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A System-Level Comparison of Cost-Efficiency and Return on Investment Related to Online Course Delivery

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As the number of students enrolling in Internet-based or online instruction grows, so do questions from educational leaders, policymakers, college and university presidents, members of governing boards, and legislators regarding cost (Johnstone, 2001). This situation is not unique to the United States.

Decision-makers considered the primary benefit of online distance education to be that costs could be spread over a large number of students, taking advantage of economy of scale, assuming that large numbers of students would increase revenue and lower cost-per-student and operating expenses. In addition, increased access and quality learning experiences remained important (Inglis, 1999).

Bates (1995) pointed out that the 'continuing reduction in the costs of technologies, and their increasing accessibility, is making it easier for organizations to enter directly at the tactical level' (p. 34). This has resulted in a number of institutions considering distance education for the first time.

This increasing popularity has led to a call by 'policy-makers to ask whether networked learning is cheaper or more expensive than other approaches to education, and what needs to be taken into account in costing such systems' (Rumble, 2001, p. 75). Rumble (1989) also found that

> the activity of costing is therefore central to the planning and development of educational systems...reports, conferences and workshops often indicate a need for a "simple" costing tool that will help those who wish to develop distance and open learning courses. (p. 2)

Most studies do not address simple questions such as 'what is the per-credit-hour cost associated with online instruction?' and 'how do costs of online delivery methods compare to more traditional, face-to-face classroom instruction?' Jones (2001) stated, 'There is not sufficient empirical evidence to yield rules of thumb that can inform managerial choices' (p. 2).

This study compared costs and revenues of Illinois community colleges related specifically to online delivery systems in order, first, to determine cost-efficiency and second, to compare the results among online courses at selected community colleges in Illinois. The research question to be answered was “To what extent are online courses delivered at community colleges in Illinois cost efficient?”

Although this study concentrates on outcomes experienced by community colleges in Illinois, the methods employed and results should be of interest to any educational institution engaged in or considering the development of online courses and/or programs.

Purpose

A system-level comparison of cost, revenue, and return on investment, constructed using Rumble’s (2001) theoretical framework, may provide a basis for the development of a financial model and expenditure estimates for other private and public ventures in this area.

This study compiled existing data, gathered additional information regarding direct and indirect costs supporting online courses, and analyzed the data for comparative purposes. Specifically, median spending related to compensation, operational, capital and course development costs was examined. In addition the numbers of students needed per course to achieve cost-efficiency were examined.

Rumble (2001) suggests that a comprehensive approach to costing networked learning is needed and that in order to compare relative cost-effectiveness of online courses among institutions, a set of delimiting definitions including expenditure by category, contributions, revenue and capital costs, and initial investment is critical.

An instrument (TCM Tabulator) was developed through the Technology Costing Methodology Project in 2001 (Western Interstate Commission for Higher Education, 2001). The TCM project was designed to consider the full range of costs associated with several different alternative as well as traditional course delivery modes. Although this instrument does an excellent job of providing a methodology for determining costs, comparing costs, and identifying benchmarks, some modification was needed to fit the TCM to the constraints of this study.

The TCM Tabulator was designed as an all-purpose instrument, ostensibly usable by any college, university, school, consortium or cluster of institutions. Additionally, the Tabulator identifies costs on a per-course basis rather than the per-credit-hour unit that is specific to Illinois.

In 1998, the chief financial officers of a consortium of five community colleges in Illinois developed a rough, unpublished set of cost variables used to calculate the cost of delivering an online course by considering both direct and indirect costs and reducing them to a per-student-credit-hour figure. This formula was rudimentary and lacked explicit operational definitions of costs found in the TCM Tabulator, but it was particularly geared to the idiosyncrasies of community colleges in Illinois. This formula considered unique factors such as categorical credit-hour reimbursement and equalization grants as well as local and system-wide initiatives designed to support and foster the development of online coursework.

In combining the explicit definitions present in the TCM Tabulator with the customized applicability of the consortium-developed tool, this study employed a customized instrument that builds upon the strengths of the antecedents. The new instrument, referred to as the Cost Identification Worksheet, was designed to meet the following objectives:

1. Consider the full range of costs associated with the delivery of coursework in a computer-mediated environment, using the Internet as the transport medium.
2. Identify and categorize course-level costs from a variety of institutions with similar missions (community colleges) and funding mechanisms, but of disparate size (both enrollment and support services), costing and accounting methods, and administrative structures.
3. Explicitly define and account for direct costs and certain indirect costs in order to ensure the highest levels of reliability when comparing data and determining factors that affect cost-efficiency and return on investment related to online courses.

Limits

When considering costs of a particular educational delivery system, Rumble (1997) outlined three general measures: cost-benefit, cost-efficiency and cost-effectiveness.

Cost-benefit ‘seeks to measure in economic terms the benefits of education to the individual and society’ in terms of the rate of return to the individual and to society as a whole (Rumble, 1997, p. 181).

According to Rumble (1989), a system is ‘cost efficient if, relative to another system, its outputs cost less per unit of input. A system increases its cost-efficiency when it maintains output with a less than proportional increase in inputs’ (p. 120).

Cost-effectiveness is a measurement or determination of the extent to which a system ‘produces outputs that are relevant to the needs and demands of its clients’ (Rumble, 1997, p. 161). Efficiency and effectiveness are not mutually exclusive. Organizations can be efficient while lacking effectiveness and vice-

versa.

There is a difference between cost-benefit and cost-effectiveness. A cost-benefit analysis is used when 'both cost and effects can be measured in monetary terms' and cost-effectiveness is applied when 'costs are expressed in monetary terms and effects are measured in non-monetary terms,' according to Moonen (1997, p. 2). In order to accurately compare two systems,

> either the cost or the effects...have to be fixed. When the costs are the same...the system with the largest effect is the most efficient. When the effects are the same...the system with the smallest cost is the most efficient. (Moonen, 1997, p. 3)

Moonen advocates a practical solution that, for the purpose of this study, assumes the effects of the two systems are the same, thereby allowing the analysis to focus on costs (1997, p. 3).

Cost and revenue information collected from each college consisted of annual actual expenditures related to online courses and categorized into specific, defined categories.

There are some costs of assets usually required to support online courses that were not recognized in the data collection instrument. These include the cost of e-mail, Web services, Internet access in general and other network-based services. Although these services can have substantial costs associated with acquisition, maintenance, and replacement, the services are used by the entire campus and would most likely be present and useful regardless of the presence of online coursework.

Historical Overview

Questions of cost-efficiency, which are central to this study, have been the subject of numerous academic research projects focusing on the relative and educational costs of different media and technology. Many cost-efficiency studies have concluded that the use of videoconferencing incurred substantial cost-savings, even though costs were higher than those of other classroom–based delivery methods (Hosley & Randolph, 1993; Markowitz, 1990; Simonson & Jones, 1993; Showalter, 1983; Trevor-Duetsch & Baker, 1997).

A number of studies have focused on implementations of computer-mediated conferencing (Harasim, 1990; McCreary & Van Duren, 1987; Rumble, 1989). Cuckier (1997) found 'a relatively large literature discussing the costs and benefits of distance education' but that 'most of the available studies have dealt with the cost-effectiveness [efficiency] of distance education as compared with traditional face-to-face teaching' (p. 137).

Cuckier (1997) added that 'there are fewer studies which examine the costs and benefits of particular technologies used in distance education or which determine

the appropriateness of various costing models' (p. 137).

One such study of an online course at the University of British Columbia found that the annual break-even enrollment based on projected costs and revenues over 4 years was 44.18 students (Bartolic-Zlomislic & Bates, 1999). The methodology employed in this study detailed cost per student rather than per credit hour, which may adequately explain cost at the university level, but which holds relatively little significance for community colleges where students are more transient and likely to enroll in only a few courses (Office of Institutional Research and Evaluation, 2001).

Several other models offering a framework for evaluating cost-effectiveness and efficiency have been developed by Bates (1995), Cuckier (1997), Jones (2001) and Rumble (2001). These studies vary significantly in methodology, technology, focus and scope, but all identify a common set of cost variables including direct and indirect costs, fixed and variable costs and costs borne by others.

The need for and utility of a costing tool to aid in planning notwithstanding, the 'measurement of the costs seems to be very straightforward, [but] in practice many problems are encountered' (Moonen, 1997, p. 2). Moonen (1997), supported by Bakia (2000), stated that there is disagreement about the kind of costs that should be taken into account as well as the lack of reliable data relative to cost because costs have not been gathered in any reliable way. Additionally, the costs in question are not stable and evolve quickly, which is typical of new communication and information technologies (Bakia, 2000). Similarly, in an analysis of previous studies on cost-efficiency, Capper and Fletcher (1996) identified factors that influenced cost in distance-delivered courses. These factors include number of courses offered, frequency of course revision, type of media employed, type and amount of student support, and rate of attrition. Cost-effectiveness is supported in most studies, but costs varied substantially and were influenced by many factors (Batey & Cowell, 1986; Rumble, 1982).

In general, it is known that 'distance education can be cost effective and that cost-effectiveness [efficiency] is largely dependent upon the number of students served and the fixed costs of development and delivery' (Phelps et al. 1991, p. 8).

Early studies on cost-effectiveness and identified factors that influenced cost in distance-delivered courses include the number of courses offered, frequency of course revision, type of media employed, type and amount of student support and rate of attrition, concluding that cost-effectiveness is supported in most studies but costs varied substantially and were influenced by many factors (Capper & Fletcher, 1996).

Methods and Procedures

Data were collected related to the number of students enrolling in online courses by institution, course, section, and residency status, all of which were available from the Illinois Virtual Campus. One full semester (Spring 2001) of data was used.

Next, a survey entitled “The Cost Identification Worksheet” was administered to chief financial officers at 34 community colleges in Illinois in order to collect data related to actual, direct, fixed, and variable costs as well as other variables suggested in the literature (Rumble, 2001, p. 76).

A detailed cost calculation procedure was developed to assist chief financial officers in providing accurate and appropriate information. This procedure was largely based upon the TCM methodology and framework and the Illinois Prairie Consortium Cost Variables (Illinois Prairie Internet Consortium, 2002; Western Interstate Commission for Higher Education, 2001).

After data collection was completed, a template for determining per-student, per-credit-hour costs was constructed for each institution as well as a cost of infrastructure, student support, and course/faculty support for comparison purposes.

The cost variable was generated by a simple formula, based on the literature that identified appropriate cost considerations.

The formula was for calculating costs was C_1+O+C_2+D = Expenditures.

The cost category C_1 included compensation of management, professional staff, full-time faculty, part-time faculty, clerical, and student/other personnel.

The cost category O included operating expenses such as office/instructional supplies, travel, communications, duplication and printing, postage and distribution, contractual services, licenses, and rent.

The cost category C_2 consisted of capital items defined as equipment that had a useful life greater than one year, had an acquisition cost greater than $1,000, and was owned by the college.

The cost category D consisted of development costs usually paid to faculty for developing an online course.

Similarly, a second variable considers revenue and is expressed as ID*ID rate+OD*OD rate)+(OS*OS rate)+(OC*OC rate)+F+B+G=Revenue.

The revenue categories ID, OD, OS, and OC represented in-district, out-of-district, out-of-state, and out-of-country tuition rates per student credit hour, respectively.

The revenue category F included fees charged exclusively to students enrolling in online sections, category B included costs borne by others and other revenue, category G included additional revenue acquired via Illinois Community Colleges Online program and/or course development grants.

The dependent variable was cost-efficiency as operationally defined by Rumble (1997). An institution that expended less money than it received, relative to the other colleges participating in the study, was considered cost efficient. A determination of cost-efficiency or inefficiency alone does not provide an adequate means for determining the extent to which an institution or system is cost efficient or inefficient. By calculating profit/loss and return on investment, a measurable illustration of the extent to which an institution was (in)efficient was determined and expressed as a percentage. It provides a standard for 'evaluating how efficiently management employs the average dollar invested in a firm's assets' (Seigel, Shim, & Dauber, 1997, p. 475).

Return on investment was determined by a formula which defined ROI 'as the "return" (incremental gain) from an action divided by the cost of that action' and calculated in the business world by dividing net profit after taxes by total assets (Seigel, Shim, & Dauber, 1997, p. 475).

Return on investment was expressed by dividing net profit by net expenditures and converting the decimal to a percentage.

Only direct costs of instruction and direct costs of associated support activities were used, and only when these costs were identifiable. This study did not attempt to allocate direct costs of support activities (commonly referred to as indirect costs) in order to yield the full cost of instruction. Consequently, this study did not consider indirect costs related to general administration, physical plant, operating and maintenance, security, Internet access, etc. and relate them back to instruction.

Direct costs that were collected through the instrument include assessment services, academic personnel development, advertising and marketing, compensation of management, compensation of professionals, compensation of full-time faculty, compensation of part-time faculty, compensation of clerical personnel, compensation of students/other, office and instructional supplies, travel, communications, duplication and printing, postage and distribution, contractual services, licenses, rent, equipment, development costs, and other. The Cost Identification Worksheet separated these expenses into three different categories: compensation, operating expenses, and capital items.
The Cost Identification Worksheet captured revenue generated by student enrollment in the form of tuition, accounting for variable rates based on residency, course/delivery fees, state apportionment, and costs borne by others. Equalization grants, small college grants, and other funding mechanisms that

attempt to balance income based on median income and similar factors were excluded from the revenue calculation.

Course development grants provided by the State of Illinois through the Illinois Community Colleges Online initiative (ILCCO) were considered a cost borne by others because these grants were designed to directly offset course development costs, a measured expense.

Additionally, the State of Illinois provides each community college with approximately $14,000 per year to provide support services and computer access to online students. Other grants that support staff technical skills training and support high tech equipment purchases, if used to support online instruction, were included. These examples are all considered as costs borne by others which, should policy change, could have a significant impact on cost calculations.

After data collection was completed, the individual institutional data were summed to determine cost in each expense category as well as summary data corresponding to cost of overhead, instruction, total course development costs, and finally, cost per student credit hour.

Revenues were calculated to determine revenue per student credit hour. An institutional ratio of part-time versus full-time faculty teaching assignments was compiled.

The question of institutional cost-efficiency was answered by simply subtracting total costs from total revenues. If the figure was positive, the institution was deemed to have demonstrated cost-efficiency in congruence with Rumble's definition, which is producing student credit hours at a cost that is less than revenue.

Cost per student credit hour as well as revenue per student credit hour data were used to calculate return on investment (ROI) and were expressed as a percentage.

After all institutional data were calculated, they were compiled into a composite spreadsheet in order to calculate mean cost and revenue per student credit hour. Additional means were calculated that consider the cost of course development, compensation, operating expenses, and cost of capital items, per student credit hour.

Finally, it was anticipated that the percentage of institutions that were cost efficient (or not) would, in conjunction with an average return on investment figure, provide a definitive response to the research question, "To what extent are online courses delivered at community colleges in Illinois cost efficient?"

Thirty-four Cost Identification Worksheets were sent to the chief financial officers

of thirty-four community colleges in Illinois. Five community colleges were excluded from the study. Four of the five exclusions were due to the fact that no course data were reported to the Illinois Virtual Campus for the spring semester of 2001. The remaining institution was excluded because it operated on a quarter credit system, which would result in a conversion and equivalency issue when compared with other institutions.

Of the thirty-four worksheets distributed, twelve were returned by the deadline, resulting in a response rate 35%. All returned Cost Identification Worksheets were compiled into an aggregate Excel file for analysis, with each institution assigned a letter/number designation of C1 through C12 to preserve institutional confidentiality. For each cost and revenue category, a mean, median, maximum, minimum, and range between maximum and minimum values was calculated. Those values represented as 0 should be interpreted as no dollars expended or no dollars in revenue rather than a lack of data.

Expenditures

Compensation (C1). The first category of expenditure consisted of compensation. This category was subdivided to separate instructional (teaching) compensation from all other compensation categories.

Instructional costs were calculated by using the reported median per-credit-hour rates of pay for part-time faculty and median annual salaries of full-time faculty divided by an average annual teaching load of thirty credit hours (Figure 1). Courses were identified as being taught by either full-time or part-time faculty. Total number of credit hours taught by part-time and full-time faculty were calculated and multiplied by the corresponding compensation rate. These values were summed to arrive at the total cost of instruction, as illustrated in Figure 1.

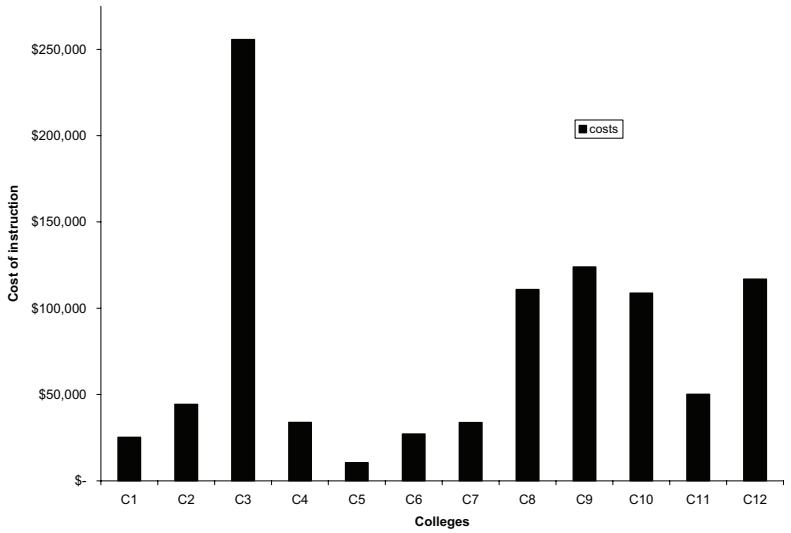

Figure 1 Instructional costs

The mean part-time faculty rate was $470.00 with a standard deviation of $96.38. Eight colleges were within one standard deviation and four colleges were within two standard deviations from the mean. These results are illustrated in Figure 2.

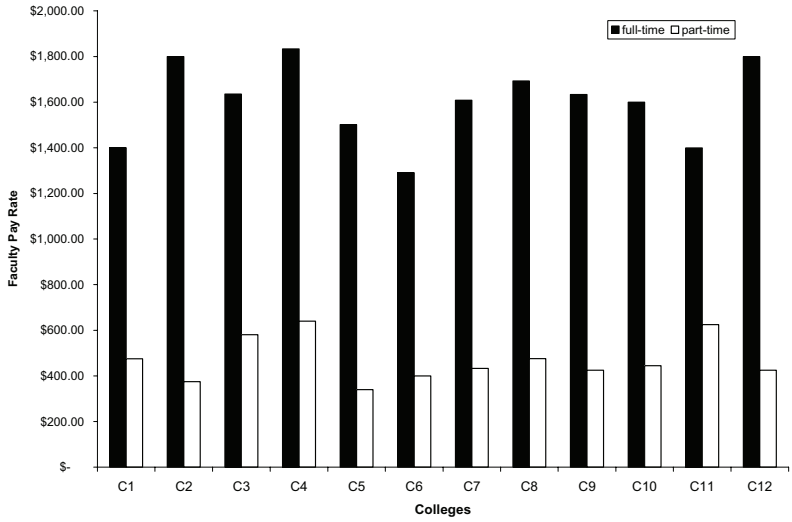

Figure 2 Median faculty pay rates

The mean full-time faculty rate was $1,599.33 with a standard deviation of $173.47. Six colleges fell within one standard deviation and six colleges were within two standard deviations from the mean.

The distribution of the cost of instruction between full-time faculty and part-time

faculty is presented in Figure 3.

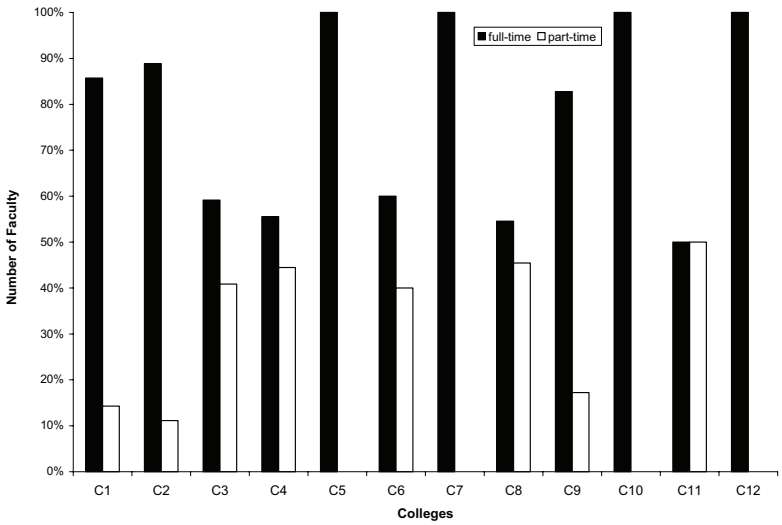

Figure 3 Full-time versus part-time load distribution

The second subdivision of the compensation category included several classifications of individuals employed to support, develop, manage, and/or direct online courses. The first classification was labeled “Executive Managers” and included those persons whose assignments required primary responsibility for management of the unit, department, or service directly related to the development, delivery, and support of online coursework. Examples included Director, Coordinator, Department Chair, Dean, and Associate Vice President. If online delivery systems represented only a portion of assigned responsibilities, respondents were asked to calculate the percentage of the annual salary devoted to online activities.

The second classification was labeled “Other Professionals” and included those persons employed for the primary purpose of performing academic support, student service, and institutional support activities directly supporting online courses. The third classification was labeled “Technicians” and included full-time network specialists, programmers, Webpage developers, graphic artists, and other similar job duties.

The fourth classification was labeled “Clerical Staff” and included those persons whose assignments were typically associated with clerical activities or were specifically of a secretarial nature. The fifth classification was labeled “Student Workers/PT Workers” and included all other hourly or non-full-time staff assigned to support, develop, coordinate, or manage some aspect of online course development, delivery, or support.

The five classifications of compensation, exclusive of instructional costs, were aggregated and expressed in Figure 4.

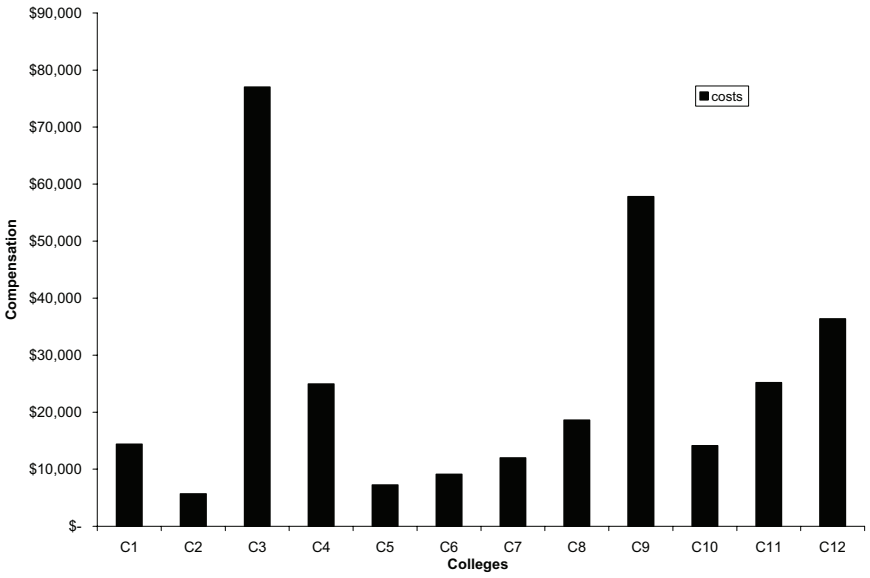

Figure 4 Compensation other than instruction

Operating expenses (O). The second category of expenditure consisted of operating expenses. This category was subdivided into eight categories and includes commodities, travel, communications, duplication of materials, postage/distribution services, contractual services, license/user fees and rent.

The eight categories of operating expenses were aggregated and expressed in Figure 5.

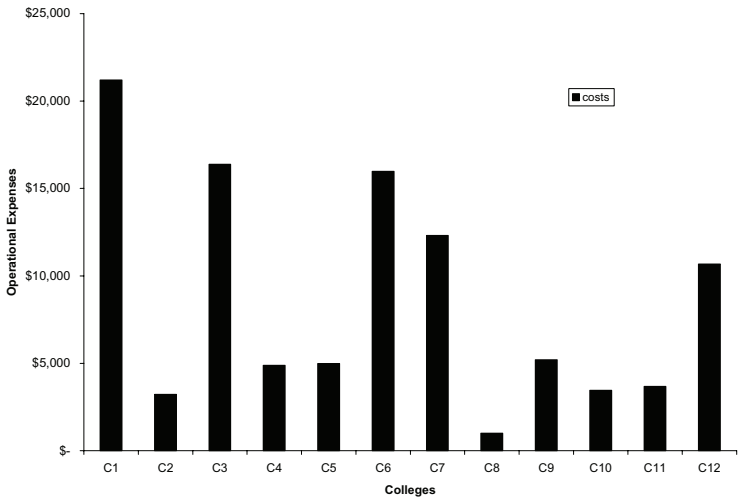

Figure 5 Operating expenses

Capital (C2). The third category of expenditure consisted of capital expenditures. Included in this category were expenditures for items that had a useful life of greater than one year and an acquisition cost of greater than $1,000.00. Also, capital items must have become the property of the college, excluding items that were rented, leased, or licensed. This category was subdivided into equipment and telecom infrastructure.

Capital expenses were aggregated and expressed in Figure 6.

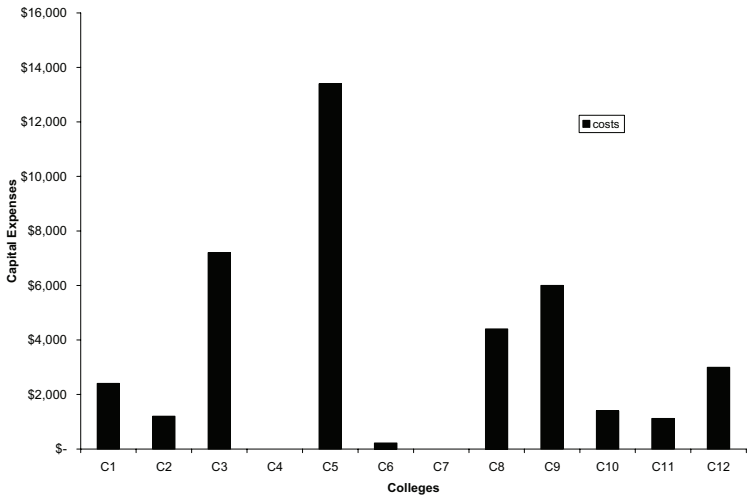

Figure 6 Capital expenses

The fourth category of expenditure consisted of course development costs. Respondents were asked to identify the amount of money paid to the particular faculty member(s) employed to develop the reported online course.

Each course, based on the institutional compensation scheme, was assigned an initial cost. This cost was amortized over a 5-year period (10 offerings), assuming the course was taught once per semester. Figure 7 represents the aggregate course development costs incurred.

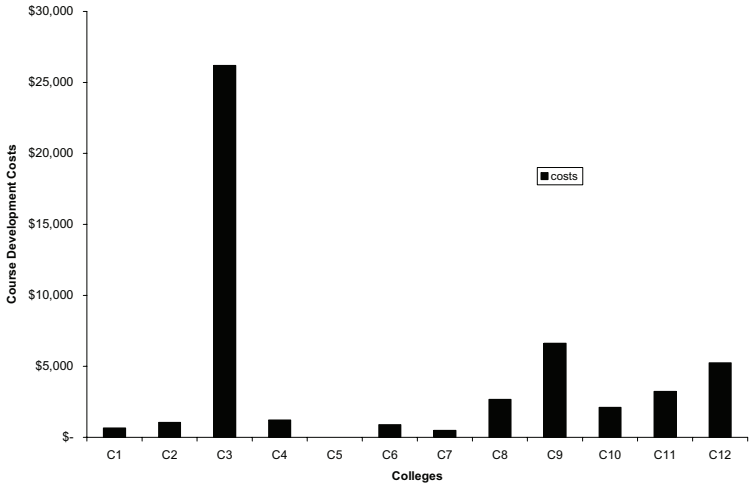

Figure 7 Course development

Each college's course development costs were summed and divided by the total number of course credit hours generated to arrive at a mean cost of course development per credit hour. These results are illustrated in Figure 8.

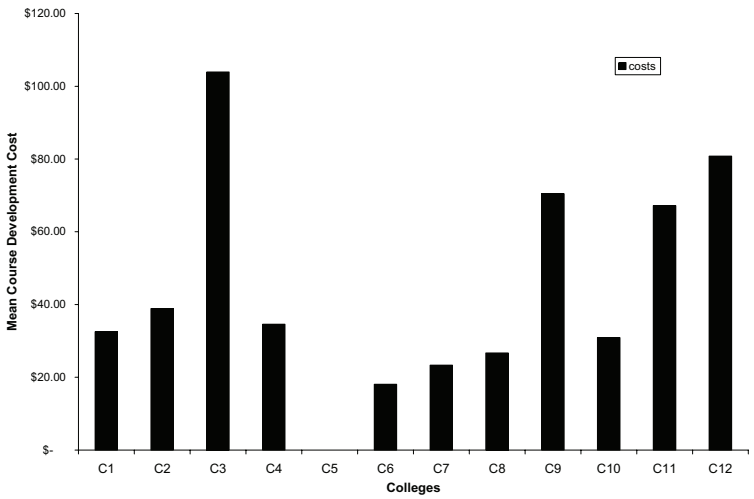

Figure 8 Mean course development cost per credit hour

Finally, all categories of expenditure (compensation, operational, capital, and course development) were summed in order to calculate net expenditures. The formula for calculating net expenditures was described in chapter 3 as C1+O+C2+D=E, with E representing net expenditures. These results are represented in Figure 9.

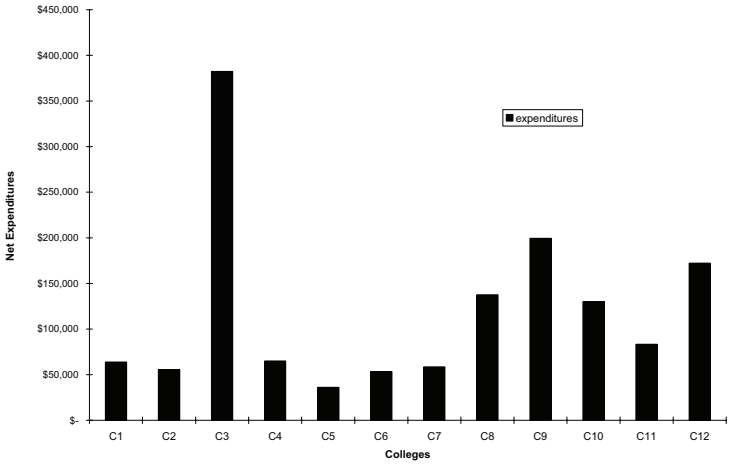

Figure 9 Net expenditures

Revenue

Revenue was identified by multiplying the tuition rate of the four residency classifications (in-district, out-of-district, out-of-state, and out-of-country) by the corresponding number of student credit hours generated in each residency

classification. Credit hours generated by in-district and out-of-district students received an additional $37.00 (averaged figure) per credit hour in state apportionment that the Illinois Community College Board reimbursed colleges in 2001. All other residency classifications were not eligible for state apportionment, hence the higher tuition rates.

Figure 10 illustrates tuition revenue based on residency classification. Tuition revenue was calculated by multiplying the number of credit hours generated in each residency classification by the corresponding tuition rate.

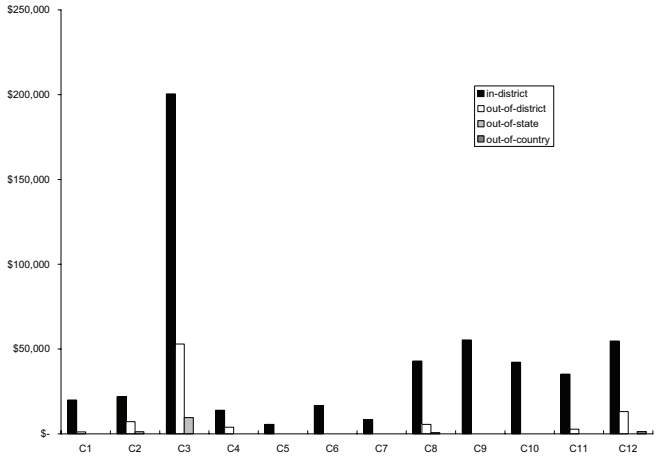

Figure 10 Tuition revenue

Tuition rates by residency classification for each college were collected and are presented in Figure 11.

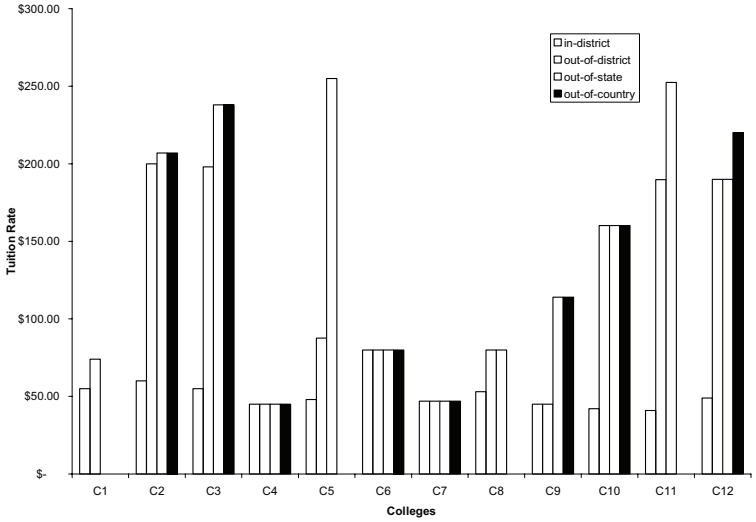

Figure 11 Tuition rates

Six of the twelve responding colleges charged a fee in addition to tuition, calculated on a per-credit-hour basis. Figure 12 identifies the net fee revenue, calculated by multiplying the per-credit-hour fee by the number of student credit hours generated.

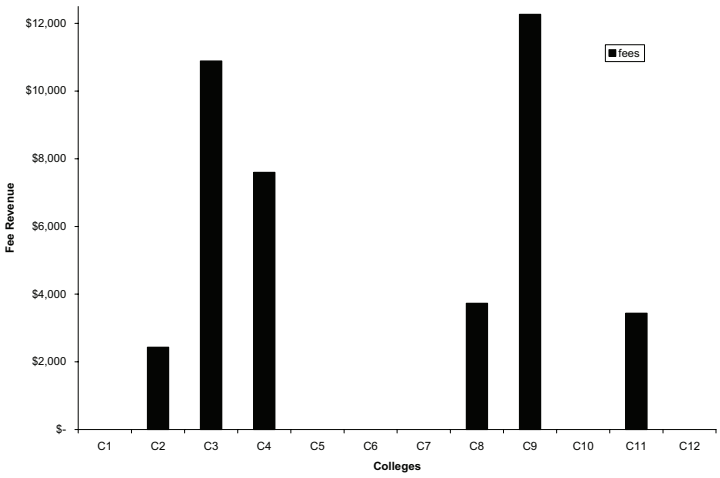

Figure 12 Fee revenue

All colleges were granted $14,100 during the 2001 academic year by the Illinois Community College Board to offset the cost of student support incurred through participation in the Illinois Community Colleges Online initiative. Two colleges received additional grant dollars that were used to support online course delivery and/or support services. Figure 13 illustrates grant revenue, of which only 60% is realized due to a single semester timeframe of study.

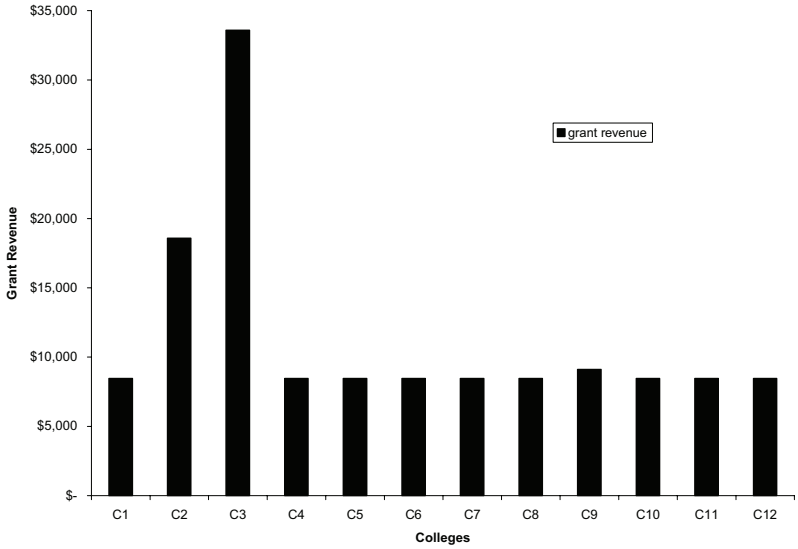

Figure 13 Grant revenue

Two colleges received revenue from sources described as Other. This category includes costs borne by others. Figure 14 reflects revenues characterized as Other.

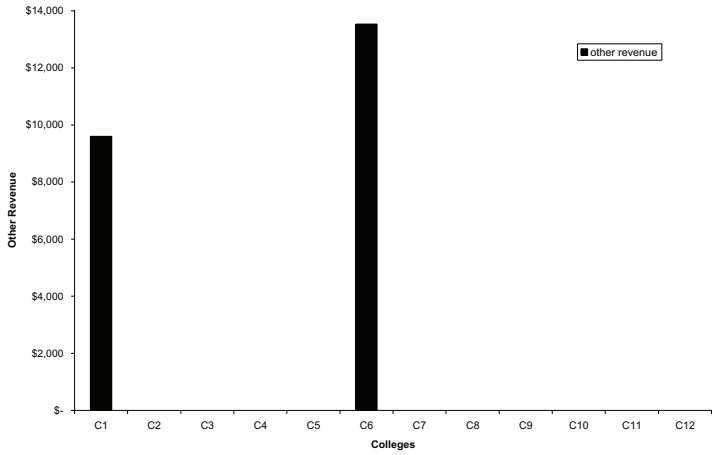

Figure 14 Other revenue

A final calculation, represented as (ID*ID rate)+(OD*OD rate)+(OS*OS rate)+(OC*OC rate)+ F + B + G = Revenue, was employed to determine net revenue. The results are represented in Figure 15.

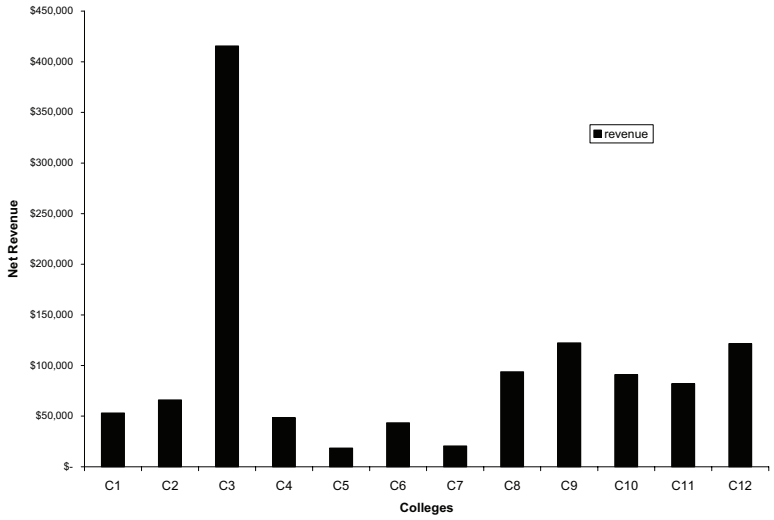

Figure 15 Net revenue

The dependent variable was cost-efficiency as operationally defined by Rumble (1997). A system is 'cost efficient if, relative to another system, its outputs cost less per unit of input' (p. 120). Therefore, an institution that expended less money than it received, relative to the other colleges participating in the study, was considered cost efficient. Figure 16 represents a profit/loss calculation which compared net revenues to net expenditures (R-E=P/L).

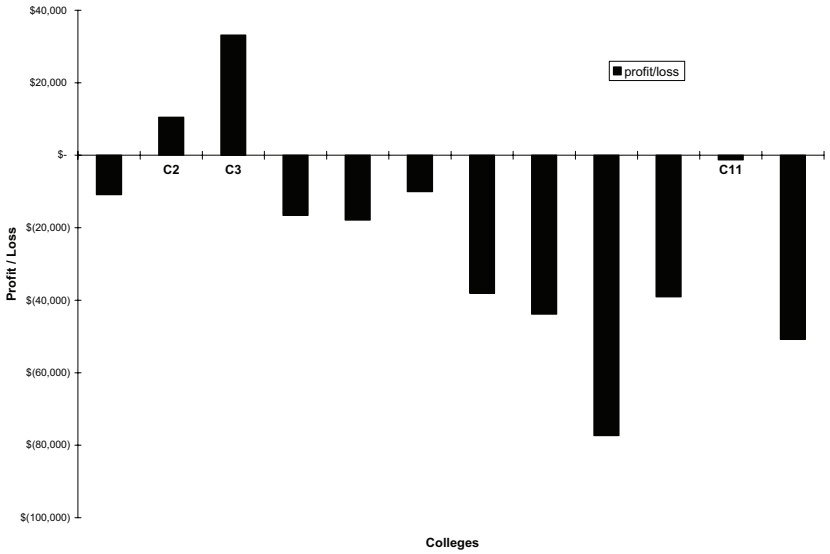

Figure 16 Profit/Loss

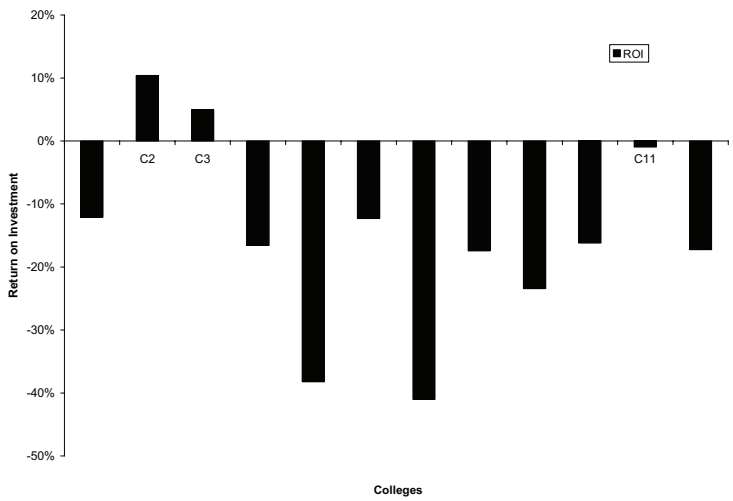

Figure 17 Return on investment

The result of this calculation was used as a basis for determining cost-efficiency. Those colleges that reflect a profit were determined to be cost efficient, and conversely, those colleges reflecting a loss were determined to be cost inefficient.

Two of the twelve colleges participating in the study were determined to be cost efficient. The remaining 10 colleges were cost-inefficient.

A range in profitability of $14,110.33 was calculated between the two colleges determined to be cost efficient. A range of $72,941.60 was calculated between the ten colleges determined to be cost inefficient.

The determination of cost per student credit hour was accomplished by dividing net expenditures by the number of student credit hours generated. Revenue per student credit hour was determined by dividing net revenue by the number of student credit hours generated. Figure 18 presents these independent variables.

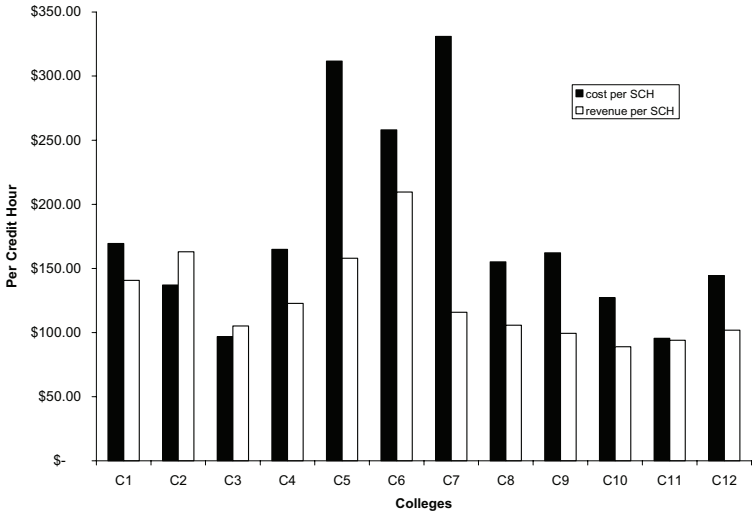

Figure 18 Cost and revenue per student credit hour

Figure 19 illustrates the difference between revenue and cost per student credit hour. Figure 20 represents mean class size.

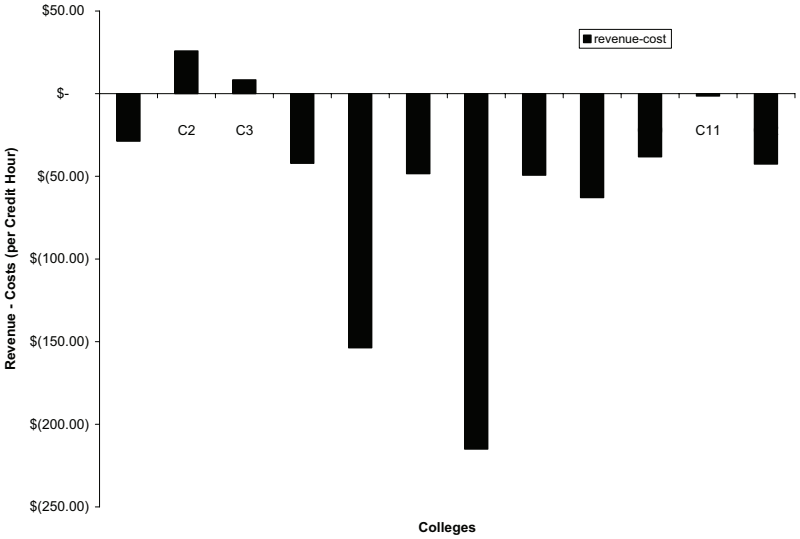

Figure 19 Revenue minus cost (per student credit hour)

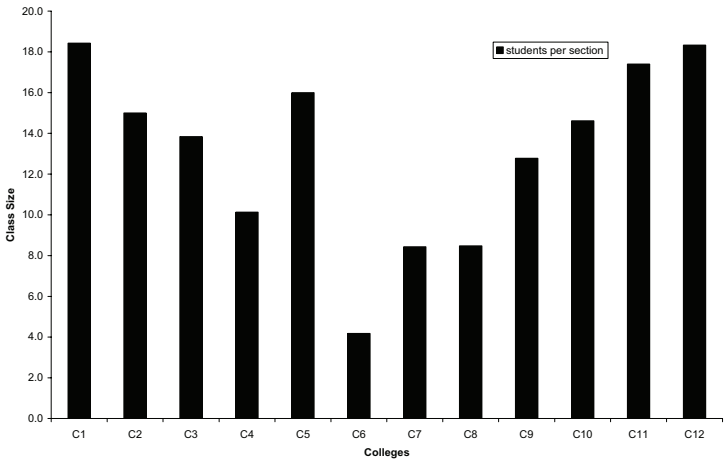

Figure 20 Mean class size

Conclusions

This study found that online programs at 83% of the community colleges participating in the study were *not* cost efficient and did *not* provide a positive return on investment. These findings are *not* consistent with the literature. Cost-effectiveness was supported in most other studies, but it was noted that costs varied substantially and were influenced by many factors (Batey & Cowell, 1986; Rumble, 1982).

Although this study was not designed to compare online courses with their traditional counterparts, it is interesting to note that after piloting the TCM (Technology Costing Methodology) at 17 institutions, Jones determined that technology-mediated instruction was more expensive than face-to-face instruction in all instances (Jones, 2001, p. v).

On the other hand, an issue identified in the literature by Inglis (1999), Kearsley (2000), and Whalen and Wright (1999) was that the reduction of costs appeared to be one of the main factors leading institutions to adopt third-generation distance education technologies. Of the two colleges determined to be cost efficient, the mean return on investment was just 7.7% for a single semester. When considering the ten cost-inefficient colleges, the mean return on investment was -19.5% in a single semester. The perception that third-generation distance education systems will reduce costs is not supported by this study.

Finally, in response to the research question “To what extent are online courses delivered at community colleges in Illinois cost efficient?” the results of this study do not support the premise that online courses are cost-efficient. Two of the 12 responding colleges were determined to be cost efficient. The mean return on investment was –15%.

Expenditures. Net expenditures in support of online programs are, to a large extent, a function of the number of students served. The two colleges that earned a positive return on investment realized an 85.5% difference in net expenditures and an 89.7% difference in the number of students enrolled but reflect only a 4.2% difference in the amount of money spent per student. There is a strong relationship between the number of students served and the overall cost of the program.

A study of the means in each category of expenditure as defined by the Cost Identification Worksheet revealed that 60.9% of net expenditures occur in the cost of instruction category. There was a significant difference in compensation for instruction with respect to full-time faculty. Full-time faculty experienced a $543 range per credit hour between the minimum and maximum, and half of the colleges were two standard deviations from the mean. To a lesser extent, part-time faculty compensation varied significantly, with a $300 range between the minimum and maximum, and one third of colleges reflected pay rates more than

one standard deviation from the mean.

Given that 78% of all courses were taught by full-time faculty, cost of instruction was found to be the most significant cost factor.

Compensation other than instruction accounted for 21.2% of the net and operating, capital, and course development costs comprised 11%, 4.6%, and 2.3%, respectively.

In response to the question 'What is the per-credit-hour cost associated with online instruction?' posed by Jones (2001, p. 2), the mean cost per student credit hour was $179.46. Cost per student credit hour, unsurprisingly, varied almost identically to full-time faculty pay rates, with a $235.45 range between the maximum and minimum, with four colleges presenting figures that were two standard deviations from the mean.

Decision-makers considered the primary benefit of online distance education to be that costs could be spread over a large number of students, taking advantage of economy of scale, assuming that large numbers of students would increase revenue and lower cost-per-student and operating expenses (Inglis, 1999). In addition, Phelps et al. (1991) stated, 'Distance education can be cost effective and that cost-effectiveness [efficiency] is largely dependent upon the number of students served and the fixed costs of development and delivery' (p. 8). Phelps et al.'s findings were only partially confirmed as the cost of instruction (delivery) and number of students had significant impact on cost-efficiency as cost of instruction is the single largest category of expenditure and student tuition accounted for the single largest revenue category. In opposition, the most cost-inefficient colleges presented the best efficiencies related to class size. College C1 presented a mean of 18 students per section, yet earned a -12.1% return on investment. The two colleges earning a positive return (C2 and C3) presented a mean class size of 15 and 13.8, which was consistent with the median class size of 14.

Jones noted that scale was a significant factor and that larger enrollments would have created conditions in which technology-mediated delivery would be less expensive and that continued effort must be made to identify those conditions (Jones, 2001, p. v). Colleges in Illinois would benefit from this advice. Given that Bartolic-Zlomislic and Bates (1991) found that the annual break-even enrollment in their study, based on projected costs and revenues over four years, was 44.18 students, perhaps the Illinois colleges need to significantly increase class size in order to approach cost-efficiency.

The cost of course development, which was underscored in the literature as one of the major cost categories, was found to be relatively insignificant and accounted for only 6.8% of net expenditures.

Revenue. In comparing the means in revenue categories, it was discovered that

70% of revenue was generated from in-district tuition plus state apportionment. Grants accounted for 18.3% of revenue, and out-of-district tuition and apportionment accounted for an additional 6%.

Revenue per student credit hour was relatively stable among colleges. Only a single college presented revenue per student credit hour that was more than one standard deviation from the mean. Accordingly, in-district tuition rates, the largest revenue producing category, mirrored revenue per credit hour with only a single college more than one standard deviation from the mean. In summary, revenue categories appeared to be relatively stable among colleges due primarily to similar in-district tuition rates. The findings of this study should be especially useful to managers and administrators at each of the colleges that participated, as well as the Illinois Community Colleges Online project. These findings allow decision-makers to determine which categories of expenditure and revenue, when compared with colleges in the same statewide system, are within reasonable proximity. The Cost Identification Worksheet may fill this need, especially in Illinois.

Future cost-efficiency studies will benefit from the use of this and other similar studies in that these definitions are becoming more explicit. It is worth noting that a threat to the statistical conclusion validity lies in the fact that it remains difficult to collect reliable data from multiple institutions at a level of detail needed for accurate comparison, as evidenced by the low response rate. There is no accurate way to error-check the data provided by the responding colleges to ensure that the cost and revenue figures defined in the study are actually what are being reported.

Of course, this study could be improved by a larger sample. Although a study of twelve institutions represents one of the largest comparison studies to date, the inclusion of all community colleges in the state of Illinois would provide a still clearer picture of cost-efficiency and return on investment.

References

Bakia, M. (2000). Costs of ICT use in higher education. *TechKnowLogia, January-February*, 49-52.

Bartolic-Zlomislic, S., & Bates, A. W. (1999). *Assessing the costs and benefits of telelearning: A case study from the University of British Columbia*. Retrieved February 5, 2002, from http://research.cstudies.ubc.ca/nce/EDST565.pdf

Bates, A. W. (1995). *Technology, open learning and distance education.* London: Routledge.

Batey, A., & Cowell, R. N. (1986). *Distance education: An overview.* Portland, OR: Northwest Regional Educational Lab. (ERIC Document Reproduction Service No. ED 278 519)

Capper, J., & Fletcher, D. (1996). *Effectiveness and cost-effectiveness of print-based correspondence study.* Alexandria, VA: Paper prepared for the Institute for Defense Analysis.

Cuckier, J. (1997). Cost-benefit analysis of telelearning: Developing a methodology framework. *Distance Education, 18*(1), 137-152.

Harasim, L. (Ed.). (1990). *Online education: Perspectives on a new environment.* New York: Praeger.

Hosley, D. L., & Randolph, S. L. (1993). *Distance learning as a training and education tool.* Kennedy Space Center, FL: Lockheed Space Operations. (ERIC Document Reproduction Service No. ED 335 936)

Inglis, A. (1999). Is online delivery less costly than print and is it meaningful to ask? *Distance Education, 20*(2), 220-239.

Johnstone, S. (2001). Calculating the cost of online learning. *Syllabus, August*, 18.

Jones, D. (2001). *Technology costing methodology handbook—version 1.0* (WICHE Publication # 2A287). Boulder, CO: Western Interstate Cooperative for Educational Telecommunications and the Western Interstate Commission for Higher Education.

Kearsley, G. (2000). *Online education: Learning and teaching in cyberspace.* Belmont, CA: Wadsworth.

Markowitz, H., Jr. (Ed.). (1990). *Distance education: Staff handbook (the guide series in continuing education)*. Urbana, IL: Office of Continuing Education and Public Services. (ERIC Document Reproduction Service No. ED 323 334)

McCreary, E., & Van Duren, J. (1987). Educational applications of computer conferencing. *Canadian Journal of Educational Communication, 16*(2), 107-115.

Moonen, J. (1997). The efficiency of telelearning. *Journal of Asynchronous Learning Networks, 1*(2).

Office of Institutional Research and Evaluation. (2001, August 2). *Annual enrollment (A1)-FY 00 & 01 table listing*. Retrieved November 2, 2002, from Parkland College Web site: http://www.parkland.edu/oire/A10001.HTM

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), 7-19.

Rumble, G. (1982). The cost analysis of learning at a distance: Venezuela's Universidad Nacional Abierta. *Distance Education, 3*(1), 116-140.

Rumble, G. (1989). On-line costs: Interactivity at a price. In R. Mason & A. Kaye (Eds.), *Mindweave: Communication, computers, and distance education* (pp. 146-165). Oxford, England: Pergamon.

Rumble, G. (2001). The costs and costing of networked learning. *Journal of Asynchronous Learning Networks, 5*(2).

Seigel, J., Shim, J., & Dauber, N. (1997). *Corporate controller's handbook of financial management.* Paramus, NJ: Prentice Hall.

Showalter, R. G. (1983). *Speaker telephone continuing education for school personnel serving handicapped children: Final project report 1981-82*. Indianapolis: Indiana State Department of Public Instruction, Indianapolis Division of Special Education. (ERIC Document Reproduction Service No. ED 231 150)

Simonson, M. R., & Jones, J. (1993). Distance education: A cost analysis. In *Proceedings of the 1993 Convention of the Association Educational Communications and Technology Proceedings (pp. 441-493)*, New Orleans, LA.

Trevor-Duetsch, L., & Baker, W. (1997). Cost/benefit review of the interactive learning connection. *University Space Network Pilot.* Ottawa, Ontario, Canada: Strathmere Associates International.

Western Interstate Commission for Higher Education. (2001). *Technology costing methodology (TCM) tabulator*. Retrieved September 14, 2001, from http://www.wcet.info/projects/tcm/download.asp

Whalen, T., & Wright, D. (1999). Methodology for cost-benefit analysis of Web-based tele-learning: Case study of the Bell Online Institute. *The American Journal of Distance Education, 13*(1), 24-44.