Costs and Effectiveness of Online Courses in Distance Education

Kwok-chi Ng
The Open University of Hong Kong, Hong Kong

ABSTRACT *This paper discusses cost-effectiveness as it applies to education, focusing particularly on the delivery of online courses in open and distance learning. The general concept of cost-effectiveness is discussed, and issues concerning the costs and effectiveness associated with using online technology in distance education are then addressed. Finally, a pilot project on an online course at the Open University of Hong Kong (OUHK) is used as an illustrative example. The key features of the pilot project relating to costs and effectiveness are outlined, and ways to improve its cost-effectiveness in implementing its second stage are suggested.*

Cost-effectiveness in Education

'Cost-effectiveness' is a concept borrowed from the lexicon of economics, which is concerned with comparing different ways of achieving the same objective such that the most cost-effective choice will be the least costly of the alternatives being compared (Thomas & Martin, 1996). There has been an increasing concern about cost-effectiveness in the choice of educational media in education since the late 1960s. The sizeable investment in projects such as the Instructional Television systems in the Ivory Coast, Brazil, etc., led funding agencies such as the World Bank, UNESCO and USAID to raise questions about the relative cost-efficiency and cost-effectiveness of educational technologies (e.g. Eicher *et al.*, 1982, cited in Rumble, 1999). In the 1970s and 1980s, similar questions began to be asked about the investment in distance teaching at university/tertiary level.

Consideration of cost-effectiveness is critical at the level of overall resource allocation within an institution, as it is obviously important to ensure that the limited resources are spent effectively. Jones (1989) suggests that any education system which seeks to make a meaningful measurement of cost-effectiveness must:

- describe the nature of the business in an objective way and establish a clear definition of the product;
- determine the extent to which one is able to achieve the product aim, i.e. quantify the output of the production process; and

- establish the cost of the operation so that one can make some sort of measurement of the cost-effectiveness of the process by relating the extent of product success to the cost of achieving it.

Unfortunately, each of these stages has its practical and conceptual difficulties. First, deciding which outcomes should be assessed for effectiveness involves value judgement and often exposes conflicts of values. Moreover, in education, the outcome of the learning process is not quantifiably measurable in most cases, while there is also no single objective criterion to use in measuring or comparing performance. Therefore, it is difficult to estimate the relationship between inputs and outputs and judge the effect of particular expenditure. Finally, to establish the cost of the operation can be a complex task as it involves the identification of all hidden and non-financial costs, as well as distinguishing between start-up and recurrent operating costs (Knight, 1993, p. 182).

The above arguments show that it is a complex process to apply the concept of cost-effectiveness in practice in educational contexts. The next section elaborates this point by focusing on the use of online technologies in distance education.

Costs and Effectiveness of Using Online Technology in Distance Education

Distance education is now in its third phase of development, based on advances in computing and telecommunications (European Commission, 1996). The key characteristic of a distance education system in this generation is 'a combination of electronic access to multimedia materials held on CD-ROMs and in tele-libraries, computer conferencing, and the electronic interchange of assignments between tutors and students' (Rumble, 1997, p. 117). The delivery of online courses in distance education is in line with such a movement.

Online Costs

The cost structures of online learning systems are different from those of traditional distance education systems. It is essential to understand the costs involved in an online course system before considering its cost-effectiveness, but the literature on this topic has been limited. Some papers focus on the costs of a particular technology, such as computer-mediated communication (CMC), in a particular setting; others discuss how the costs of CMC could be affected by various factors.

Rumble (1989) undertook a study of the costs of using computer-mediated communication for a reasonably large group of students in a course, DT200: *An Introduction to Information Technology*, offered by the Open University of the United Kingdom (UKOU). The calculation of the costs of CMC operating within the framework of DT200 was broken down into the following categories.

- Development and fixed production costs, which included the human capital, the development of course materials, the initial costs for software licences and capital equipment, and the costs of space for staff and equipment.
- Distribution costs, which included the costs of storage and despatch of course materials, and the recurrent costs for software licences.

- Reception and delivery costs, which included teaching costs and costs incurred by the student, e.g. the network and central computer costs, the purchase of micro-computers and modems for loan to students, the tuition costs, etc.

Of course, the specific costs for the DT200 system may not transfer to other systems because local costs will differ and the particular arrangements made at the UKOU would not be adopted in other institutions. Another factor is that the ownership of PCs is more commonplace nowadays. Assuming student ownership of a PC, the overall cost would have looked very different. Nevertheless, Rumble's (1989) study provides an indication of the costs that could be incurred in setting up an online learning system, which can be used as a basis for analysing the cost-effectiveness of using online technologies.

Wells (1992) reviewed the literature on CMC and suggested that the costs of implementing a CMC course might be affected by the following factors:

- the type of implementation;
- who pays for which costs; and
- whether a computer infrastructure is in place.

Wells's analysis provides a useful framework for considering the factors involved in presenting a CMC course.

Cost-effectiveness of Online Technologies

Again, the literature on this topic is very limited and focuses mainly on comparing the relative cost-effectiveness of a particular technology—for example, CMC—with the provision of more conventional classroom-based instruction.

Phelps *et al.* (1991) compared the costs and effectiveness of a conventional residential classroom and a CMC learning environment for two US Army Reserve courses ('Leadership' and 'Engineering'). In this study, course completion data, test scores, and students' self-ratings of their levels of knowledge before and after the courses, were used as indicators to evaluate the effectiveness of the instructional methods. Evidence showed that both formats were equally effective in facilitating learning, but the CMC 'classroom' cost less than resident instruction in the long term.

In summary, given the narrow scope of studies such as those by Rumble (1989), Wells (1992), and Phelps *et al.* (1991), the potential cost-effectiveness of using online technologies in distance education is still uncertain. These studies also show that the concepts of cost and effectiveness are in practice complicated. The selection of criteria to define the effectiveness of a programme, and decisions about the allocation of costs in a programme, reflect value judgements and could be arbitrary. For example, in the study of Phelps *et al.* (1991), the effectiveness of the CMC course might vary if different criteria were used. Also, in Rumble's case (1989), the overall cost to the institution would have looked very different had equipment not been supplied to students. Therefore, both the costs and effectiveness of a pro-

gramme may vary as a function of the selection of assessment criteria and the type of implementation.

The Pilot Online Course Project in OUHK

The OUHK pilot online course project considered here illustrates the importance and complexity of considering cost-effectiveness in practice, and suggests ways to improve the cost-effectiveness of the project in its next stage.

Background of the Project

The Open University of Hong Kong (formerly the Open Learning Institute of Hong Kong) is the only distance learning university in Hong Kong. As a provider of distance education, OUHK is very interested in the use of information and educational technology to support learning activities. In the past two years, some elements of network- or Web-based instruction (WBI) have been incorporated in several courses at the OUHK (Yuen et al.*, 1998)*.

For the April 1999 presentation, the OUHK launched a pilot project to promote a new online course delivery system—the Online Learning Environment (OLE). A Web course development tool—WebCT—was selected as a unified platform for delivery. The aims of the pilot project were to test WebCT in the OUHK environment and to prepare for a larger scale implementation of WBI in OUHK courses. Its objectives were to consider:

- the requirements of and provision for students registering for online courses, including requirements for PCs and for the provision of online facilities by the University;
- the requirements of tutors responsible for the online courses, e.g. tutors' compensation and training; and
- the workload implications for course coordinators involved in the online course.

Nine courses—two business courses, two computing courses, three education courses and two social science courses—joined the pilot.

Key Features of the Project

Some of the main features relating to the costs of implementation of the pilot project are:

- *The type of implementation.* The online course is not a replacement for the traditional mode of course delivery. Printed course materials are provided along with online course materials, and students can also gain support from face-to-face tutorials and telephone tuition. There are three categories of online courses in the pilot. The *mandatory* category requires students to access the course materials, the multimedia programmes in CD-ROMs, and the remote database, through the OLE, and to be involved in online conferencing activities. In the *optional*

category, students are allowed to select either the online or traditional mode of the course at the start of the semester. However, those who choose the online mode are required to use the relevant electronic materials, and to be involved in online discussion activities as for those in the mandatory mode. Finally, for the *enhancement* category, a limited online facility is provided to all students taking the course. However, its inclusion is for enhancement purposes only, and there is no requirement for students' involvement in the OLE. Not surprisingly, the two computing courses included in the project were offered in the mandatory mode. The other courses were delivered either in the optional or enhancement mode.

- *Who pays for which costs?* Students and tutors are expected to have computers that meet University specifications, and modems. The University has provided Internet access to tutors, while students are required to have their own. There is no extra payment to tutors for undertaking the tasks in online courses as they have already been paid for face-to-face tutorial sessions, and there was uncertainty about the impact of the online elements on tutors' workload.
- *Infrastructure and other support.* The network infrastructure has been developed at the OUHK, and the Information Technology Unit (ITU) provides technical support. The development and production of the online courses involved full-time academic staff—for example, individual course coordinators, and editorial, design, educational technology and other staff of the Educational Technology and Publishing Unit (ETPU). The ETPU was also responsible for providing training to internal staff and tutors, and for producing a training manual and video.

Discussion and Suggestions

The above features have significant implications for the cost and effectiveness of implementing the pilot online course project.

First, it should be noted that setting clear and appropriate objectives is an essential step in evaluating the effectiveness of a project. The objectives of the pilot have mainly been administrative considerations, such as the requirement for equipment, the provision of the online facilities for different modes of delivery, and the workload of staff. They have not focused in detail on the educational purposes of providing online courses and new technologies, an aspect of the project which should be further elaborated and clearly stated in the second stage in order to evaluate whether the expected outcomes are achieved.

The cost of online courses is affected by how they are implemented: as an enhancement, or as the primary teaching medium. The latter is considerably more expensive as the cost may involve the conversion of traditional correspondence materials and designing online learning activities such as electronic conferences. However, in order to judge the cost-effectiveness of an online course, the pedagogical purposes of different modes of delivery need to be taken into account. For example, in the mandatory mode, interaction among students can be promoted through online discussion. In contrast, the online facilities in the enhancement mode are for enrichment purposes only, and students need not become involved in it. It

is, therefore, impossible to judge the relative cost-effectiveness of different modes of online course as their pedagogical purposes vary. On the other hand, the students targeted are likely to be different. For instance, students on computing courses are better able to cope with the mandatory online mode, but this does not necessarily imply that students in other disciplines would not benefit from it. Therefore, the pedagogical purposes of the different categories of online course, and the needs of students involved in them, should be further considered in the next stage. It is impossible to estimate which alternative is the most cost-effective choice unless this is done.

It is also important not to mix the concepts of efficiency and cost-effectiveness. As noted by Atkinson (1983; cited in Thomas, 1990, p. 50), 'it is possible for a programme to be efficient but not cost effective if the outputs which are actually produced do not contribute to the programme objectives; that is it may be efficient at doing the wrong things'.

In the pilot, students were not given any support in terms of access to computer facilities and the Internet. While the institution can save money by shifting the costs to students, this also raises questions about affordability and access. The literature indicates that the cost of supplying students with equipment is actually minor compared to the costs of course development or operations and support (Phelps *et al.*, 1991). The provision of a pool of computers and modems on loan to students can be considered in the next stage of implementation.

Tutor payment is another important issue. While the institution can again save money by not paying the tutors for undertaking the online tasks, this makes it virtually impossible to manage effectively tutors' involvement in online tutoring. In Rumble's study(1989), tutors were paid an allowance in addition to their normal fees, in recognition of the expenses which they incurred in respect of line charges and computer consumables. In fact, tutor involvement could be a critical factor affecting students' participation. It is likely that students' desire to participate in the OLE is heavily influenced by whether a tutor is joining in, so payment for tutors for undertaking the tasks in the OLE should be given serious reconsideration. Another alternative is to use the CMC to replace face-to-face tutorials and telephone tuition completely to reduce the costs.

Finally, the potential cost for the implementation of the project on a large scale must be carefully analysed. Human capital and the costs of conversion are expenses that can easily be underestimated. As indicated by Rumble (1989), there is huge human capital involved in the development and production of a CMC system, which must not be overlooked. The pilot project has addressed the workload implications for academic staff only. However, the introduction of online courses requires the acquisition of considerable additional manpower including editorial, design, educational technology, administrative and other staff. These staff costs need to be taken into account for the cost-estimation for the next stage of implemen-tation. It should also be noted that the introduction of online courses will require a fundamental rethinking of all the course components, and the fullest exploitation of the potential of online courses for distance education might entail the conversion and redesign of course materials (Phelps *et al.*, 1991; Rumble, 1989). To ensure that

the online course project can be implemented in a cost-effective manner, this cost should not be underestimated.

Conclusions

Much attention is currently focused on the potential offered by the new computing and communications technologies for enriching and extending the provision of distance education, and perhaps for reducing costs (European Commission, 1996). However, many current applications of these technologies in distance and open learning are essentially experimental, and in many cases their operational cost-effectiveness is still uncertain.

The implementation of an online course project in the OUHK illustrates the complex nature of applying the concepts of cost and effectiveness in practice. Various factors need to be taken into account to ensure that the project is implemented in a cost-effective manner—especially concerning the educational effects which are being sought, and whether the application of online technologies helps or hinders their achievement.

Mr Kwok-chi Ng, School of Education and Languages, The Open University of Hong Kong, 30 Shepherd Street, Homantin, Hong Kong. E-mail: kcng@ouhk.edu.hk

References

EICHER, J.-C., HAWKRIDGE, D., MCANANY, E., MARIET, F. & ORIVEL, F. (1982) *The Economics of New Educational Media. Volume 3: Cost and effectiveness overview and synthesis* (Paris, The UNESCO Press).

EUROPEAN COMMISSION (1996) *The Potential Cost-effectiveness of Tertiary Open and Distance Learning* (Luxembourg, Office for Publications of the European Communities).

JONES, D. (1989) A practical unit cost approach to budgeting and accountability in colleges, in: R. LEVACIC (Ed.) *Financial Management in Education* (Buckingham, Open University Press).

KNIGHT, B. (1993) *Financial Management for Schools: The Thinking Manager's Guide* (Oxford, Heinemann Educational Publishers).

PHELPS, R. H., WELLS, R. A., ASHWORTH, R. L. & HAHN, H. A. (1991) Effectiveness and costs of distance education using computer-mediated communication, *American Journal of Distance Education*, 5(3), pp. 7–19.

RUMBLE, G. (1989) Online costs: interactivity at a price, in: R. MASON & A. KAYE (Eds) *Mind-weave: Communication, Computers and Distance Education* (Oxford, Pergamon Press).

RUMBLE, G. (1997) *The Costs and Economics of Open and Distance Learning* (London, Kogan Page).

RUMBLE, G. (1999) Cost analysis of distance learning, *Performance Improvement Quarterly*, 12(2), pp. 122–137.

THOMAS, H. (1990) *Education Costs and Performance, A Cost-effectiveness Analysis* (London, Cassell).

THOMAS, H. & MARTIN, J. (1996) *Managing Resources for School Improvement* (London, Routledge).

WELLS, R. (1992) *Computer-mediated Communication for Distance Education: An International Review of Design, Teaching, and Institutional Issues*, Research Monographs No. 6, The American Centre for the Study of Distance Education, The Pennsylvania State University.

YUEN, K. S., CHUNG, S. L., MAK, J. & CHOW, L. (1998) 'Provision of an effective electronic learning environment for distance students in Hong Kong?' Conference Proceedings: 15th IFIP World Computer Congress 'The Global Information Society on the Way to the Next Millennium' in Vienna and Budapest (31 August–4 September 1998), Organized by the Austrian Computer Society (OCG) and the John V. Neumann Computer Society, (NJSzT), on behalf of the International Federation for Information Processing (IFIP).