Africa. Retrieved 21 June 2005, from <http://www.unisa.ac.za/>
- [29] Vision and Mission of Distance Education Centre, Indira Gandhi National Open University, India. Retrieved 21 June 2005 from <http://www.ignou.ac.in/>
- [30] Organisation's Mission, Hong Kong Open University, Hong Kong. Retrieved 21 June 2005 from http://www.ouhk.edu.hk/WCM/?FUELAP_TEMPLATENAME=tcSingPage&lang=eng
- [31] Distance Learning System, Sukhothai Thammathirat Open University, Thailand. Retrieved 21 June 2005 from <http://www.stou.ac.th/Eng/>
- [32] China Central Radio and TV University. Retrieved 28 June 2005 from http://www.crtvu.edu.cn/English_crtvu/index_en.html
- [33] Moodle Documentations, Retrieved 2 April 2006 from <http://docs.moodle.org/en>
- [34] Martin Pott (13 February 2002). NGN Roadmap 2002, NGN Project Concentration, Brussels.
- [35] Regulatory implications of the introduction of next generation networks and other new developments in electronic communications, Final V.1.0 16th may 2003, SITICOM & Cullen Int.
- [36] Martin Potts Martel (9-10 July 2003). Workshop on Next Generation Networks, Geneva: What, When and How? From <http://www.itu.int/itudoc/itu-t/workshop/ngn/>
- [37] Strategic Role of E-Learning: Realizing new possibilities in business performance, (Nov 2003). SRI. from <http://www.sric-bi.com/consulting/briefings/StrategicRoleE-Learn2003-11.pdf>
- [38] WiMAX Broadband Wireless Access Technology, Intel Cooperation 2004 Website from <http://www.intel.com/netcomms/technologies/wimax/>
- [39] NGN 2004 Project Description, Version 3. (12 February 2004) ITU [NGN-9], updated 26.3.2006, from http://www.itu.int/itudoc/itu-t/com13/ngn/9_ww9.doc
- [40] MPEG-7 Overview (Version 9), editor José M. Martínez (UAM-GTI, ES), ISO/IEC JTC1/SC29/WG11N5525, Pattaya, March 2003. from <http://www.chiariglione.org/mpeg/standards/mpeg-7/mpeg-7.htm>
- [41] A Summary of e2e Learning Framework (2003) ISBN 1 85338 854 8, and Skills Development Agency from www.LSDA.org.uk,
- [42] J. Rosenberg, M. (2006). What Lies Beyond E-Learning? Retrieved October 1, 2006, from http://www.learningcircuits.org/2006/Marc_h/rosenberg.htm
- [43] Malaysian Grid for Learning, Retrieved October 1, 2006 from <http://www.mygfl.net.my>
- [44] David Asirvatham, Abtar Kaur, Zoraini Wati Abas (2005). Country Report: E-learning in Malaysia. Retrieved October 1, 2006 from <http://www.asia-elearning.net/content/conference/2005/index.html>
- [45] Chapter 5 - Mainstreaming Information and Communications Technology, Ninth Malaysia Plan 2006-2010. Retrieved November 11, 2006 from <http://www.epu.jpm.my/rm9/english/Chapter5.pdf>
- [46] PurpleTrain.com (about us).(2005) Retrieved March 3, 2006 from <http://www.purpletrain.com/>