ODL SYSTEM FOR ENGINEERING POSTGRADUATE STUDIES

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INTRODUCTION

In the information age, ODL postgraduate studies are one of new forms of Life Long Learning Process (LLL) for working adults (knowledge updating). They enable education independently on time and place. They comply with actual professional needs and requirements.

Training Centre at National Institute of Telecommunications (NIT) in Poland offers, as a continuing education, postgraduate studies for adult engineers such as: multimedia telecommunications systems, management of telecommunications networks, radio-communications systems and also series of courses and workshops in the field of modern telecommunications and informatics. NIT plans to offer ODL postgraduate studie s and ODL courses for engineers.

Elaboration of high quality and useful ODL System requires to identify purposeful and functional requirements that comply with students needs, possibilities and expectations. Many analyses, considerations and comparisons concerning existing ODL models, information technology and telecommunications tools, character of studies, economic and pedagogic aspects of ODL should be performed to prepare an appropriate ODL system.

Analysis of existing ODL models (off-campus, near-campus, transparent for lecturers, using knowbots, with distributed cohorts) was presented. Use of presentation, distribution and interaction technologies was considered. Advantages and disadvantages of asynchronous and synchronous telecommunications tools were compared. Economic, pedagogic aspects (Kolb's experiential theory) and also engineering character of postgraduate studies were taken into account in the paper.

ANALYSIS OF ODL MODELS

Distance education programs can be offered (dependently of learners presence at the same time) in asynchronous mode, synchronous mode and hybrid mode. The following models of learning process can be specified according to time and place of learning process:

♦ synchronous mode: the same time and place (traditional), the same time and different places;
♦ asynchronous mode: the same place and different times, different times and places

Distance Learning process can take place either off-campus and on-campus. In the case of off-campus learning two models of ODL can be determined:

♦ very-far-from campus (students have remote access to educational and supporting services);
♦ near-campus (students can register in the remote manner using computer but other supporting services such as financial services, libraries services, examinations and laboratories are offered on-campus).

In the case of on-campus DL students can participate in traditional lecturers and communicate with other learners and tutor using computer and Internet on campus. Self-pacing is possible in this case. Distributed cohort groups model (small groups of 3-5 persons geographically distributed, working together) is used in Asynchronous Learning Networks (ALNs are used by Sloan ALN Consortium). It is very useful in narrow specialities (for small number of specialists located in different places). Some models of ODL concerning tutors work were developed. Learning process is transparent for lecturers in Stanford Model. Other model uses intelligent agent techniques. Intelligent software agents that automated the repetitive tasks of human facilitators are called knowbots (knowledge robots).

FUNCTIONS OF ODL SYSTEM

Educational system, applied by the educational institution for Distance Learning shall ensure on-line courses and lectures, storage of data concerning (archives) courses, lectures and course participants, marketing of courses, statistics concerning courses and course participants, services for system users.

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Functions of ODL system for engineering postgraduate studies should be specified with regard to different types of users and their privileges:
for students (access to general and learner's information, registration, payments, training, interactions), *for lecturers/tutors* (access to information concerning particular users, updating of didactic material, timetables, interactions: consultations, examinations), *for administration staff* (access to administrative information concerning particular users, updating of administrative information, preparation and service of course certificates). These functions should be accessible through the educational portal.

Educational portal is an interface where each user of education system can find appropriate entry with access to different systems functions (educational, information, administrative).

INFORMATION AND COMMUNICATION TECHNOLOGY FOR ODL

New open and distance forms of education are the result of very quick development of Information and Communication Technology (ICT). Technologies used for creation of ODL systems are of the following types:

♦ *presentation technologies* enabling presentation of learning material in rich form being friendly to user (using multimedia, graphics, hypermedia, simulations and animations);
♦ *distribution technologies* enabling delivery of learning material;
♦ *interactive technologies* enabling human interaction during learning process.

Telecommunications tools are used in open and distance learning for communication between users of ODL system. They are of the following types, according to the requirements, concerning user dependency of time during learning process:

♦ *asynchronous tools* (communication independent of time);
♦ *synchronous tools* (communication at the same time).

Asynchronous tools are very good for text based communication and distributing file based information to learners. Synchronous tools are very good for brainstorming and starting of new activities. In the case of asynchronous discussion tutors can answer only once to all learners and can moderate discussion without pressure of time. In the case of synchronous communication tutors more easily keep the thread of a discussion than in asynchronous communication. Asynchronous tools ensure self-paced learning, reflected feedback, collaboration with other learners independently on time. Synchronous tools ensure individual and group work, immediate feedback, spontaneity and immediacy.

Practical experience concerning use of ODL courses (e.g. gained as a learner in ODL courses via Internet) is very useful to formulate appropriate solutions for ODL systems. It is very important to select appropriate technology and tools for preparation of good and high quality ODL lecturers that facilitate learning process (learning is more effective and more pleasant). ODL didactic material should ensure very high degree of interaction, very quick search of information, possibility of self-learning and self-evaluation and also well-organized references (e.g. to electronic libraries) enabling deeper knowledge of material. It should use rich presentation technologies (multimedia and simulation programs) ensuring large capacity. It can be accessible on CD ROM and in the Internet. Appropriate telecommunications tools (asynchronous and synchronous) should be chosen according to communications needs and requests of students and lecturers enabling interaction (asynchronous or synchronous) between lecturer/tutor and students and also between students.

DIFFERENT ASPECTS OF ODL FOR ENGINEERS

Pedagogical and economic aspects of ODL system for engineers are presented in this chapter. Good understanding of learning process is very important for designing and implementation of appropriate and useful learning environments. According to Kolb's experiential learning theory: learning is a process whereby knowledge is created through the transformations of experiences. Learning process is facilitated by the creation of appropriate learning environment where learners can gain experiences. Learners are in direct contact with the reality being studied in experiential learning. Human brain contains two hemispheres: left hemisphere represents abstract symbols and the right hemisphere represents reality. The learning process is not identical for all human beings so different learning styles can be distinguished: accommodation, divergence, assimilation, convergence. Two perpendicular learning dimensions mutually independent (prehension dimension: from concrete experience to abstract conceptualization and

transformation dimension: from active experimentation to reflective observation) determine four learning modes: active experimentation, abstract conceptualization, reflective observation, concrete experience and four knowledge types: convergent, assimilative, divergent, accommodative. Learning styles are determined by learning modes. An appropriate learning environment (that supports learning mode) is needful for effective learning. Learning environments can be of the following types: behaviourally complex, symbolically complex, perceptually complex, affectively complex.

In engineering education, the laboratory experience and team-related design experience are of great value. In ODL system for engineers it can be realized by: Distance Laboratory and Distance Designing. The concept of Distance Laboratory contains the following forms: simulation of device functions or phenomenon by the mathematical model of an experiment, real distance experiment (computer controls the measurement system by the use of Internet), home laboratory (by the use of home computer and laboratory kit). Distance Designing is realized by group work with the following capabilities: asynchronous interactivity, synchronous group work (by the use of white boards), individual work space. It often requires use of expensive complex software (such software can be installed on a special server and accessible for remote users).

Education costs can be of two types: faculty (lecturers salary) and non-faculty (salary of administration and technical staff, costs of physical campus and equipment). Cost of learning in asynchronous mode depends on the kind of learning: self-study, study with instructor support, hybrid of these two previous forms. Costs can be decreased by the increase of number of students participating in courses. Education activity is expensive thus total costs should be reduced as much as possible ensuring high quality of teaching.
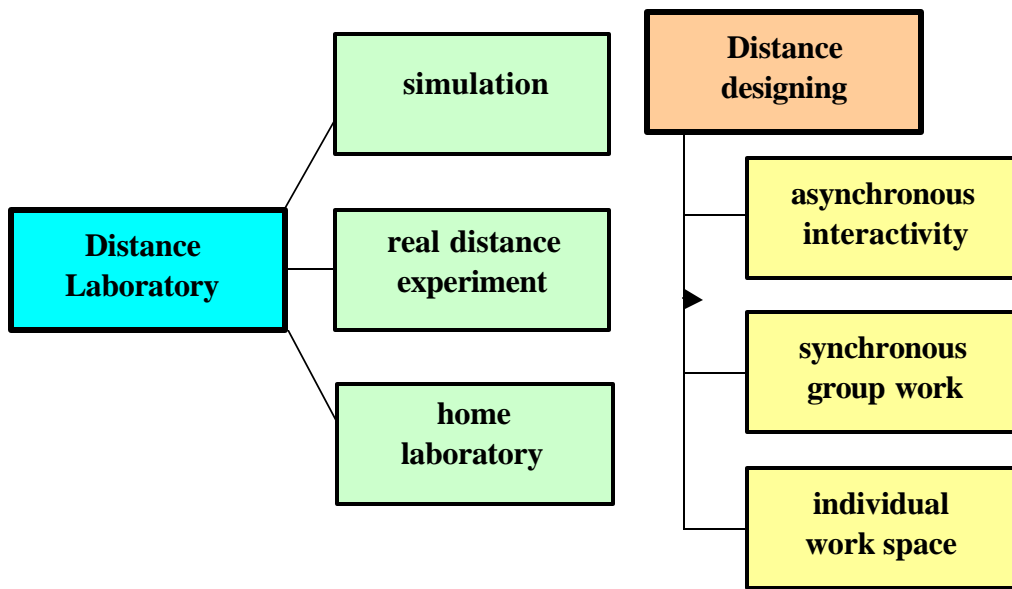

Fig. 1. Distance laboratory and distance designing in engineering studies

CONCLUSION

The paper is based on my analysis of materials accessible in Internet (especially Journal of ALN and ALN Magazine: 1997, 1998, 1999, 2000), conference proceedings concerning education, proceedings of professional tools for education (ready products), my practical experience gained as a learner in ODL courses via Internet concerning quality assurance in ODL and ODL theory (FACILE course).

Asynchronous mode of education (anytime, anywhere) with modern and cheap synchronous mechanisms is chosen as the best solution for postgraduate studies, to be offered by National Institute of Telecommunications in Poland, to comply with needs, possibilities and requests of engineers (working adults).