Global Engineering Education:
Benefits and Limitations of Distance Education

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Abstract:

The continuing demand for life-long learning and availability of quality engineering personnel is strategically important to the economic welfare of today's businesses and industries. This unparalleled need is essentially provoked by swift changes in advanced technologies and an evermore-global competitive environment. The success of this workforce will then be depended on the availability of an educational system capable of responding to these new requirements, which are being met by application of technology and fostered by some educational institutions as well as their partners in corporate and industrial sectors.

The fundamental principle of access to education 'at any time, any place, any where, and any how' have resulted in an explosion of new alliances such as Western Governors, Southern Regional and Open University – USA. At the same time, a review of the Society of Manufacturing Engineers, Manufacturing Education Plan clearly outlines emerging skills such as Personal attributes (values), communication and teamwork as prerequisites for success.

This presentation specifically focus on:

- A historical perspective,
- Recent developments and collaborations,

- Benefits and limitations of distance education, and
- Future plans.

It is the authors' intent to justify the benefits and limitations of several delivery systems, while soliciting participants' input as part of this discussion.

A Historical Perspective:

The evidence of communication dates back to the beginning of time. Some 3000 years ago, the rulers of China used scholars to educate those in governmental positions in conducting the business of government[1]. Distance education, which allows access to education regardless of location, is an alternative delivery and learning method to the traditional classroom. There still exist the relation between the provider (professor) and the beneficiary (student), but the way the information is delivered is different. Many institutions have been providing different forms of distance education for years. In 1858, for example, Oxford and Cambridge offered extension courses after people demanded access to the educational resources these universities provided[2]. Since that time, other institutions have employed distance education within their curriculum. For example, the first president at the University of Chicago promoted the use of distance education[3]. From the mid 1930s, television was used to bring educational opportunities to various institutions of higher learning (Kurtz, 1959, Brown, Lewis, and Harcleroad, 1969) as cited in Barron[4]. 1969 marked a new era in distance education, and a coalition of universities including the Open University in United Kingdom, took the teaching to a new level by combining correspondence with various broadcasting capabilities[5 & 6]. With the birth of Internet, the global opportunities for distance education became remarkable. Today, students have more choice than ever before to earn a degree form a university of their choice, without having to leave the comfort of their homes.

Recent developments and collaborations:

"Knowledge is an organization's most important asset and learning is the critical technology of today's economy"[7] (p. 200), and Norris[8] (p. J-14) asserts that "To be successful in the 21st century, learning must be available any time, any place, any where, and any how. It must be fused with work, recreation, entertainment, and personal development." According to Manjourldes[5], the cost-effective, on-demand education and training via the Internet is a reality.

With unemployment at rock bottom and labor efficiency at an all-time high, the urgency to strive more effectively has challenged many organizations in developing a workforce with capable global business expertise[9]. Among many factors effecting students, access to material should be the number one priority. This need, in turn, has led to the birth of a number of innovations and educational competitors including the 'corporate universities'. The real explosion of corporate universities began about ten years ago to over 1000 today[10]. Perhaps more interesting, is the effort of the Engineers' and Managers' Association (EMA) union in the United Kingdom which has recently launched an MBA program for its members to enhance their career prospects[11]. Furthermore, in the global

and Just-in-Time environment where work schedules, personal and family obligations and even distances make frequent trips to school difficult, alternative delivery systems are becoming a possible and cost-effective mode for achieving higher education not only for traditional students but more importantly for mature working professionals.

While many of us continue to be thrilled about theories, the industry's needs are becoming more competency- based and skill-based. The formal education and training of the early days are rapidly being replaced by a number of alternative delivery systems such as correspondence courses, audio conferencing, point-to-point microwave, tele-courses (broadcast TV/cable, video cassettes, satellite), interactive video discs, CD-ROM, compressed videoconferencing, internet on-line, self-paced learning and many others.

Dr. Turkle, a professor at MIT, based on her research on a broad range of computer users, submitted that people are growing up in a 'culture of simulation' that has its roots in video-game technology and "these environments are premised on the ability to proceed, to learn from doing, and to do from learning" according to Biemiller[12]. The question is then, what do students, businesses, and industries in local, regional, national, and international markets need?

Western Governors University:
Western Governors University uses information technologies to promote cooperation between colleges and corporations, and distributes courses and programs to students wherever they are. WGU makes education more accessible by pulling together the courses and programs of dozens of existing institutions, and other entities into a master catalog. And along with offering students greater choice and access to traditional credit-based college courses, WGU is breaking new ground in offering competency-based degrees at a distance.

University of Phoenix:
Accredited in 1978, the University of Phoenix was among the first to recognize the need for degree and continuing education programs for adult professionals. With over 61,000 currently enrolled students, the University of Phoenix is America's largest private accredited university for working adults.

The Open University – USA:
The Open University is the world's leader in part-time education and training for adults. Employers have provided tuition support for students, and 164,000 students in 41 countries are studying with The Open University. Courses are produced using specially written, high quality, mixed media learning tools, unlike other distance learning programs. The Open University is bringing its education and training to the United States: initially the United States Open University will offer only a small selection of the 300 courses in the Open University curriculum.

National Technological University
Headquartered in Fort Collins, Colorado, NTU works cooperatively with premier universities in delivering graduate level engineering education at a distance. NTU has no

campus and all of its students take various courses through a number of alternative education technologies including Internet and satellite television.

Benefits and Limitations:
Much like any technology-driven activity, the business of distance education brings a number of advantages and disadvantages. While, this section is not meant to be conclusive, major points are explored. Major benefits include the following:

- Could be cost effective for providing opportunities over a large geographical areas, including global coverage;
- Adaptability to various learning styles;
- Newer technologies can be relatively inexpensive to receive;
- Interactive participation where participants can see and hear each other;
- Multimedia capabilities;
- Wide access availability;
- Synchronous and asynchronous possibilities;
- Accommodate for small class sizes at given locations;
- Can be adapted for individual or group use.

Major limitations of distance education technologies might include:

- Cost;
- May restrict learning styles;
- Restricted distribution due to technology;
- May be subject to weather interference;
- Availability on a wide basis;
- May have restrictive or no interaction;
- Requires expertise to operate and support;
- Requires commitment in cost and personnel;
- May not work in all environments or conditions.

Future Plans:
For the growing number of professionals who need continued training, interaction and accessibility are perhaps important factors in determining how to achieve training. Although tele-courses (real-time videoconferencing) may be more accessible than classrooms, they still require the participants to leave their place of work or home and go to a remote classroom. On the other hand, CD-ROM technology, Internet and Web technologies, have greatly eliminated this requirement; the student can log-on at ‘any time, any place, any where, and any how’.

As Prof. Jafari has pointed out, the business world has already taken advantage of technology and if higher education does not take necessary steps to provide such access, soon we will see ‘.com’ instead of ‘.edu’. There seems to be a window of opportunity for

educators to provide access to students, businesses, and industries in local, regional, national, and international markets[13].

The future holds enormous opportunities for educational institutions that hold the significance of working in a 'perpetual, distributed, interactive' mode[14]. This concept has already been brought into existence, and while LTC currently is capable of providing interactive videoconferencing, CD-ROM and other non-traditional deliveries, we plan to utilize desktop-to-desktop delivery using present LAN capabilities. LTC's longer-term interests include a more effective implementation of online and interactive formats toward becoming the center of the 'Smart Communities' in the next century for our global community. The other authors' home institutions, Jefferson Community College is greatly expanding its Internet and Satellite TV capabilities in an effort to reach new students, with a particular emphasis on workforce development. In fact, a number of private sector and College partnerships are allowing the institution to serve professional members of business in new and creative ways such as credit-based professional development programs, industry certification and other upcoming workforce needs.

This paper has explored a number of central issues relevant to distance and engineering education. The authors hope that such exploration will foster more discussions on those aspects of distance methodologies, which have the potential of benefiting distance education most.

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