Questions and issues in realizing the Engineering Studies Program in SPRINT Model

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Abstract – **All[1] forms of studies realized at Center Of Distance Education at Warsaw University of Technology (CODE) are characterized in the presentation. The methodology and tools used in the SPRINT Model, profiles of students and effectiveness of this model is shortly described in this article. Finally, the questionnaire concerning CODE and fulfilled by students is analyzed. This analysis leads to recommended way of developing the SPRINT Model in the nearest future.**
"SPRINT" is a shortcut for (S)tudies at (P)olytechnic (R)ealized via (Int)ernet.
Index Terms - distance learning, e-learning

BACKGROUND

The first formal analysis of algorythmisation & automatisation of educational process were made in the sixties. Since this time until now, the algorithmised & automatised educational process and tools have developed rapidly. In result, the concept of the distance learning system using virtual tools was created. In particular, Center of Distance Education at Warsaw University of Technology (CODE) has developed the concept of engineering studies realized via Internet (SPRINT Mode) based on using the new educational virtual tools. Thus, since 2001, CODE has organized the following engineering studies in the SPRINT Model:

- **The Postgraduate Studies „Computer Science & INTERNET Techniques"** at the Faculty of Electrical Engineering since 2002/03,
- **The PhD Studies on Electronics and Information Technology (**in English**),** lectured by Professors from Tor Vergata University in Rome, for students at Warsaw & Gdańsk University of Technology since 2003/04. (I*n area "Microwave Transistor Power Amplifers")*
- **The Postgraduate Studies „Tools & Techniques of Distance Learning"** at the Faculty of Electronics & Information Technology since 2004/05,
- **Interfaculty Studies for M. Sc. Degree** in SPRINT Model at the Faculty of Computer Science since 2005/06. [3]

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THE CONCEPT OF THE SPRINT MODEL

The main concept of SPRINT Model means that all educational materials (student books, lectures, exercises, task, exams) are available via Internet in electronic version and all academic teachers are available via Internet as well. For the purposes of the above engineering studies in SPRINT Model the following systems are used:

- **Content Management System** (CMS) based mostly on "virtual student books" in electronic version [1]. It should be mentioned that over 40 teams of authors (over 130 University Professors & PhD teachers) worked on „the student books of new multimedia generation" for SPRINT Model. [1, 6]
- **Learning Management System** (LMS), used for managing and communication with students, based on the following tools: own monitoring data system for documentation of learning achievements of students [7], WWW sites used for presenting individual data for each student, meetings on line („virtual classes") based on e-mail and Skype communication.

The following studies at the Warsaw University of Technology are available in the SPRINT Model:

- **B.Sc. Engineer** - 4 years study at Faculty of Electrical Engineering (specialization at applied computer science), Faculty of Electronics and Information Technology (specializations at biomedical engineering, computers engineering and multimedia techniques) and Faculty of Mechatronics (specialization at mechatronics and multimedia techniques) [2]
- **M. Sc. Engineer** – 2 years study for students having B.Sc. to become M. Sc .Engineer in informatics area (since 2006) at Faculty of Electrical Engineering, Faculty of Electronics and Information Technology [3],
- **Postgraduate studies** – 1 year study "The tools and techniques of the distance education" and 1,5 year study for the teachers "Computer science and Internet techniques",
- **Other Courses** (in example C++ programming, data bases, computer network) to individually chosen by students.

The study in the SPRINT Model takes 4 years: one year of basic studies which are the same for all faculties, two years of faculty oriented studies and one year of specialization studies. Four laboratory meetings are required during the above 4-year period: preliminary meeting, two specialized

meetings and final meeting. Each meeting takes one week (40 hours) of laboratory exercises.

Moreover, graduated persons are allowed to study one or more chosen subjects in the SPRINT Model ("short term" students).

STUDENTS' PROFILE

The amount of students [4] at the different faculties & specializations in the years 2001 – 2006 is presented in the Table I.

TABLE I
THE AMOUNT OF STUDENTS AT THE DIFFERENT FACULTIES

Faculties	Specialization	TOTAL
Electronics and Information Technology	Computer Engineering	371
	Multimedia Techniques	161
Electrical Engineering	Applied Computer Science	197
Mechatronics	Mechatronics	60
	Multimedia Techniques	89
"Short term" student		205
TOTAL		1083

The changing tendency in the above data is presented in the Figure 1. It should be noticed that the rapid increase tendency of amount of students at the faculty of electronics and electrical engineering is observed (in opposite to mechatronics). It confirms our assumption that the SPRINT Model is highly appreciated by students interested in using multimedia techniques and informatics tools during their study and professional future occupations. Thus, due to our experience, we expect that currently in Poland, educational models similar to the SPRINT Model have the chance for success at electronic and electric faculties. [8]

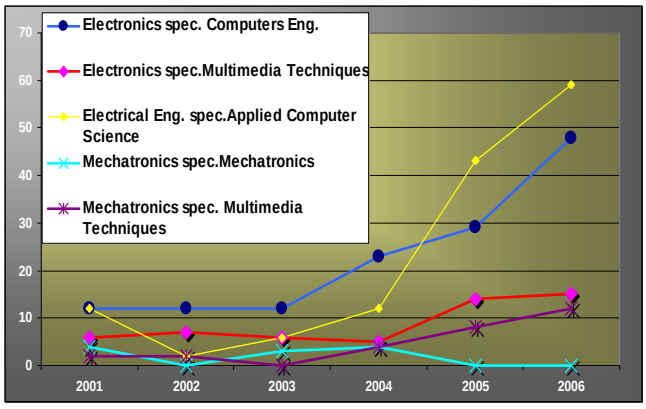

FIGURE 1
THE AMOUNT OF STUDENTS AT THE DIFFERENT FACULTIES

The characteristic of persons [4] becoming the students of CODE is presented in the Table II.

TABLE II
THE AMOUNT OF ALUMNUS BECOMING THE CODE'S STUDENTS

Year of study	Alumnus of the general secondary school	Alumnus of the technical secondary school	Other schools	TOTAL
2001/2002	94	55	44	193
2002/2003	78	51	42	171
2003/2004	67	40	26	133
2004/2005	73	39	29	141
2005/2006	70	32	21	123
2006/2007	68	40	9	117
Total	450	257	171	878*)
Share in %	51,3%	29,3%	19,5%	100,0%

*)Without "Short term student"

The changing tendency in the above data is presented in the Figure II.

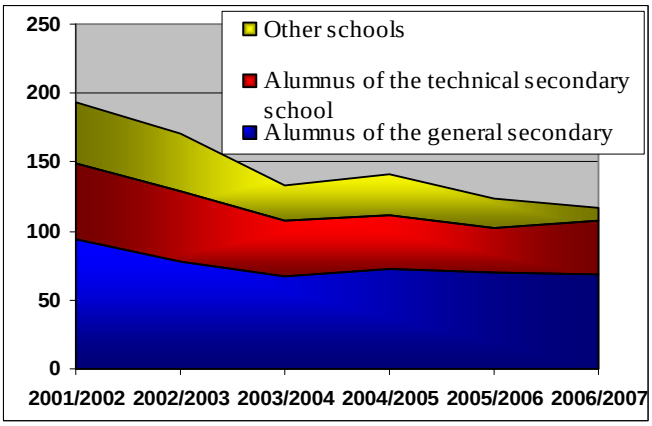

FIGURE II
THE CHARACTERISTIC OF PERSONS BECOMING THE STUDENTS OF CODE

It is observed that currently ca 50% of all students are alumnus of the general secondary school. Moreover, this percentage is rather constant. As alumnus of technical secondary schools and alumnus of other schools are considered, their participation in the CODE studies has been significantly decreased since 2001.

In our opinion, this tendency results from the fact, that the amount of technical secondary schools in Poland has been decreased in the same period as well. As far as other schools are analyzed, due to their different characteristic, it is not possible to define or explain the reason of the above decrease. Thus, in our opinion, as the alumnus of technical

secondary schools were more specialized in technical knowledge and skills than the alumnus of general secondary schools, learning program used for CODE studies should be accordingly adjusted. It should be more profiled for alumnus of the general secondary schools.
The age of students becoming the students of CODE [7] is presented in the chart below.

TABLE III
THE AGE OF CODE'S STUDENTS

Age	56 50	50 45	45 40	40 35	35 30	30 25	25 20	Below 20
Amount of students	4	13	26	42	67	101	121	21

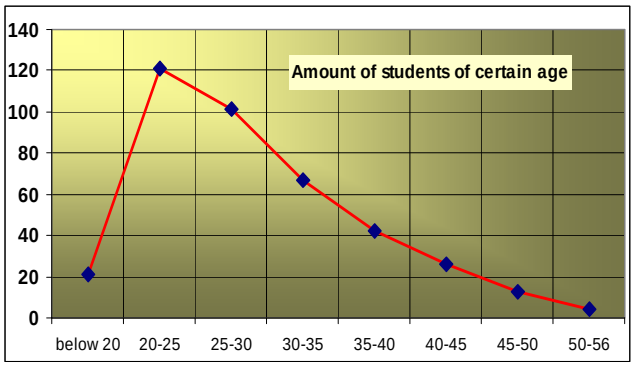

FIGURE III
THE AGE OF CODE'S STUDENTS

It is observed that the age of students of CODE varies from 20 to 56 years. It means that the skills of students are different as well. Thus, it is possible for volunteers to take part in additional courses "refreshing" the knowledge and /or skills required for the CODE studies.
The amount of throw-outs in the period 2004 – 2006 is presented in the Table IV.
In general, it is observed that the percentage of throw-outs is ca 60%. Please note that this percentage does not differ from the percentage of throw outs in standard studies at the Warsaw University of Technology

EVALUATION OF THE SPRINT MODEL

One of the most important factors analyzed by us due to improve and reshape the SPRINT Model are results of the questionnaire concerning CODE fulfilled by students. The most important data and their interpretation are presented below.

- **Analysis concerning CODE university teachers**

Due to the questionnaire fulfilled by students from engineering studies, the relation teacher – students is as follows:

4%	Some responses of the teachers were not clear
18%	Waiting for response of teachers was too long
62%	Relation teacher – students was satisfied
16%	Other comments ("the relation is extraordinary", "the relation is of bad quality", "no opinion in this respect")

TABLE IV
THE AMOUNT OF THROW-OUTS IN THE PERIOD 2004-2006

			Throw-out in %			
Facu-lties	**Specia-lization**	**Begin-ning year**	**2004**	**2005**	**2006**	**Total throw-out in %**
Electronics and Information technology	Computers Engineering	2001	50%	9%	6%	64%
		2002	40%	17%	9%	66%
		2003		48%	12%	60%
		2004			51%	51%
	Mult media Techniques	2001	52%	6%	6%	64%
		2002	28%	25%	8%	60%
		2003		48%	15%	63%
		2004			54%	54%
		2005			5%	5%
Electrical Engi-neering	Applied Computer Science	2001	34%	16%	2%	52%
		2002		64%	9%	73%
		2003		36%	14%	50%
		2004			48%	48%
Mecha-tronics	Mechatonics	2001	35%	19%	0%	54%
		2002	56%	22%	0%	78%
		2003		43%	14%	57%
		2004			55%	55%
	Multimedia Techniques	2001	39%	8%	5%	53%
		2002	55%	5%	20%	80%
		2003		100%		100%
		2004			60%	60%
"Short term" students		2001	50%			50%
		2002	28%	44%		72%
		2003		47%		47%
		2004		2%		2%
		2005			2%	2%
TOTAL			22%	18%	12%	52%

Due to the above results, in our opinion, the relation teacher – students does not require any improvements and the SPRINT Model results in a positive results in this matter. The only one aspect that should be taken into account is timing of access to the teachers.
Due to the questionnaire fulfilled by students from engineering studies, the demands of teachers are:

22%	Too high in respect of certain subjects
18%	Not high
56%	Proper & as expected for the university
4%	Exceeding ability to answer on the basis of the provided information

Due to the above results, in our opinion, the demands of teachers meet the expectations and / or abilities of students. Thus, we assume that the SPRINT Model has not have any special impact on the demands of the teachers.

- **Analysis concerning the profile of CODE students.**

Due to the questionnaire fulfilled by students from engineering studies, their systematic self-learning in distance learning system can be described as follows:

44%	A lot of difficulties with systematic self-learning
5%	High "motivating" impact made by the employers
13%	High "motivating" impact made by the family
38%	No difficulties with systematic self – learning

Due to the above results, in our opinion, two categories of students are observed: students having difficulties with systematic self-learning (it is one of the most important background for high percentage of throw outs) and students not having these difficulties at all. Relatively high amount of students in the second category (38%) confirms that their decision to study in SPRINT Model was fully mature and that they were aware of flexible system of learning (with its both advantages and disadvantages).

- Analysis concerning the CODE learning units

Due to the questionnaire fulfilled by students from engineering studies, the learning units are as follows:

5%	Easy
75%	From easy to difficult depending on the unit
5%	Too difficult
15%	Other ("medium", "not clear", "no opinion")

Due to the above results, in our opinion, the valuation of difficulties is similar in the CODE studies and in the standard studies (mainly described as "from easy to difficult depending on the units"). Thus, we assume that the SPRINT Model has not have any special impact on the valuation of the learning units.

- **Analysis concerning CODE students books**

Due to the questionnaire fulfilled by students from engineering studies, the quality of students books are as follows:

42%	Good & sufficient for exam requirements
31%	Certain changes are recommended
22%	Using library is needed to support learning process
5%	Other

Due to the above results, in our opinion, it is important to constantly monitor the process of education and expectations / requirements of students for changes. In result of such monitoring, the SPRINT Model assumes the yearly updating of students books.

- **Analysis concerning organisation of the CODE studies**

Due to the questionnaire fulfilled by students from engineering studies, the organization of the distance studies is as follows:

15%	Classical "face to face" contact with teachers is preferred
45%	Good but the possibility of passing the exams via Internet is expected
35%	Good but wider using of audio-video tools is expected
5%	Other

Due to the above results, we intend to expand using distance tools as wide as possible (in particular for exams).

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Finally, it should be mentioned that there is a great future for the e-learning systems. These systems should create the common virtually space for education of engineers. It is really a challenge for the international academic society.

REFERENCES

[1] Galwas B., Nowak J., Pajer M., Witoński P., "New Model of Electronic-Book for Distance-Learning Courses", *Proceedings of the EDEN 10th Anniversary Conference*, Stockholm – Sweden, 10-13 June 2001

[2] Galwas B., Nowak S., Piwowarska E., Rak R., "Web-based model of Engineering Studies Developed by Warsaw University of Technology", *Proceedings of European Conference "The New Educational Benefits of ICT"* , 2-4 September, Rotterdam 2002

[3] Galwas B., "Interfaculty Studies for M. Sc. Degree in SPRINT Model", *V conference and workshop, Virtual* University, VU'2005, Warsaw 2005

[4] Grzejszczyk E., "Computer system monitoring process of the teaching in the CODE Warsaw University of Technology", *V conference and workshop, Virtual* University, VU'2005, Warsaw 2005

[5] Grzejszczyk E., "Computer-interactive methodology of the teaching as a source of the curriculum", *Quality of the teaching in higher school – Multimedia and methodology improvement quality of the teaching*, Siedlce 2005

[6] Grzejszczyk E., "e-Book Computer Science 0", *the CODE at Warsaw University of Technology*, Warsaw 2004

[7] Grzejszczyk E., " Authorized computer program collecting achievements of students", made by presentation's author, *the CODE at Warsaw University of Technology*, Warsaw 2001-2007

[8] Grzejszczyk E., "The issues of e-learning selected on the basis of Distance Learning Institute of the Warsaw University of Technology", *The workshop-seminar „Distance learning", Polish Japanise IT School* , Warsaw, December, 2006