ECONOMIC ANALYSIS OF BLENDED LEARNING FROM THE STUDENTS' POINT OF VIEW

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Introduction

Currently, the economic efficiency of e-learning especially from the students' point of view lies on the periphery of scientific debates. However, behind the reasons of institutional developments the prospect to offer a less expensive but equivalent degree to potential students can be found, which could seriously increase the institutional competitiveness even in the short run. Also, IT-based educational programs induce serious methodological, institutional and pedagogical challenges, which are only tangentially discussed in this study. The measuring of economic efficiency is based on a financial model, which takes the relevant cost and cost-saving element into account regarding the whole studying period with a correct financial logic. The results will be demonstrated by the comparison of a blended distance course with a conventional distance and a regular course of Dennis Gabor Applied University [1].

Material and methods

Learning, or more precisely obtaining a degree can be defined as an investment. At the evaluation of these investments general financial rules are valid. To measure the economic efficiency of education programs the decision rule of the Net Present Value (NPV) can be applied. This is the summation of initial expenditures and the present value of future cashflows. If the result is positive, the investment is worth realizing, since the sum of the present values calculated with the consideration of the discount rate exceeds the expenses of realization.

In this article the authors measure the economic efficiency of blended courses from the students' point of view by the comparison of education programs. The economic characteristics of distance blended programs are compared first with conventional regulars, second with conventional distance programs. The analysis opposes the cost and cost saving elements of the blended distance program Technical Informatics BSc which started in 2006/2007 with the adequate data of the program created from conventional distance and regular courses Technical Informatics started in 2001/2002 at the Dennis Gabor Applied University. Naturally financial data is adjusted to a 2006/2007 level.

This kind of comparison is necessary, because it is not adequate to oppose the blended distance program with the actual regular course, as some e-learning elements has been introduced at the University since 2005, therefore the benefits of an e-learning application can't be demonstrated. Second nowadays there are only blended programs at Dennis Gabor Applied University, so the comparison of these with an actual conventional program is impossible. The introduction of e-learning at the University started in 2005, so a course before this time had to be chosen. Other universities are also running conventional courses.

To evaluate an e-learning system in the business sector from the implementer's point of view the following main cost savings opportunities may be considered: travelling costs, trainer costs, costs of administration and booking rooms and venues, costs occurred from the absence of employees from work. On the one hand costs of an e-platform, content and marketing are elements of the initial investment, but on the other hand all the previous costs exist, and in addition also some administration expenditures sustaining costs, too [2].

In the model of the study the following cost and cost saving elements are taken into account:

- IT infrastructure at home: A laptop with an average market price of 600 € is respected in the model, and for the students of the University Internet connection (120 € in a semester) is available on a reduced price, assuming that for the regular conventional course IT-infrastructure at home is not inevitable, because they could use it on school premises. Software requirements can be acquired for free within the frame of the contract between the University and Microsoft.
- Difference in the fee. The difference in the fee between the conventional regular and blended distance courses amounts to 80 € per semester; the fee of conventional distance and blended distance courses are the same.
- Calculation of attendance in days, accommodation and travelling costs: The authors first assumed that the daily number of lectures is six at all courses, so the number of school-days in a semester can be calculated by dividing the total number of contact lectures by six, secondly that students attend all the lectures offered. At conventional

regular courses there are lectures on three following workdays in a week, so the students have to travel (return) every three days, and for these three days 2 nights of accommodation are necessary. At conventional distance courses there are lectures on Fridays and Saturdays, so students have to travel on every second school-day, and need the same number of accommodation nights (in the model: in 2006 10 €/night/person). At blended distance learning courses the lectures are only on Saturdays (no accommodation necessary). The total number of exams must be added to this amount. At conventional programs there is one exam per day; besides in the blended distance system two exams can be taken per day as a result of the shared exam organisation. Based on the university statistics at the conventional regular course 0,45; at the conventional distance 0,52; and at the blended distance 0,64 failed exams per person were assumed additionally. The summarized days of attendance have to be multiplied by travelling costs. The basis of determining travelling costs is the average distance between the students' home and the University. The average distance is 115 km in the case of students admitted to BSc blended distance course in 2006. In all calculations this value is applied. The average cost of travelling in kms is approximately 14 € (calculated with 50% train and in 50% coach charges). In the model, the students from Budapest have no travelling costs.

- Cost of absence from work: At conventional regular courses lectures are only at workdays, at conventional distance courses consultations are on Saturdays and on Fridays (which means, that the student must be away for a half day from work). At blended distance courses consultations are only at weekends. The exams at conventional regular courses are only in workdays, at conventional distance courses 50% on workdays, at blended distance courses only at weekends. An exam on workday requires a half day absence from work. The cost of an absence day is calculated from the average monthly net wages in Hungary [4]. This value amounts 16 € per day, calculated with a month of 20 workdays.

Assumptions of the simplified model:

- All costs and cost-savings occur at the beginning of the actual semester in a single amount.
- During the whole planning period all costs and cost-savings are in real value constant; the discrepancy in nominal values is caused only by the inflation.
- The nominal discount rate is in the whole planning period constant.
- The decision of the students in choosing the suitable educational program emerges at the beginning of the first semester.
- The students don't leave their home neither in the case of a regular program nor in the case of a distance program. Regardless of the distance they travel daily to school.
- The discrepancy between a calendar and educational year was not taken into account.

The calculations are based on nominal values. As the calculations are given by using nominal interest rates, all the elements of the costs and cost savings must be adjusted by the inflation. For historical data the published inflation rate in Hungary [6], and for future estimation the inflation prognosis of the Nation Bank of Hungary is used [7]. Each of the calculated monetary data will be given in Euros, making international comparisons more feasible. The EUR/HUF exchange rate is the average of the midrates of 2007 published by the National Bank of Hungary, which amounts to 250. The discount rates used for the calculations are determined by the following methodology:

For the correct financial calculation it is necessary to transform the costs or savings occurred in different times (during the semesters of the education program) to the same basis, when students decide about their program choice at the beginning of the first semester. The instrument used to discount the cashflows is the opportunity cost of the investment, which equals with the return of the alternative education opportunities. With a simplified model, in which the state-fee, foregone earnings, and the difference in earnings achieved through higher qualification [3, 4] are taken into account, the general internal rate of return (IRR) of the learning in Hungary can be calculated. According to the estimations the IRR is approximately 14%. In the OECD publication this value for Hungary in 2003 (average of males and females) is 19% [8].

The educational data used in the study are collected from the internal statistics of the Dennis Gabor Applied University. The data filtering is achieved with the assistance of the administrative staff.

Results

From 1990 the number of non-regular students (participants of distance, correspondence, and evening courses) in Hungary and in other countries of the European Union rose strongly in the higher education. Besides the rising number of participants it is also important, that the rate of non regular and regular students rose greatly too. In Hungary in 1990 on one non regular student fell three regulars, in 2006 on two non-regular students fell three regulars. Furthermore the number of regular students has tripled in 2006 compared to 1990, the number of non-regulars has increased to the sevenfold (see Figure 1). On Figure 2 a moderated but significant growth of the absolute and relative number of non-regular students in several European countries can be observed.

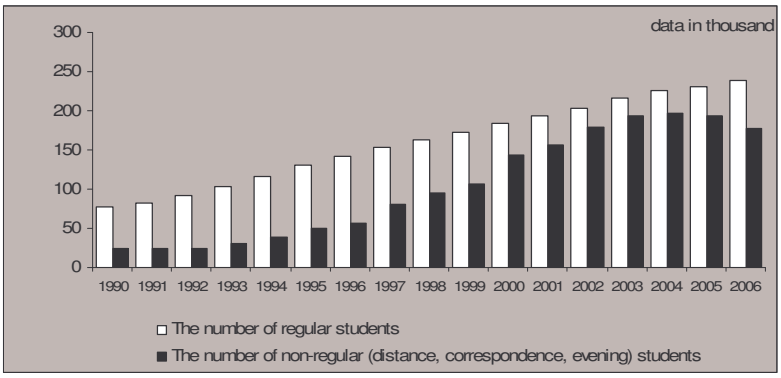

Figure 1 Number of regular and non-regular students in higher education in Hungary [9]

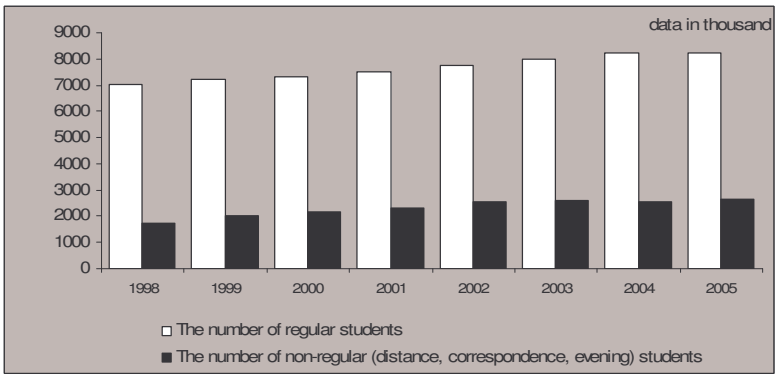

Figure 2 Number of regular and non-regular students in the higher education in several European countries (UK, Sweden, Spain, Poland, Norway, The Netherlands, Ireland, Hungary, Germany, Czech Republic, Austria) [10]

Without extensively examining the changes mentioned above, it can be defined, that the expansion of non-regular education means the involvement of social groups with special demands in higher education. In our opinion these special demands can be considered from the economic point of view too. The attractiveness of the blended courses appearing in higher education as alternatives of regular education programs can be originated from the cheaper, but equivalent degree.

The economic analysis beyond the emphasis of blended distance programs' economic efficiency besides the students' advantages, indicate the competitiveness of the University as well. Certainly there are lots of preconditions to introduce IT-based educational programs such as the following factors: pioneer activities of Dennis Gabor Applied University in the field of open courses, rapid reaction of the management to the international trends and local requirements (technological innovation, first introduction and continuous development of ILIAS in Hungary [11], development of on-line teaching materials. [12] The efficiency of blended-learning courses is accomplished by institutional coordination, new methodology, trained mentors and tutors, and supported by regular survey and qualitative examinations, also by tracking and evaluating feedback-answer processes.

The most important components of creating the right conditions at Dennis Gabor Applied University are:

- *Professional, didactically established e-learning courses*: appropriate curricula, learning contents of a high-standard, on-line training based on ICT, proposal for learning schedules and methodology, trained and qualified tutors and

mentors, and changing face-to-face training: formal introductions then consultations preparing for exams instead of conventional lectures
- *Education organizing*: face-to-face training and seminars at weekends, shared examination
- *Technological development*: testing and introducing new ILIAS versions to support students' demands and pedagogical purposes (installed multimedia, ICT, assessing feedback, web 2.0, user tracking)
- *Appropriate IT background*: IT sets for reduced price and free software for students through partnership
- *Improving social and cooperative competencies* by forum activity and by mentors' and tutors' pedagogical efforts (which could also increase discussion and cooperation in the learning process, administrative tasks and shared travels).

To accomplish that students really do not have to attend school often t for getting information and tutorial support, obtaining PCs and Internet-connection, using software, the university is forced to find multiple innovative solutions harmonized and managed on an institutional level.

Exploiting ILIAS facilities has many preconditions. The new learning environment is challenging for both users and suppliers. It demands change management, preparing tutors and mentors for their new tasks. Dennis Gabor Applied University has a six-year experience in implementation and development. The ILIAS frame system provides complex services in a simple structure with a safe 24-hour running. For students, tutors and mentors, the basic competences required are knowledge and experience about the new learning environment including ILIAS services, e-learning facilities, e-communication methods, typing and digital communications skills, ability for individual and team-work. All of these demand training and continuous improvement.

Characteristics of efficient blended-learning at Dennis Gabor Applied University:

- The three basic elements of learning are: 1) decreasing contact hours, but intensive hours of practice, 2) increasing e-learning services, 3) supported by printed learning material prepared for distance education
- On-line, multimedia and paper-based materials of a high standard
- Active tutoring and mentoring based on carefully considered methodology
- On- and off-line communication: by forums, e-mail, face-to-face consultation
- Knowledge and competence tests at several points of the learning process (self test questions after chapters, on-line tests after modules, ILIAS homework, and written and oral examination terminally)
- Formative evaluation of ILIAS homework (practice exercises to be sent to the tutor through ILIAS)
- ILIAS training for students, tutors and mentors with personal consultations and on-line ILIAS courses including users' manual guide, ILIAS exercises, a sample course and learning modules, self-tests, glossary [13]
- Change management.

The changing educational structure and learning environment implicate new tasks for tutors and mentors. Roles are changing: the teacher is not a conductor any more, but a supporter of the learning process which is managed by the ILIAS frame system, students naturally should be more interactive in e-learning, mentors become a link between students and the university, and help tutors as well if necessary. The impersonality of e-learning and digital pedagogy is eased by active tutoring and mentoring, empathic attitude, personal attention to each of the students, and uploading photos. We take care of giving quick and clear answers to students' questions and problems. We appreciate and methodically prepare the tutors'/mentors' work and the improvement of the participants' e-competence.

Students have new roles and characteristics. They have larger autonomy and consciousness in the learning process. Instead of conduction, they follow supported courses. They get practical recommendations about learning techniques and timing, which help them to manage their own learning plan. They can decide when to enter ILIAS, how far they get on and what facilities they use. Their knowledge and skills are monitored by self-tests and finally by teachers (during writing and oral examination). Incorporated self-tests and sample exams give digital feedback per question and also as a sum, and offer a suggestion (ex. repeating a modules or a certain chapter) that would be useful to follow. But, in this system, it depends on the students whether they carry the motion or ignore it. They can gather information partly during face-to-face consultations, but mainly from curriculum guides, forum dialogues, on-line stores of FAQ, ETR and ILIAS notice-boards. They have the possibility to use all these facilities not only as passive consumers but as active participants and authors (posing questions, giving information, dividing various study-help and useful links). *Students' requisite competences* for efficient e-learning (besides basic competences) are motivation and ability to acquire the curriculum individually but also with a support, make learning plan, use study-helps, ILIAS facilities, elaborate subjects

and draw the inference from self-test feedback and teachers' evaluation, then build or modify learning strategies, and improve an interactive, cooperative and assertive behaviour. All these need to be improved and supported by tutors and mentors.

Expansion of ILIAS-based courses demands enlarging mentors' staff. In 2007, we had organised a six-week intensive course for new mentors which terminated with an examination. Curriculum of mentors' training had been following a blended-learning methodology in its learning types, materials, timing and self-test. The training consisted of 18-hours face-to-face consultation and practice, then twice as much individual learning with homework, followed by a 16-hour personal and a lot of e-consultations (through forums and e-mail), also an approximately 30-hour individual practice. Those, who passed the exam, got a certificate and could join the ILIAS team.

*The mentors' new tasks are: c*ontinuous online correspondence, posting public information in the mentors' forums, supporting students in this new kind of learning environment, answering students' questions (except curricular ones), assisting students in solving their problems, following the learning progress, getting information from ETR (Unified Student Registering System) and ILIAS User tracking (an incorporated follow-up system) statistics, reminding students to their lagging behind, encouraging them for regular learning and giving support if necessary, and trying to anticipate dropouts in different manners. Furthermore, they are to help tutors (by answering general questions and forwarding curricular ones to tutors, paying their attention (if necessary) for the period of active tutoring and for correcting ILIAS homework, and simultaneously calming impatient students). *Competences required for mentors* for efficient e-learning are: empathy, supporting attitude and being familiar with the structure and the administrative processes of the institution and the education system, regulations, documents and the contacts to each organizational entity, being familiar with the characteristics, components and study-helps of the course that students' follow (curriculum, syllabus, subjects, materials, time-table/agenda).

The tutors' new tasks are: active tutoring, participation in the development of on-line and off-line materials and further study-helps that are suitable for blended learning, quick feedback to ILIAS homeworks with normative or formative evaluation, plus further instructions if it seems to be useful, and conscious forum animation (with the regular checking of forums, giving concrete (not general nor superficial) and quick (within 1-3 days) answers to the given questions, conducting and forwarding discussions, giving instructions and asking questions if it seems to be necessary, and taking care of the clearness and traceability of discussions). In this system personal consultations have three types: a) aspect-shaper, formal introductions at the beginning and at the major points of subject elaborating, b) practices, c) consultations preparing for exams (instead of conventional lectures) where teachers set out matters, answer the questions, give further instruction, prepare and help to transform the theoretical knowledge into practical application. *Tutors' requisite competences* for efficient e-learning (besides basic competences) are the knowledge about the new methodology and e-pedagogy, Practical experience in the support of the learning processes in the LCMS, supporting attitude and ability for individualizing the subject and materials (fit for student's needs and competences). Tutors' trainings and conferences aim to introduce the current methodology, to improve requisite competences, discuss problems and developmental recommendations applying feedback given by students, tutors, mentors, system administrators and content developers.

Table 1 Comparison of conventional regular course Technical Informatics 2001 (Fictive) and blended distance BSc Technical Informatics 2006

Inflation	Semester	The cost of hardware and internet connection (€)	Difference in Fee (€)	Difference in the cost of travelling (€)	Difference in the cost of accommo-dation (€)	Difference in the cost of absence of work (€)	Sum of costs and cost savings	Discounted sum of costs and cost savings
3,90%	I. 06/07	-672	80	187	367	978	940	940
8,00%	II. 06/07	-73	82	173	376	994	1552	1456
8,00%	III. 07/08	-76	85	489	693	1853	3043	2680
5,00%	IV. 07/08	-79	88	467	588	1593	2657	2196
5,00%	V. 08/09	-81	90	391	610	1623	2634	2043
3,00%	VI. 08/09	-83	93	200	293	829	1333	970
3,00%	VII. 09/10	-84	94	-86	0	0	-76	-52
	VIII. 09/10		0	0	0	0	0	0
								10234

Table 2 Comparison of conventional distance course Technical Informatics 2001 (Fictive) and blended distance BSc Technical Informatics 2006

Inflation	Semester	The cost of hardware and internet connection (€)	Difference in Fee (€)	Difference in the cost of travelling (€)	Difference in the cost of accommo-dation (€)	Difference in the cost of absence of work (€)	Sum of costs and cost savings	Discounted sum of costs and cost savings
3,90%	I. 06/07	-672	0	84	110	215	-263	-263
8,00%	II. 06/07	-73	0	79	122	232	360	338
8,00%	III. 07/08	-76	0	36	90	180	230	203
5,00%	IV. 07/08	-79	0	134	105	214	374	309
5,00%	V. 08/09	-81	0	251	192	377	739	573
3,00%	VI. 08/09	-83	0	366	220	439	941	685
3,00%	VII. 09/10	-84	0	261	165	315	656	448
	VIII. 09/10		0	53	12	32	96	62
								2355

On Table 1 the main marginal cost and cost saving elements of the comparison of conventional regular and blended distance courses can be observed. After summarizing the cashflows, the present value of savings is approximately 10000 €. If the blended distance course is compared with a conventional one, the present value of the savings reaches approx. 2350 € (see Table 2). It is important to emphasize that this extremely significant economic advantage means the redistribution of the time demand of learning. The reduction of contact lectures causes the radical growth of time required for individualized learning. On the other hand a successful methodical change is necessary on the side of the university.

As a summary of the results of the economic efficiency, the following statements can be made:

- Increase of competitiveness of the University
- Through cheaper, blended-learning courses more people have a chance to take part in (higher) education
- Blended distance courses present equal chances for the rural population, disabled people, young mothers and people with a family or a job.

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