

Development of Learning Network for Mechanical Engineering in Indonesia

I Gusti Bagus Wijaya Kusuma

Department of Mechanical Engineering, Faculty of Engineering,
University of Udayana, Bukit Jimbaran, Badung, Bali, 80361, Indonesia
Phone: 62-361-703321, Fax: 62-361-701806
Email: wijaya.kusuma@me.unud.ac.id

Abstract

In the global economy of the information age, knowledge and information become more vital to sustainable development than buildings. Policy-makers, private sector leaders, community workers and other key 'agents of change' in the developing world know that the success depend on bridging the gap between the information-poor and the technology-rich. Department of Mechanical Engineering University of Udayana considers to developing a solid reputation in the distance learning providing services to support and develop engineering hospitality of tourism. Since 2004, Department of Mechanical Engineering University of Udayana implemented a strategic plan providing the corporate direction through the year 2010. Many of the issues identified are not unique to Department of Mechanical Engineering University of Udayana but are experienced by other similar organizations, public and private sectors, throughout Indonesia that lead the way in using 21st century learning technologies to share development knowledge between any other institutions in Indonesia and the world.

Keywords: *Information age, technologies and learning network, engineering*

Introduction

It is undeniable that the economic consideration is now more considered during the globalization. As the economic growth stagnant, government revenues failed to keep up with the increasing demand for social sector, especially in education, health, welfare programs, and infrastructure. In the industrial revolution, industries are developed based on highly standardized procedures, tools and workers to produce standardized goods and services.

Nowadays, the fading of industries are shifting to flexible production, where products are more easily modified to accommodate a wide variety of needs, tastes, and cultures in a global market. Instead of uniformity and tightly supervised top down planning the new highly flexible industries rely on teamwork and network approach, heavily emphasis on innovation and creativity.

In order to live in the global community, nations have to respect and accept a set of common values and norms. In political term, it means that they have to accept democracy, human rights, and civil society. In economic term, it means that they have to respect trade agreements, international capital mobility, and follow the concept of market economy. In technological term, it means that they have to accept the communication standard and respect the intellectual property rights.

The development of learning network, however, will give an advantageous to bridging this case, since people can meet their colleagues abroad and sharing their experience through a teleconference program. This method can deliver more detailed subject of discussion and can be done more quickly than the conventional process, easy and exciting. The method has many advantages, such as: to remove boundaries of time, to remove boundaries of place and to remove boundaries of sources.

Impact of Information and Communication Technology (ICT)

In the new concept of national wealth creation, universities should produce graduates that are employable and relevant to the economic development. Since its contribution to the national wealth becomes an important performance indicator, university research becomes more important, particularly in developing the techno-science.

In addition to the need of adequate supply of highly skilled manpower, the national economic development also relies on university research to support product development, market development, and creatively new products, merging the scientific development with technology development. Such

reliance is particularly strong in the development of new technology, such as information-telecommunication technology and biotechnology.

The world is now witnessing the convergence of telecommunication and information technology, commonly labeled as ICT. The market for telecommunication services has been several times folded due to the recent development. From the information technology view, the technological advancement has provided a tremendous boost to the market, and even more dramatic is the integration of the two. It produces services that were beyond anyone comprehension 20 years ago. The impact of e-commerce is felt by all sectors, and has tremendously changed the national systems on custom, law, trade, culture, and practically almost every aspect of human life.

Those features of ICT have made it possible for people living in different time zones to interact asynchronously without having to change their life style. In the context of education, there are some important arguments that call into question such development: its cognitive limitations of electronic delivery and information retrieval based on fragmentation of knowledge; the loss of the critical, reflective side of education in a context driven by individualized packaging and marketing of skills; its contribution to further breakdown of local communities and educational systems; and cultural invasion. Although asynchronous interaction has significantly improved communication, synchronous interaction is still needed, particularly to fill the gap. The current technology to support synchronous interaction includes chat and video conferencing.

Nowadays, the demand for access to higher education has far exceeded the ability of the system to provide, particularly in developing countries such Indonesia. The demand for more access is not limited to mature or employed students, but also to those in the age of 18-23. Since students do not have to interact face to face with the teacher, many providers just hire low quality part time tutors to keep the cost low. The result is, inadequate student learning experience that produced less than adequate quality of graduates. In order to prevent over commercialism, therefore, ICT based distance education should be carefully designed and prepared. ICT based distance education is a relatively immature field that various experiments to find the best delivery method are still in progress.

Related institutions was formed during this period which representatives of the Center for Communication and Information Technology for Education (Pustekkom), the Indonesian Open Learning University (UT) and the Global Development Learning Network (GDLN) Indonesia, which under Directorate General of Higher Education, Department of National Education, Republic of Indonesia. The rationale for the establishment among others was the conviction that conventional schools alone will not be able to meet the education for all. Furthermore, several institutions have implemented open and distance learning programs as alternative ways for increasing the opportunities and access for learners to participate in educational/training programs, but there are still some institutions that have not yet implemented any open and distance learning programs even though the need for education and training cannot be provided by existing conventional institutions. Mechanical Engineering Department of University of Udayana is proposed in order to promote the implementation of open and distance learning and foster the growth of existing open and distance learning programs to meet the demand of "education for all".

The participation of the private sector is quite dominant as illustrated in Table-1. Around 70%-80% of its 450,000 students is teachers in their in-service training program. Although staff qualification can be considered as sufficient in a few most established universities, nationally it is still far from adequate, as illustrated in Table-2 and -3. In 1997 the number of public institutions are 51 universities, and 25 polytechnics. In addition, there are a number of religious universities under the Ministry of Religious Affairs (IAIN) and some other occupational schools under other respected Ministries.

Table I. Student enrolment in 1997

Public sector ¹	942,973
Private sector	1,681,175
Religious institutions	189,540
Occupational institutions	51,498
TOTAL	2,865,186

Table II. Distribution of staff in public universities¹

Highest degree earned	Total	Proportion
Diploma	471	0.98%
S-1	27597	57.58%
Specialist	1747	3.65%
S-2	13990	29.19%
S-3	4123	8.60%
Total	47928	100.00%

Table III. Distribution of institutions

Public institutions	76
Private institutions	1558
Total	1634

¹ Excluding students enrolled in the Open University

Methodology of the Development of Learning Network for Mechanical Engineering

The immediate and direct beneficiaries of developing learning network for Mechanical Engineering Department are the institutions provide education and training through distance learning. However the intended primary beneficiaries are:

1. The trainees, students and participants from all sectors of the population, both men and women, urban and rural, who are unable to benefit from the traditional education and training systems.
2. Men and women already in the work-force who wish to upgrade their skills or to gain new competencies to enhance their career development and employment opportunities.
3. Adults who wish to improve their educational standard through this second change modality.
4. Traditional educational and training institutions which will utilize good distance learning materials as part of their own instructional provision.

Educational problems, both in the conventional and non-conventional system become more and more complex. This situation caused by the increasing number of population to be educationally served and the limited available resources to fulfill the need for education. The fast development of technologies, and in particular of the ICT needs to be learned and mastered by the educational managers/administrators to become capable of optimizing the utilization of development of technologies in a timely and accurate decision making process.

Many scholars argue that information networking is needed for the promotion of resource sharing and cost effectiveness and the polling and transfer of experiences. This is particularly important for academic activities in developing countries where information and financial resources are limited. Many institutions in Eastern region of Indonesia intent to or have established Open and Distance Learning (ODL) systems to cope with their educational problems that cannot be solved by using the existing conventional education systems. In the implementation of ODL system, students must utilize self-learning materials - mainly with the printed self-learning material (modules) - because they have to learn with the absence of teachers. Self-learning materials are different from regular textbooks in that they are written with special techniques to make the self-learning materials relatively easier to learn without the help of teachers. Some observations and information from the field indicate that many ODL institutions and some institutions that intent to establish ODL systems do not have sufficient, skillful, and knowledgeable staff in developing self-learning materials or modules, and require training on self-learning material development.

The vision of the development of learning network for Mechanical Engineering Department in Indonesia is for decision-makers and agents of change across the developing world to have

inexpensive and regular access to a global network of peers, experts and practitioners with whom they may share ideas and experience that will help them in their work: to fight poverty and all its attendant challenges, serve the purpose of improving the national competitiveness through access to global information, narrowing the disparity of access to information between regions, and introducing the latest technology to a wider audience.

The mission of the development of learning network for Mechanical Engineering Department in Indonesia is to harness modern technology – including interactive video, the Internet, and satellite communications -- in a cost-effective way, so that people who know are brought together with those who need to know, to learn with and from each other about the full range of development issues, be able to prepare necessary infrastructure for economic development, by providing cost-effective interactive learning activities, reaching across geographic borders, time zones, and language barriers, and to improve decision-making through access to real-life experience shared by experts, practitioners, and decision-makers.

The network

The development of learning network for Mechanical Engineering Department is proposed as the only fully interactive, multi-channel network with a mandate to serve the developing world. This highly flexible learning tool uses two-way video, internet and other advanced communications technologies in global network of learning centers, provides learning opportunities for key stakeholders in the development process and provides cost-effective capacity building programs in countries that now--for the first time in history--are able to make a sustained effort to close the knowledge gap with the rest of the world.

The development of learning network for for Mechanical Engineering Department is a telecommunications network that connects distance-learning centers in cities across the globe. It harnesses the latest learning tools — interactive video, electronic classrooms, satellite communications and the internet — to help bridge the digital divide. The network uses three channels of compressed video, audio and data transmitted via satellites. All participants can hear, see and fully interact with one another. Additional sites are able to receive video transmission. The video conferencing service can be used for one-way (broadcast) and two-way (interactive) connections. A computer laboratory, usually located next door to the video laboratory, provides additional 30 personal computers that allow high-speed access to the Internet, individual or small group study, and e-mail interaction among peer groups and instructors. Each center provides and manages its space, infrastructure and a program of courses and seminars. This includes local marketing and promotion of the learning program and provision of administrative support such as participant registration and the follow-up.

Design for Indonesia

Indonesia is a large country that its span is as wide as the United States, comprising more than 13,500 islands, that a single distance-learning center will only benefit a tiny fraction of the population, and have a very limited impact to the national development. It is proposed, therefore, to establish several distance-learning centers. This smaller center will be equipped with appropriate technology to support project's objectives and includes increased translation capacity, instructional designs, and media conversion facilities.

Each center will be equipped with a computer laboratory and a distance-learning classroom. This center will have facilities and equipment to support: interactive video-conferencing reception and transmission (satellite connectivity), broadcast mode television reception and transmission, simultaneous translation from English and other languages to Bahasa Indonesia, interactive computer-based learning and e-mail, internet connectivity and “touch screen” technologies. It is expected that at a minimum there will be one-way, broadcast mode television reception, internet-based learning (virtual classroom), e-mail, and computer-based learning. Both sites will also be supported with the necessary operational costs, including cost of satellite connectivity, for a period of three years. A possible configuration of using the available services provided by local providers is presented in the following figure.

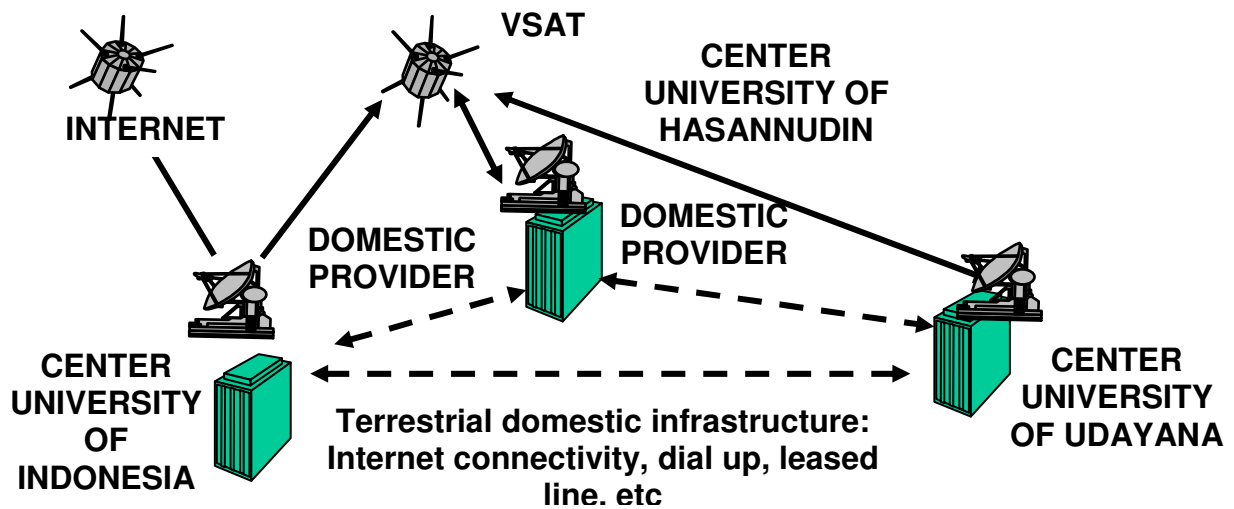


Figure 1. Alternative configuration for local connectivity in each center

Policy in implementing ICT in higher education

It has to be realized that as a developing country, scarce resources should be allocated for the country's most urgent needs, such as poverty alleviation or staple foods. The investment in ICT, therefore, has to be accompanied by a very strong rationale and argument of its concrete benefits to the people. In order to experience the benefits and explore the risks, the development of learning network initiative should be implemented as a pilot project. Although it might be limited to non-regular students in the first stage of its implementation, the pilot project is expected to also play an important role in filling the gap created by insufficient capacity in developing on line courses for regular students. The segment of non-students should provide benefits as much as possible to the national development through training in various sectors, e.g. health, SME, regional development, and democracy. The pilot implementation of video conferencing capacity in several locations will be reviewed periodically. A successful implementation will lead to further expansion of the network involving more locations within the country.

Prediction for Distance Learning in the Future

Internet services and its demand increase in past two years. Although the net income of Indonesian people is relatively medium, but the need to gain something new from internet is very high, especially for high school and university student. The number of user increase by the time, and it was affect for the number of provider in Indonesia. The number of student in the university increases each year, especially for master or specialist program, but in the other hand, the number of student to study abroad also increase every year. The development of distance learning by linking to foreign universities is a good idea to anticipate the demand of student to study abroad. This also supported by the increase of demand for making conference in Indonesia, for where it is an advantageous using teleconference to support their activity. Several offerings, ceremonies and events which are interesting and seldom to present for public domain can be packed by using a teleconference, and it will be an advantageous for people abroad.

Conclusion

The links between universities and institutions including employers, government and legislative members, private and governmental companies (BUMN), hospitals (public and private sector), practitioners (physicians, physiotherapists, lawyers and psychologists) and other potential groups,

including network and provider companies have been chosen as the diversification candidates to be included in this plan. The primary reasons for choosing these candidates are:

1. The provision of network services has grown to encompass new opportunities in the public and private sectors.
2. The center of learning network provides a better service on network especially for education and distance learning, since the manual method of UT is relatively not sufficient enough to deliver the content of education material.
3. Management programs and the workplace are starting by adopting early identification and intervention procedures such as in the private sectors.
4. Demand for study abroad is relatively high, not only for youngster but also for professional staffs in those institutions describe above. The number of student who use UT services is also relatively high.
5. The practitioners receive virtually no training that relates to their understanding of the aspects of distance learning, yet they are given the authority to determine their ability to distance learning method.
6. Provider companies have a mandate to diversify and offer a wider spectrum of services. Given the significant cost of developing new products, these companies often choose to subcontract these services to established providers.

References

- Daniel, J.S., 1997, *Mega University and knowledge media: technology strategies for higher education*, Kogan Page, London.
- Moeliodihardjo, et.al, 2000, *Higher education strategy: implementing the new paradigm*, Final report draft of the Task Force on Higher Education.
- Morrow, R.A. and Torres, M, 2000, *The state, globalization, and educational theory*, in *Globalization and education: critical perspective*, edited by N.C. Burbules and C.A. Torres, Routledge, New York – London.
- Slaughter, S. and Leslie, L.L, 1997, *Academic capitalism: politics, policies, and the entrepreneurial university*, John Hopkins University Press.