

THE INTERNET-BASED MODEL OF HIGHER DISTANCE EDUCATION – A CASE OF THE WARSAW UNIVERSITY OF TECHNOLOGY

Izabela Maleńczyk

*Institute for Organisation of Production Systems, Warsaw University of Technology,
Narbutta Str. 86 room 112, 02-524 Warsaw, Poland
Centre for Open and Distance Education, Warsaw University of Technology, Pl.
Politechniki 1 room 324, 00-661 Warsaw, Poland*

*Corresponding author's e-mail: izabela.malenczyk@pw.edu.pl

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ABSTRACT

In the Polish academic environment, many activities have been devoted to improve and enrich didactics. Many of them are based on the implementation of modern technologies and the Internet into various forms of academic education. The paper analyses legal framework, potential and barriers related to e-learning in Polish institutions of tertiary education. The aim of the article is to present the organisational structure, the model of functioning and management and the types of courses offered by the Centre for Open and Distance Education at Warsaw University of Technology (CODE WUT). The role of CODE WUT in shaping the culture within the organisation and its implementation in the academic world has been described. This was followed by a description of an academic multimedia textbook model and its role in the educational process. The article also attempts to define the basic business processes and analyses their structure using the BPMN notation. Finally, students' opinion on



e-learning significance and their evaluation of effectiveness and satisfaction of online classes were empirically surveyed and discussed.

Keywords: open and distance learning, education, e-learning, studies via the Internet, distance learning

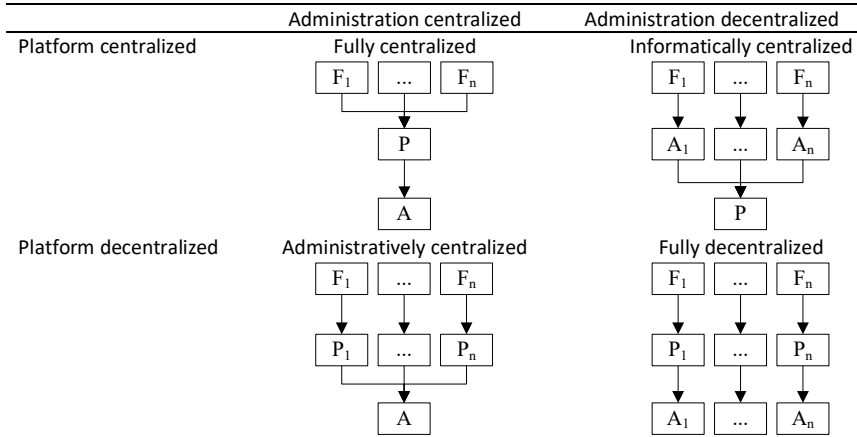
INTRODUCTION

E-learning is a modern and interactive method of distance learning using the Internet and electronic educational content. Currently, e-learning can be found in nearly all aspects of life, from business, politics to social and private spheres. Its outstanding characteristic is the possibility of learning in any given place, time and pace. The ever, increasing number of schools offering e-learning proves its effectiveness and of this type of learning method.

Polish academicians have been enriching didactics with various forms of Internet and modern information technology (IT). Intensive development of e-learning in Poland, which has caused significant changes in didactics at most universities, is historic. One of the main drivers for e-learning development was financial support for European Union (EU) funds. Projects that were financed and supported covered implementations of e-learning platforms, development of multimedia educational materials, online courses and training, and conferences and workshops promoting e-learning. A second important factor was a change in the law, which mandated applications of distance learning methods and techniques. Consequently, increasing research interest in e-learning in Poland has led to much published work on a national level, but mainly in Polish. E-learning is practiced in many Polish universities, and its forms are varied (Table 1).

Table 1: Academic e-Learning Models in Poland Concerning Administration and IT

(Source: Own work)



Note: A – administration; F – faculty; P – platform.

The system of higher education in Poland is based on the Act of 27 July 2005: Law on Higher Education. This act provides rules, terminology and typology for higher education in Poland. According to (POLON: System Informacji o Nauce i Szkolnictwie Wyższym [System of Information on Science and Higher Education]). There are 397 institutions of tertiary education in Poland academic (including 139 public and 258 non-public). The first implementation of e-learning in Polish universities took place in the late 1990s.

At present, this form of education is used by more than 60% of Polish universities. The most commonly used form of education is blended learning, where platforms are used to support traditional learning. In the e-learning formula, the most common are general occupational courses (eg. Health and safety courses, library training and language courses). However, a relatively small number of universities still offer on-line studies. The current legal system allows the use of e-learning in Polish higher education (Kula & Zalewska-Traczyk, 2008). In this respect, the basic legislation regulating remote learning is the following: Regulation of the Minister of Science and Higher Education of 25 September 2007 on the conditions to be fulfilled in order to enable the teaching of studies to be carried out using the methods and techniques of distance education and its three subsequent amendments.

The provisions contained in this regulation allow conducting teaching activities using distance learning methods and techniques on all faculties of study and at all levels of full-time and part-time studies. The most important of the provisions contained in this legal act are:

- The number of hours taught on-line cannot exceed 60%;
- Necessity to prepare academic staff for distance learning, provision of information and communication infrastructure (synchronous and asynchronous) between teachers and students;
- Providing teaching materials in electronic form;
- Providing students with personal consultations with teachers at the university headquarters;
- Providing ongoing control of the activity of the classes;
- Organisation of cyclical trainings for students preparing for the use of e-learning activities;
- Training in the field of practical skills, including laboratory, field and workshop classes, should take place in real life, in didactic classes requiring the direct involvement of academic teachers and students. Distance learning methods and techniques, including virtual laboratories, may only be of assistance to this extent.

The majority of Colleges and Universities also have internal regulations governing the organisation and functioning of e-learning. These regulations are issued under the rector's management and ordinances, resolutions of the senate or faculty councils, and regulations of the e-learning units coordinating activities in this field at the university level.

PRESENTATION OF THE CENTRE FOR OPEN AND DISTANCE EDUCATION

General Information

One of the largest Polish e-learning academic unions is the Centre for Open and Distance Education at Warsaw University of Technology – CODE WUT (OKNO: Ośrodek Kształcenia na Odległość [Centre for Open and Distance Education]). Using the internet and media the Centre organises,

informs and co-ordinates regular as well as long distance learning. The aim of CODE WUT is also to aid and promote new technology growth and forms of education, based on the latest internet and teleinformatique, as well as coordinating international partnership of the Warsaw University of Technology in that scope. CODE WUT tasks include (Maleńczyk, 2015):

1. Organising and coordinating I and II level e-students, post-graduate and short-term.
2. Coordinating preparation of didactic materials and overseeing this process.
3. Promoting and coordinating WUT open education and distance learning actions through the Internet.
4. Conducting research programmes.
5. Assisting preparation of teachers to lead distance lessons.
6. Inspiring and conducting exhibition work promoting using of education techniques supported by teleinformatique tools.
7. Organising science education conferences and seminars treating distance learning.

Implementing the above mentioned tasks the centre cooperates with basics and other organisational units from Warsaw University of Technology organisations taking part in distance learning, also (as much as needed) with other schools, science institutes and specialised institutions from Poland and abroad. CODE conducts lessons in cooperation with three WUT faculties: Electronics and Information Technology, Mechatronics and Electrical Engineering. The research and teaching staffs of the centre are accompanied by members of other faculties, such as: Physics, Mathematics & Information Science, Production Engineering, Management and Administration & Social Science.

**Table 2: CODE - Fact and Figures (Data for 2017/2018)
(Source: Own work)**

Type	Value	Notes
Faculties	3	
Fields of study	4	
Specialisations	9	
Students	Approx. 1000	700 (B.Sc.), 300 (M.Sc.)
Employers	12	
Academic teachers	Approx. 120	
Courses	Approx. 150	
Laboratory rooms	2	+ faculty resources
e-Learning platforms	2	

Table 2 presents the most important quantitative information on the functioning of the centre

Organisational Structure and Financing Actions

The organisational structure of CODE (Figure 1) is a typical functional structure, incorporating functional sectors lead by specialists. The work of the Centre is directed by the Head Director, who is responsible for its functioning to the rector. The Dean proxies have direct didactic supervision over the Centre (heads of institutions conducting extramural distance studies organised by the Centre). CODE carries out its goals on the basis of annual work plans prepared by the Head, in agreement with Programme Board CODE, whose function is planning and opinionating actions.

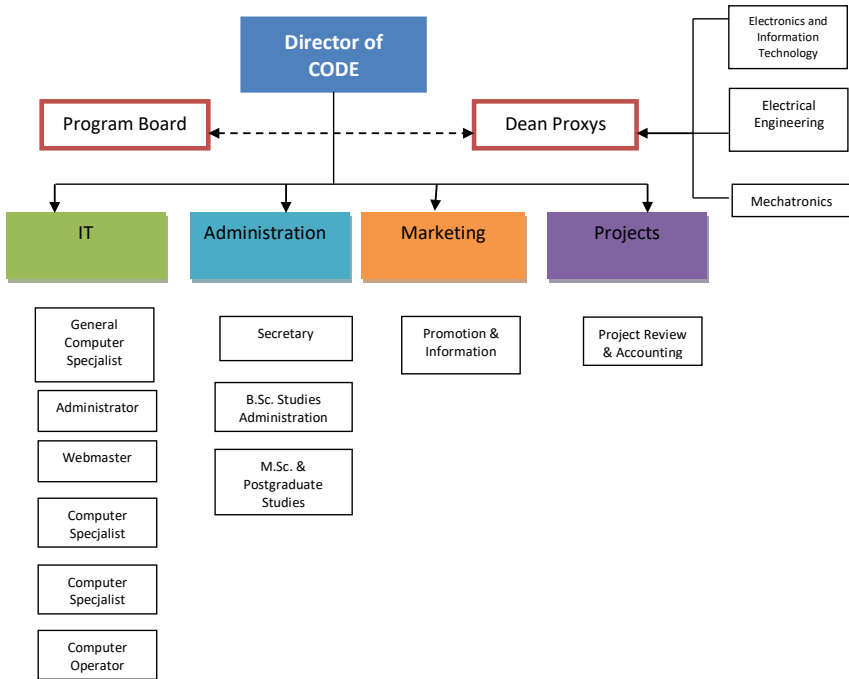


Figure 1: Organisational Structure of CODE WUT
Source: Own work

The Centre for Open and Distance Education (CODE) activity is financed by:

- Part of I and II level studies fees;
- Student payments from post-graduate studies and courses led and coordinated by the centre;
- Income from research programmes financed by the Ministry of Science and Higher Education, European funds and other work;
- Income from projects carried out within the European distance learning programmes;
- Direct payment from WUT budget;
- Direct payment from sponsors outside WUT.

Business Process Modelling Notation in the Example Case of CODE

Business processes occurring in the Centre can be identified and analysed according to their structure using BPMN grading (Business Process Modelling Notation). The process involves a section of centrum activity, where a new teaching programme is the stimulus to engage in studies. An example of such analysis of key centre activity (i.e. recruitment and conducting studies) using BPMN is shown in Figure 2.

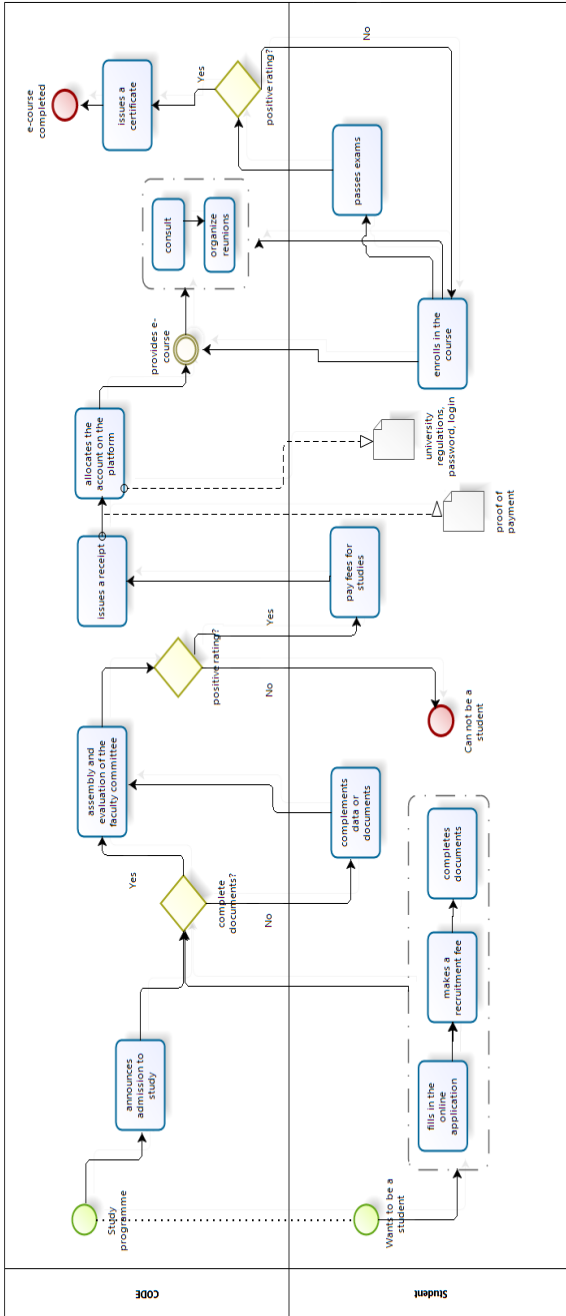


Figure 2: Core Business Process CODE (Source: Own work)

The model presents a clear and logical organisation of tasks (operations, events and processes) that make up the whole system. In a given situation it is a guarantee of eliminating organisational obstacles by way of student certification.

The presented process model can be used to visualise the recruitment path and organisation of the online study process to future users (students). In addition, this model can be used to build a user-friendly graphical user interface, which clearly guides the person who is interested to register as soon as possible.

Code's Extra-Curricular Activity

CODE WUT actively participates in multiple activities aiming to propagate e-education and environment integration. Among the activities of this type are listed as below:

- PTNEI (Polish Learned Society for the Internet-Based Education);
- Conferences (Virtual University: model, implements, practice) since 2001;
- Seminar – Progress on the Internet-Based Education, since 2009;
- Projects co-financed by the European Union (since 2003 CODE WUT carries out at least one project per year).

PTNEI gathers people dealing in educational activities using the latest information technology. It was formed in need of acting on behalf of development and growth of e-education in Poland, functioning within the guidelines of association law. It is a legal entity (Maleńczyk, 2015; PTNEI: Polskie Towarzystwo Naukowe Edukacji Internetowej [Polish Learned Society for the Internet-Based Education]).

Since the academic year 2009/2010, and under PTNEI patronage, an open environment seminar 'Internet Education Progress' has been launched. The theme of this seminar can be broadly described as education using internet, multimedia techniques, and informatics and telecommunications tools. The seminar meetings are held once a month throughout the whole academic year.

Since 2001, CODE WUT, together with the University of Warsaw, Polish-Japanese Academy of Information Technology, along with Warsaw University of Life Science organise a yearly conference called Virtual University: Model, Tools, Practice.

EDUCATIONAL OFFER AND MODEL OF STUDIES

Faculties and Specialisations

CODE offers non-stationary Internet studies on the following levels:

- Engineer;
- Master of Science;
- Postgraduate;
- Specialist Courses.

The system of studies is compliant with The Bologna Declaration on the European Space for Higher Education. CODE offers programme of studies compliant with requirements and education standards of the faculties of Warsaw University of Technology.

CODE education offers are listed specifically in Table 3. The offer is based on cooperation of Centre of Open and Distance Education with three faculties of Warsaw University of Technology (Kula & Gładysz, 2008; Kula & Gładysz, 2009).

Table 3: Description of CODE Courses

(Source: Own work)

Course Title	Duration	Field of study	Specialisations	Faculty
1. Extramural Engineering B.Sc. Studies	Four-year	1.1. Electronics and telecommunication	1.1.1. Computer engineering	Faculty of Electronics and Information Technology
			1.1.2. Multimedia techniques	
			1.1.3. Teleinformatique	

		1.2. Information technology	Applied informatics	Faculty of Electrical Engineering
		1.3. Automation and Robotics	Industrial informatics	Faculty of Mechatronics
2. Extramural Interfaculty M.Sc. Studies	Two-year	2.1. Information technology	Internet systems management support	Faculty of Electronics and Information Technology
			2.1.1. Software engineering	Faculty of Electrical Engineering
			2.1.2. Information technology in business	
3. Postgraduates Studies	One-year	3.1 Information Technology and Techniques	Internet	Faculty of Electrical Engineering

SPRINT Model of Studies

CODE WUT has designed and implemented its own model of distance studies –SPRINT. The key foundation of the SPRINT model is the individualisation of the key aspects of studying via internet: pace, place and studying time. Fulfilling these is made possible with constant technology updates, providing distance education in the SPRINT model, special focus on the e-learning platform and tools intended for creating didactic material.

The SPRINT model assumes leading didactic classes by means of three basic forms of student activity: course, laboratory meeting and degree (Figure 3).



Figure 3. The General Model of Studies in CODE
Source: Own work

Course

The didactic online time is realised according to the studies schedule in specific time-frames, based on base didactic material - the e-textbook. Upon completing subject courses, the student is in constant asynchrony and synchronic contact with the teacher. The intensity of these contacts, and choice of communication channels, are dependent on the specific subject and the teachers' preference. Online classes for each subject are intermixed with traditional classes. The curriculum and order of traditional classes are individually tailored to each subject. Each class subject ends with an exam.

Laboratory meeting

Weekly stationary classes which focused on intensive workshops, conducted in the schools on-site laboratories. Classes are held daily and are segmented into thematic blocks lead by lecturers of given subjects. A laboratory meet is held once a semester, thus the thematic blocks of the meet regard subjects realised during a given semester.

Degree thesis

A diploma project prepared by students during the two last half-semester under the supervision of a Diploma Promotor. A diploma work concerns the practical implementation of knowledge and abilities gained during studies. The themes and schedule of the work are determined by the

student and guardian. This is an individual piece of work by the student together with the leader, realised with the use of virtual laboratories, as well as direct individual contact and with the use of the e-learning platform.

Academic Year Calendar

The studies that are currently offered via Internet (SPRINT) enable an individual programme to be conducted. The academic year is divided into four half-semester (spring, summer, autumn, winter) lasting eight weeks each. During a single half-semester, students usually complete two to three subjects, although sometimes only one. The number of subjects within one half-semester depends on the student’s choice. Thus, such a division leads to a better organisation of the student’s worktime and helps them manage their progress in studies.

The form of the completion of the lectures during studies is the stationary exams. Such exam is being led in a traditional way by the university. Laboratories and selected projects are managed during weekly on-site conventions (PTNEI: Polskie Towarzystwo Naukowe Edukacji Internetowej [*Polish Learned Society for the Internet-Based Education*]).

1 st year	2 nd year	3 rd year	4 th year
Laboratory meeting 1	x	x	x
half -semester 1	half-semester 5	half-semester 9	half-semester 13
half-semester 2	half-semester 6	half-semester 10	half-semester 14
half-semester 3	half-semester 7	half-semester 11	half-semester 15
half-semester 4	half-semester 8	half-semester 12	half-semester 16

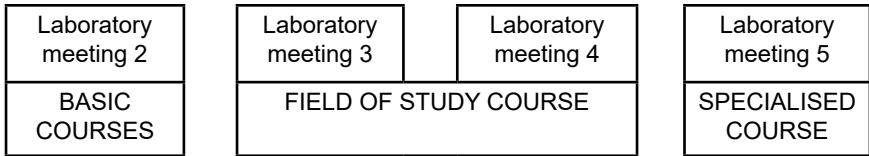


Figure 4: The SPRINT Model
(Source: Own work)

Contact with the Teacher

During the accomplishment of each of the subjects, the students remain under constant supervision of their guardian. The available didactic materials on the platform act as the base for the subject - the key element is still the didactic process on the e-learning platform, which relies on constant contact between student and teacher. This contact is enabled by synchronic tools: messengers and virtual classes - as well as asynchronous tools: e-mail, discussion forum, subject WWW pages, and open tasks.

Stationary Classes, Accounting and Project Exercises

During the eight week of the semester, traditional classes with workshops and exercises are organised at the school. These are an obligatory element of the subject in the SPRINT model. Classes are usually held on Saturdays, during which students learn practical abilities and have a chance to discuss online classes (e.g. they can solve problems arising during realising online material).

Exams and Passing Tests

Passing classes are held in the school. These are exams or passing tests conducted in project form. Exams are held usually in the eighth or ninth week of the semester.

E-learning Platforms

Currently the Centre uses two LMS (Learning Management System) class platforms.

SAS:

- Proprietary Studies Administration System,

Moodle:

- Bachelor’s and master’s degree studies,
- Postgraduate studies,
- Courses, projects.

Academic Textbooks

Academic textbooks are developed by school professors and lecturers, according to course programmes accepted by the Faculty of Electronics and Information Technology, Faculty of Electrical Engineering, Faculty of Mechatronics.

E-books and material preparation is a branch of the IT team of Centre of Open and Distance Education. For e-books CODE uses self-made template. Such template is based on HTML files with the course content. Sometimes the pure HTML is not enough. That is why technologies like Flash, Java, and Java script are used. Recently video layers to e-books have been added. The recordings are converted into FLV files and are included in the e-book. Moreover, for interactive courses presentations that connect PowerPoint slides with voice or even video comment are being built. Preparation of the full interactive courses, tests, are tutorials are also possible.

Course
Author’s note
Requirements for computer
How to use an electronic book
What to know, to understand
Learning Units
Examination requirements

Learning Units
Chapter 1:
LU 1.1
LU 1.2
.....
LU 1.n
Chapter 2:
LU 2.1
LU 2.2
.....
LU 2.n

Learning Unit 1
Introduction, objectives
Knowledge segments
Problems
Exercises
Glossary
Bibliography

HTML version		PDF or HTML version
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Figure 5: Structure of the Academic Textbooks
Source: Own work

Lecture materials would be enriched according to the possibilities, using graphics and illustrations, animations, video and audio clips with explanations and comments, multimedia presentations, questions and tasks with or without key.

The distribution of textbooks is in both forms: PDF documents form (review possible by the use of free Acrobat Reader Programme) as well as HTML version - shared on e-learning platforms.

E-learning in the Student's Opinion

The Centre regularly conducts surveys to identify students' opinions on the effectiveness and satisfaction of e-learning (Kula & Plebańska, 2011). The responses given by the students participating in the study indicates that e-studies are considered useful both in the context of student self-development and the position of the employee in the company. The content level of e-studies is assessed as high. Students also highly evaluate e-learning as a form of training for active people.

The main barrier to the implementation of e-studies is that the respondents are limited in contact with the persons conducting the classes (Kula & Plebańska, 2012). A possible recommendation to solve this problem will be the introduction of obligatory online consultations in the course of conducted subjects. The didactic effectiveness of this type of studies is, according to students, comparable to the effectiveness of traditional methods of acquiring knowledge. Both the value of knowledge and skills acquired during e-learning and the level of overall e-learning satisfaction are highly evaluated.

CONCLUSIONS

CODE WUT education offer is systematically enriched by creating new studies and specialisations, as well as using new and advanced multimedia tools used to be used in preparing the course subjects. It is necessary to prepare new tools to conduct projects and computer simulations using advanced software, and enabling distance experiments and laboratory work.

Another important future issue is creating a network of schools, which would be able to offer similar studies based on the same didactic material and software. This dispersed network will allow the students to interact and contact with their teachers, thus broadening the subject and specialisations offer, and will significantly lower the cost of material preparation.

CODE established its main directions of development. These are:

- Continuous technological improvement;
Improving applied information technologies, implementing new technologies and improving hardware and software.
- Utilisation of internet courses for conventional studies;
Internet courses are excellent forms of supporting conventional studies, allowing automation and improvement of communication process between lecturer and students.
- New forms of didactical and science materials;
Adding open access materials and publications.

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