Institutional perspectives for online learning: Policy and return-on-investment

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Abstract: An analysis will be presented about why, at the institutional level and in particular at the university level, online learning is being introduced. This will be done in the context of a general design approach to steer innovation in education. Costs and financial-benefit issues will be explored, including costing models, measurement of productivity increases and return-on-investment. Although the article focuses on the university context, it can be predicted that similar issues will soon confront secondary schools.

Keywords: Costing, distance learning, flexible learning, management

1. INTRODUCTION

Most Western universities are currently introducing online learning facilities, primarily via use of Web-functionalities. When asked why, the most common answer is that they cannot *not* do it, as everybody else is doing it. Although specifics of their particular situations influence their decision making, a common reason seems to be not to loose (distance learning) students as those students' expectations include having online facilities. In addition most universities want to open new markets for (distance learning) students who did not consider taking courses before. Thus, economic reasons are a prime reason for the introduction of online learning. In addition quality and efficiency reasons are mentioned as well, although there is a general understanding that there is a long way to go before this improvement will show up. From a pure economic or return-on-

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investment (ROI) perspective, the equation still has to be worked out. It is generally agreed that investments in online learning are necessary. ROI will (hopefully) come later. However, decision makers balance project budgets with potential benefits. Instructors balance costs in terms of energy and time with possible payoff. ROI guides decision making even if the actors involved do not identify it as such.

2. INNOVATION AND DESIGN

Introducing an institution-wide online learning approach is an innovative activity as well as a (re)design of the teaching-learning environment.

There is a vast amount of literature about educational innovation and change. Major success factors in educational innovation and change processes are the positive involvement and support of the management of an institution, an already existing innovative culture within an institution and the fact that each innovation takes time in order to grow, find its anchors and flourish. Environmental pressures, technological and educational developments, institutional conditions, cost reduction/cost-effectiveness and support facilities are initiators for institutional change (Fisser, 1999).

Identifying change factors is one element of the change process. Influencing and controlling them are much more difficult issues. It is unlikely to expect that it is possible to handle all of the potential change issues at the same time. Construction of an implementation strategy with identifiable phases as well as an assessment of influential factors for each of the phases will improve the control and the understanding of the change process. Policy to support this implementation process is critical.

A perspective to understand a change process is to look at it from a design-oriented point of view. A design approach can focus on the major results of the change activity: the new products (including new kinds of learning and instructional material) and the new instructional and learning processes. Design is a very generic process. A design activity can be described referring to three so-called *activity spaces*: (a) the consensus space, (b) the task space, and (c) the implementation space (Moonen, 2000a). In the consensus space stakeholders negotiate the specifications of what has to be designed. The context, history, culture and what is already available as experiences and as products and processes, are determining factors. As soon as a consensus is reached and global specifications are agreed upon, these specifications form the starting point for the development of the products and processes in the task space. According to what has to be developed and the available expertise, particular methods will be used. The result of the activities in the task space will be products and processes, preferably in a

format that can be further adapted in the implementation space. The adaptable products and processes will then be implemented in a real situation taking into account particular specifics determined by its implementation context.

A major aspect in such an approach is to determine the major stakeholders in each space, as well as the crucial decision makers and their criteria. In the following section, we focus upon crucial decisions in the consensus stage.

3. FACTORS TO STIMULATE THE INTRODUCTION OF ONLINE LEARNING

The introduction of online learning has been happening for more than a decade, most often on the basis of an individual decision made by a faculty member. Now online learning is becoming more popular, especially within the management of university institutions. In a detailed analysis three kind of reasons, with a different emphasis, can be extracted (Collis & Moonen, 2000): (a) not to loose students (economic argument), (b) improve the quality of the instructional environment (quality argument) and (c) improve the efficiency of the institutional environment (efficiency argument). The emphasis on each of these reasons is different with respect to the function of the person interviewed. Managers of institutions emphasise the economic argument, while instructors and students emphasise the quality argument. All actors in the online learning situation (including the students) are interested in the efficiency argument: managers for improving the financial basis of the institutions, instructors for reducing their workload and students for reducing their throughput time.

The main criterion of success will be the eventual incentive for the actor involved. For an institution the incentive will be (at least) a stabilisation and preferably an improvement of the financial basis. The incentive for the average instructor to be fully engaged will be a confirmation and strengthening of his faculty position, a potential reduction of the workload and an improved quality of his tasks. The student will expect improved quality of the teaching-learning process and efficiency gains in terms of flexibility in time and place. Each of the main actors wants the incentive to be tangible. The instructors and students want it in a short time, the institution will accept a longer-term perspective.

A discussion about the introduction of online learning should take into account a number of dimensions: (a) the 'spaces' in the design activity, (b) the decision-making arguments and criteria and (c) the main categories of actors. Each dimension has a number of components. There are three design

spaces: consensus space, task space and implementation space. There are three main arguments: economic argument, quality argument and efficiency argument. Finally, there are (at least) three actors: institution, instructors and students. Thus, a 3x3x3 matrix constitutes the framework for our analysis. In this framework each combination of components should be analysed in terms of actions to improve the introduction and use of online learning (the design component), be related to the potential incentives (the argument component), for each category of actors (the actors component).

To simplify such an analysis, one can argue that the major involvement of the different actors will each be concentrated. The influence of the institutional management will be maximised in the consensus space of the design process, when the decision about the introduction of online learning has to be made. The contribution of the instructors (and the instructional designers) will be maximised in the task space when the specifics of the materials and processes have to be determined and worked out into products. The involvement of the instructors and the students will be maximum in the implementation space as the products and processes produced have to be used in practice.

4. ACTIVITIES IN THE CONSENSUS SPACE

As the focus of this article is on the institutional perspective, we will discuss now main activities in the consensus space. Such activities concentrate around discussions among the decision makers and result in a satisfactory answer to the 'why online learning?' question, in criteria to eventually measure its successful implementation and in functional specifications about how to work out the necessary steps, processes and products.

Most institutions have a consensus and explicit statements about their overall vision and mission. Visions are, almost by definition, nicely phrased but at the same indicate the central commitment of an organisation. Mission statements are further worked out in a strategic plan. It is noticeable that, in particular in newly published strategic plans, institutions are giving explicit references to the use of new technologies in their educational approach. Examples are the Edith Cowan University (1998) and Southern Cross University (1999), both Australia.

But visions and strategic plans have to be worked out and specific objectives and criteria for the assessment thereof have to appear. As indicated before there are many issues for which explicit criteria and methods have to be formulated. As an example, a discussion document for the reshaping of the University of Western Sydney mentions explicitly

objectives "to improve the quality of services and educational experiences" and "to provide these services in a co-ordinated and cost efficient way, building on all elements of best practice" (Reid, 1999).

5. COST AND FINANCIAL BENEFIT ISSUES

As most universities are (partly) funded on the basis of the number of students, universities are competing to maintain or enlarge their student enrolment. Most universities are organised according to a projected minimal number of students. When that number of students goes down each institution reacts, striving for stability, predictability and legitimacy, and in particular, institutional survival. In addition, in many Western countries governmental funding for universities is in a slow but steady decline. Finally in some countries, for example Japan, the university system expects the overall student enrolment to be reduced dramatically in the near future.

In that context universities are looking for new markets, in particular to attract student populations that were not focussing on or not able to attend university education before. The need for lifelong learning and retraining feeds this potential. The Hyogo University for Teacher Education (Japan) is expanding its regular program with distance education "in order to survive". The University of Twente, and in particular the Faculty of Educational Science and Technology, has introduced online learning through its innovative TeleTOP Web-based course-management system, making its regular program also available for part-time and distance learning students. And in Australia, with the exception of the so-called *sandstone* universities, most universities are introducing online learning to expand the student population.

Another new market for universities is that of foreign students. In the English speaking world (UK, USA, Australia) universities have been very active in this market segment. Perth's Curtin University grew 15,4 per cent from 1997 to 1998 in foreign students enrolment. Other countries, in Europe and Japan, are also discovering this market, thereby responding to the growing need in developing countries for an enhancement of their educational systems and further economic development (Jongbloed, Maassen, & Neuve, 1999).

Another reaction, particularly from smaller or less prestigious universities, is the formation of strategic alliances. The University of Twente has formed a strategic alliance with other European partners in what is called a consortium of 'Entrepreneurial Universities'. In the Kyoto area of Japan 35 universities have formed a joint committee in order to discuss how to strengthen their positions. Even prestigious American Universities such as

MIT, University of Berkeley, University of Stanford, University of British Columbia and 22 others promote their distance learning courses in a single online catalogue.

The basic issue of all of these activities is to enlarge the student population in order to balance budgets and avoid major restructuring, or even closing down institutions. More careful monitoring of spending and costs have become a very important issue. Explicit awareness about the cost of providing instruction at the university level is a well known issue in the university distance education sector (Rumble, 1998). Researchers and course designers are much less aware of explicit costs of specific courses. As many are now starting to provide dual or mixed mode facilities, the financial consequences are unexplored territory. An interesting study in this respect is presented by Taylor and White (1991). They describe the transition from single to mixed mode, starting from a distance learning situation. Their analysis shows that "cost controls are in the hands of the teaching institution which can vary costs by producing different standards of instructional materials, just as they can vary face-to-face teaching costs by altering the contact time". They conclude that "the crucial point is that mixed-mode teaching is not readily available on a cost-effective basis for non-distance education institutions". In a recent report about the costs of networked learning (Bacsich, Ash, Boniwell and Kaplan, 1999) the authors indicate that "the key comes from the earlier (and still ongoing) debates about finance and planning for ICT. It is for educators (not planners or finance staff) to imbue and enliven financial and planning tools with a modern educational viewpoint". Not only a careful cost analysis of the new situation is necessary, but also an adequate positioning of the expected details of such an analysis in the broader context of educational and managerial decision making.

In the past, print material was the most important carrier of the instructional message. This situation has dramatically changed over the last decade in two perspectives: (a) a broad range of information and communication technologies (ICT) are being used as carriers for the instructional messages and (b) teaching for students off-campus is no longer the unique task of distance learning institutions; many traditional universities now are providing on- as well as off-campus instructional and learning facilities. In The Netherlands the Minister of Education has announced that as regular institutions for higher education are increasingly dealing with providing distributed learning facilities using technology, the typical open and distance learning task of the Dutch Open University has to be reconsidered. At Edith Cowan University 11,000 students are full-time, while 9,000 students are part-time or external students. At Charles Sturt

University (Australia) two-thirds of their 27,000 students are distance education students.

A crucial question in this new situation, with (partially) on- and off-campus students, is if these two or three cohorts of students, in their instructional approach, should be dealt with separately or in a combined way. Many approaches are possible. At the Faculty of Educational Science and Technology of the University of Twente for instance, three cohorts of students (full-time and on-campus, part-time, and external) exist. The policy is to offer those students a free choice of the modality (on-campus and very active, on-campus during a limited number of fixed days, or off-campus) through which they want to follow the courses.

Whatever the organisational context in which online learning will be introduced, the need for a thorough insight in the costs of different delivery methods is growing. This requires some form of costing model.

6. COSTING MODELS

Many costing models have been developed in order to measure the costs of educational delivery in relation to the use of ICT (for example De Vries, 1999, Jewett and Young, 1998, Shepherd, 1999 and Bacsich, Ash, Boniwell and Kaplan, 1999). It is found that there is a significant difference between a strong rational for costing models and the applicability of such models in practice.

In addition, the cost issue is only one side of the story: the other side represents the benefits when using online learning. Measuring the benefits of using networked learning is an even more difficult task than measuring costs. Arguments about benefits relate to the discussion about the productivity paradox when introducing information technology in industry. This topic will be more explicitly discussed in the next section.

When making a decision about a major change in an organisation, such as the introduction of online learning, explicit criteria should be used to measure the likelihood of success. At the management level those criteria relate to the cost and the benefits, and in particular to the perspective of a positive return-on-investment. However it is seen that there are no realistic cost or benefit data available to back up such a decision (Moonen, 1999).

So the management will have to decide to go on with online learning mainly based on positive speculation. However, is there serious ground for such speculation?

7. PRODUCTIVITY

There has been a constant discussion in the corporate world about the productivity gains as a result of investments in ICT. One argument is that such gains are unclear, certainly when compared to other major changes in industrial activity such as the introduction of steam machines or electricity. This phenomena has been called the 'productivity paradox' (e.g. Brynjolfsson and Yang, 1996). Nevertheless, industry is still investing huge amounts of money incorporating ICT for appropriate functionalities. Economists came up with four explanations to explain this strange behaviour. The first points to a measurement problem. As computers are often being used to offer faster, more personal and more varied services; those advantages are not taken into account in the traditional data collection and statistical overviews. The second explanation is that in industry only a small percentage of the total operational budget is used to introduce ICT. As a consequence, often a critical mass to create a clearly visible productivity gain is not reached. A third explanation is the fact that each change needs a long incubation time before it will lead to a productive exploitation of the new situation. Finally, one has to acknowledge that many of the current applications probably only provide us with products that are in fact still a kind of interim development; the real breakthrough will only be realised when computers and applications really are adapted to the task for which one wants to use them.

However, at this moment the relationship between productivity gains and ICT investment in business seems to have become more obvious. Economists are reviewing their opinions. Probably aspects of each of the reasons given above contribute to that change op opinion. One explanation could relate to changes in measurement, in particular with respect to the costs and intangible advantages. In the new economy business spending on software is now being considered as an investment. Previously, it was considered as a cost.

Critical mass and incubation time are also related. The continuing investment in ICT advances the chance of having a critical mass of ICT investments. As PCs were introduced in the beginning of the 1980s, the incubation time is now 15-20 years. 15-20 years is also comparable to the time span for a new generation of employees to enter the workforce. This new generation has grown up with computers around them and is much more familiar with them then the previous generation. Finally, the computer and its software have escaped their previous image of (mainly incomprehensible) mainframe applications, as ICT is becoming more powerful almost each day, allowing substantial improvements in the area of the human-computer interface and user friendliness.

Developments in education follow, at a certain time distance, developments in society. Therefore ICT has been introduced in education as well. With respect to the impact of ICT on education, introducing ICT in education seems to follow the same pattern as the introduction of ICT in industry. Past and current results about productivity gains in education because of ICT are not that obvious (Moonen, 1994). On the other hand, governments all over the world continue to invest huge amounts of money into ICT in education. To explain this paradox for the educational sector the same four arguments used in industry can be used: measurement problems, lack of critical mass, long incubation time and finding the right applications. To begin the analogy, indeed there is a severe measurement problem in education, especially when new instructional approaches such as a constructivist approach, supported by ICT are introduced. Educators believe that by following such an approach higher cognitive skills and even metacognitive skills will be stimulated. However, how do we measure those skills? Current test techniques have difficulties dealing with such outcomes. One can also assume that many of the positive results of using ICT in education, for instance to be better prepared for the current society and a more competitive commercial world, only will show up after many years.

A second problem is the need for a critical mass. Certainly in education the critical mass problem relates to the technical infrastructure, but also to the human (teacher/instructor) infrastructure needed to teach about and integrate ICT in existing curricula. That critical mass for technical infrastructure is already there in many educational institutions, certainly in the Western world. However, the needed critical mass of well-trained and knowledgeable instructors is another matter. Many efforts in the teacher-training area may be the only solution, producing a new generation of teachers, educated in another era, familiar with using ICT as a common commodity. So the incubation time for the introduction and productive implementation of ICT in education probably also needs 10-15 years. The last of the four explanations relates to the kind of ICT applications. Until now, many of the ICT applications in education can be referred to as tutorial-type educational software or courseware. Courseware, however, is not popular in education, nor does the use of it improve student performance in a significant way (with the exception of certain drill-and-practice programs in certain situations). In addition, educational publishers are not eager to invest in the development and production of educational software as there is, so they claim, no real market for it. However, the Internet and the WWW are now creating a wealth of new application areas for ICT. Maybe this will create the momentum for educational ICT applications to escape from a still existing 'antiquated' paradigm about how to apply ICT for educational purposes.

In summary one could ask: "Is there a new economy in education?" (Moonen, 2000b). One could argue that as education is going through a comparable cycle as has happened in industry, a future prospect of productivity gains as a result of using ICT in education is a reasonable one. As in industry, there are two conditions in order to reach that point: (a) traditional measurement methods must adapt to the new technologically supported approaches so that potential gains can be made visible and measurable and (b) ICT has to find its productive niche, probably through applications that make adequate use of the Internet. In the next section, such a measurement method based on return on investment is examined.

8. RETURN ON INVESTMENT

What are the consequences of the reasoning in the previous section with respect to the activities in the consensus space of the 3-Space Design Strategy introduced in Section 2? A major item is to agree upon the major functional specifications of what has to be designed, in our case an online learning system for an educational institution. Another crucial part of the decision-making process in the consensus space is to decide upon the criteria that will eventually determine if the chosen strategy is successful. In Section 4 it was argued that the main criterion for the management of an educational institution with respect to a decision about change and investments will be related to the return-on-investment (ROI) ratio.

Return-on-investment is a well-known concept in the business world and is used for decision-making criteria within industrial and corporate activities. However ROI is often used as a criterion for decision making in training situations (Shepherd, 1999), it is not common as an explicit concept in education, although there are some indications of a renewed interest (Gustafson and Watkins, 1998).

Conceptually, ROI is very simple. In order to measure the ROI of an activity one has to compute the benefits of the activity and compare (by dividing or subtracting) them by the costs. Both aspects have to be expressed in monetary terms in classic ROI. The simplicity of the concept immediately disappears however, as soon as one want to calculate both items. As has been argued in Section 6, benefits or results in education are not so easy to measure. Education is intended to result in benefits, but often benefits will be hidden, implicit or only show up after a long time. But even when the benefits are explicit and overt, it is often difficult to transform them into a number let alone converting that number into a monetary value. A comparable problem arises when calculating the costs. Although there are many items of which the cost can immediately be expressed in monetary

terms, there also many other costs which have to be accounted for, in particular costs which are hidden or not explicitly available, such as the frustration costs of an instructor when working with crashing technology or the huge amount of extra time an instructor has to put into answering continuously incoming e-mail from students. In addition, arguments about the calculation of a ROI are only relevant after a change has been introduced and data about how the change is evolving become available. Using costs and benefits as a criterion at the start of the decision-making, when no reliable data are available at all, is a much more difficult issue.

There are a number of ways to deal with these problems. First of all one has to agree that collecting *exact* costs and benefits data at the start of a process is impossible. An alternative is to rely on data of comparable situations. However, comparable situations can only give global indications. Such data can be used as estimates, maybe even weighted by a certain probability, and put in the ROI equation. Manipulating the entries of the data and probabilities offers an output for decision support. A major issue in order to be able to carry out this process is that for the costs as well as for the benefits the relevant items have to be identified, estimated and put in the ROI equation. When a complete set of data for comparable situations are not available, another way to solve the ROI in education problem is to abandon the idea of a ROI calculation in a 'absolute' way, and concentrate on a more intuitive calculation that emphasises the relative comparison of ROI in one situation with another situation. We call this a simplified ROI.

9. SIMPLIFIED ROI

A simplified ROI approach is to replace the 'absolute' ROI calculation with a more 'relative' or 'simplified' ROI calculation. To reduce the complexity of the data gathering and calculation, a simplified ROI only takes those (positive and negative) items into account that are substantially different in a traditional versus a new situation. The result of the calculation gives an indication of the 'gain' in ROI if a situation is changed from A to B. It is not the absolute ROI of an educational approach that is being calculated, but how much positive (or negative) change in ROI will occur when changing situation A to B. This change can be expressed intuitively when concrete data are not available. A first and major task is to identify these 'substantially' different items. As such identification is dependent upon a specific situation, the example given in the following subsections can only be worked out in a generic way and should be interpreted as only an hypothetical example.

9.1 Cost issues in a simplified ROI

When introducing ICT in a teaching-learning situation, major tangible differences in cost items when compared with a traditional situation will be: (a) additional specialised personnel; (b) acquiring and depreciation of hard- and software; (c) new physical facilities; and (d) the production, distribution and maintenance costs of digital learning material.

Besides such tangible costs, other more implicit, hidden, or intangible costs will occur such as: (e) necessary training for staff to be able to handle the ICT; (f) time spent by teaching and help-desk staff accommodating the requests for online help and communication by students; (g) hidden and intangible non-monetary costs such as the frustration of students and teaching staff as a result of malfunctioning of the technology and the time spend to identify the problem and repair it; (h) opportunity costs, relating to the time that staff spend on technology which they could have spent on other things; and so on. Again this list is only meant as an example. In a specific situation much care is necessary to identify those items that really make a difference.

9.2 Benefit issues in a simplified ROI

A comparable approach can be worked out with respect to the benefits, whereby one should concentrate on those benefits that are potentially different in a situation with and without the use of ICT. Such a list could be based upon the literature about the effects of ICT and media. The most commonly expected benefit in addition to maintaining or increasing the number of students will be in the area of (a) performance. However, many research reports about the effects on performance when using ICT in education indicate that there is no significant improvement of the performance of students (Russell, 1999). Other potential benefits such as (b) attitude; (c) motivation, (d) completion and dropout rates and (e) throughput time are more likely to be positively related to IT use.

Besides the tangible effects mentioned, one can also think about a number of intangible benefits such as: (f) flexibility; (g) time-place independence; (h) communication facilities; (i) marketing value; (j) impact of working with ICT on future professional career, and so on. This list of benefit items is also only meant as an example. In a specific situation much care is necessary to identify those items that really make a difference.

9.3 Simplified ROI matrix

After identifying cost and benefit items that are substantially different in an ICT-based situation versus an traditional situation, a calculation method has to be used in order to come up with some numbers that can be interpreted. What is considered as a 'substantial difference' will have to be defined by the user of the method. In addition a measurement method will have to be designed in order to quantify the substantial differences.

A first issue to deal with, also with reference to the analysis proposal in Section 3, is that a simplified ROI calculation should distinguish between the different arguments (economic, quality and efficiency) and between the different actors (institution, instructor, student). Another issue is to distinguish between tangible (or easily measurable) costs and benefits, and intangible or hidden (and difficult to measure) costs and benefits. For the measurable items, one could use monetary data (if available) indicating the difference in costs and benefits when moving from situation A to situation B. For items that cannot be measured precisely, one can use estimates on a scale (+5 to –5) indicating the 'expected' differences in costs and benefits when moving from situation A to situation B. Similarly, for intangible costs and benefits relating to quality and efficiency, this sort of predictive and relative assessment can be elicited from the user. The purpose of the activity is not to calculate a specific metric, as such a calculation is not possible or feasible, but rather to give the decision maker a easy-to-use type of metric to increase systematic awareness of important factors related to return on investment.

9.4 Some examples

Assume that in an institution the management considers moving from a traditional learning-teaching situation (regular lectures + computer laboratories) towards a situation whereby each instructor and each student will instead of being provided with the use of a computer laboratory will be provided with a portable computer, to be used at home and at the institution. In both home and institution, connection to the university network will be available. In addition the number of lectures will be reduced to a minimum and activities will mainly be focussed on online learning activities.

In order to support decision making about this approach the management can make a simplified ROI calculation. According to the suggestion in Section 3, such a calculation could be split up with respect to the different design spaces (consensus space, task space and implementation space), as the costs and benefits in each of the spaces will be different. Eventually

however, the combination of the results of activities in those spaces is of major importance.

Tables 1 and 2 illustrate some of the results of such a calculation. For each of the possibilities only a limited number of items is chosen as an illustration.

Table 1. Economic arguments, simplified ROI (in units of US$ 1,000)

Actors:	**Institution**		**Instructor**		**Student**	
Items:	Costs	Benefits	Costs	Benefits	Costs	Benefits
Extra hard- and software	+110	-	-	+5	-	+50
Reduction in hard- and software	-	+20	-	-	-	-
Completion and dropout	-	+12	-	-	-	-
Total	+110	+32	-	+5	-	+50
ROI (benefits–costs)	-68		+5		+50	

9.4.1 Assumptions in this example

- The institution is providing the hard- and software equipment out of its own funds and that the calculation is being made for the period of one academic year, involving 100 first-year students and 10 instructors.
- A laptop computer costs US$ 1,000. Thus the costs for extra hardware are US$ 110,000.
- The institution will not have to replace their 40 old desktop computers (at US$500 per computer): a benefit of US$ 20,000.
- Benefits for instructors (who do not have to buy a new desktop computer) equal US$ 5,000.
- Benefits for students equal US$ 50,000.
- In the new situation the completion rate will raise and at the same time the dropout rate will go down. As a consequence 10% more students are predicted to enter their second year than before.
- The institution is paid by the university according to the numbers of students in each year. Further assume that on the average 60 out of 100 first students graduate to the second year, which now will increase with 6 students. When the university pays the institution US$2,000 per student, the new situation creates a benefit of US$ 12,000.

9.4.2 Comments

Although the arguments in this paper focus on the institutional actor, data for other actors (instructor and student) are included in Table 1 as well. This makes the table more interesting as it shows that a negative ROI for one actor can be complimented, as is shown in this example, by a positive ROI for other actors. This can be useful information for the decision-making process. It is clear that identifying the major differences causing costs and benefits but also allocating them among the three actors are the major challenge in the simplified ROI calculation. In that perspective the simplified ROI calculation can be interpreted as a decision-support tool for the management.

Table 2. Economic argument, simplified ROI (intangible costs and benefits items)

Actors:	**Institution**		**Instructor**		**Student**	
Items:	Costs	Benefits	Costs	Benefits	Costs	Benefits
Potential growth in enrolment	-	+2	+1	-	-	-
Marketing value	-	+3	-	+1	-	+1
Extra time needed because of malfunctioning of systems	-	-	+2	-	+1	-
Total	-	+5	+3	+1	+1	+1
ROI (benefits–costs)	+5		-2		0	

9.4.3 Assumptions

- Values in table 2 are chosen on the basis of an estimate of a positive (benefit) or negative (cost) impression or expectation, based upon a scale from +5 to –5.
- Giving for free a portable computer to students will attract more students and raise the enrolment. The incentive therefore is positive and the (subjective) evaluation on the scale for the institution is +2. However a larger enrolment will result in a larger effort and larger classes by the instructors. For them this item will result in a negative incentive, further estimated with a cost of +1.
- The 'free' portable computer will certainly positively contribute to the general image of the institution and is therefore an important marketing instrument. The incentive is estimated positively (as a benefit) at +2. In the long term working at a highly appreciated institute will contribute to the 'personal value' of the instructors as

well as to the 'value' of the diploma of the students. Both are values as positive (benefit) with a scale value of +1.

- The new hardware and systems will certainly create extra malfunctions, leading to frustration and investment of extra time by instructors and students. Both are evaluated as negative (costs) with a scale value of +2 respectively +1.

9.4.4 Comments

Of course each of the scale values are subjective and therefore open to debate. This debate can be a benefit in an institution. Also, by quantifying the costs and the benefits of the items mentioned, it becomes necessary to form an opinion about these issues. Furthermore and because of the splitting of the different actors, it becomes visible who is getting a positive ROI and vice versa. So in Table 2 it is clear that the institute gets a very positive ROI out of what is been proposed while the instructors seem to pay the bill. This is certainly an interesting issue in discussions about the proposed policy change, but also an interesting issue to compare with the results in Table 1.

Comparable tables can be set up for dealing with items related to the quality and efficiency issues. In those cases and given the difficulty (even impossibility) to convert results of those issues into monetary values, the use of a scale as in Table 2 is an appropriate approach. A crucial issue when trying to combine values within a table, but certainly across tables, is the implicit assumption that all of the items have an equal weight in the decision-making. Of course this is not the case. The simple solution then is to give a weight to each of the items involved.

In practice, the tables mentioned above can be set up using a spreadsheet program. Items in the different tables could be listed in pull-down menus to be chosen by the executor of the simplified ROI approach. And databases with known practical results can be made available to help the user to make a justifiable guess about the scale values he wants to use. All of this can be combined into a software program. Such a program will be developed in the near future at the University of Twente.

10. CONCLUSIONS

Colleges, universities, regions, governmental agencies and private foundations are making large investments in instructional technologies on the assumption that technology will somehow lead to improvements in educational quality and an eventual reduction in costs through greater efficiency. Although there are no concrete data available (yet) to prove this

assumption, the likelihood of this claim is certainly realistic. However, efforts should be made in order to move from the potential to the reality, for instance by calculating the return-on-investment (ROI).

Calculating ROI, however, is a complex matter leading to major objections for its use in practice. A potential solution is to reduce the complexity by using a kind of simplified ROI whereby the focus is on those items that differ significantly in a new situation, using ICT, versus the traditional situation. In a simplified ROI, an intuitive and predictive approach is used, supported by a software tool to suggest options. Major benefits of the simplified ROI approach will be the discussion and debate it triggers and the awareness it stimulates among those involved in policy making for an educational institution.

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