Date : 02/07/2008

The Economics of Learner Centered Online Education

Bruce Kingma
Associate Provost and Professor
Syracuse University
USA

Kathleen Schisa
Director, Web-based Information Science Education Consortium

Meeting: **163. E-learning Discussion Group**
Simultaneous Interpretation: English-French and French-English only

WORLD LIBRARY AND INFORMATION CONGRESS: 74TH IFLA GENERAL CONFERENCE AND COUNCIL
10-14 August 2008, Québec, Canada
http://www.ifla.org/IV/ifla74/index.htm

Abstract

Learner-centered online education requires faculty, staff, technology, and library resources to provide high-quality online instruction. Sloan-C, WISE, and other organizations have established quality metrics that emphasize the learner-centered approach to online instruction. The quality of online instruction is influenced by the number of students in a class, the presence of an instructional designer, and other factors (Keefe and Kingma, 2006). Each of the characteristics that influence the quality of online instruction has an associated cost.

This presentation and paper will examine:

- *The research on the key characteristics that influence quality in online education*
- *The added cost of online education in institutions offering comparable face-to-face programs*
- *The cost of providing high quality learner-centered online education.*

Introduction

The economics of leaner centered online education depends on the balance between quality and cost. Quality online education requires the support of resources beyond those needed for campus-based programs. Additional resources amount to additional costs. A body of research examining quality metrics for online courses and programs has emerged alongside the growth of online delivery as an integral method in higher education (ADEC, 2003; ASHE, 2006; Cavanaugh, 2005; McGorry, 2003; Moore, 2005; Ruth, 2006; WISE, 2006). In addition to defining quality, researchers have investigated the cost of offering online courses (ASHE, 2006; Bartley & Golek, 2004; Hardy & Robinson,

2004; Rumble, 2001). The literature examining the relationship between cost and quality in online education is less mature, with most work focusing on reducing delivery costs for moderate-quality, high-enrollment programs. The present work aims:

- To establish an accepted definition of quality in learner-centered online education incorporating concepts from the existing literature
- And to provide an analysis of the costs a school faces when adding a high-quality graduate/masters level online program to an existing campus-based program.

Defining Quality in Online Education

Technology, when used appropriately and effectively, can expand the reach of talented faculty and provide geographically bound students with access to highly regarded academic programs. It may also enable instructors to enrich course content with multimedia materials and access to relevant web-based resources at the point of need (e.g.: embedded in a PowerPoint lecture), and it allows instructors to encourage ongoing discussions in the online forum that extend far beyond the constraints of a single face-to-face class meeting. To preserve the integrity of the academy as use of emerging technologies in the online teaching environment increases, several national organizations and independent researchers have proposed guidelines for high-quality online education delivery.

The Sloan Consortium [Sloan-C] frames quality with five pillars for Asynchronous Learning Networks, or "people networks for anytime, anywhere learning (Moore, 2005, p.1)." Sloan-C stresses the importance of continuous quality improvement [CQI] in online education. CQI, which "measures progress towards goals using metrics and feedback from stakeholders for continuous improvement," is an imperative process in establishing and maintaining quality in an online program (Moore, 2005, p.9). The growth and evolution of these dynamic programs is rapid, and the offering institution has the responsibility of oversight and modification at each stage to ensure that quality is preserved. The minimum quality expectation set by Sloan-C dictates that "learning online should be at least as effective as learning in other modes," expanding on this concept with the five pillars of quality and associated goals (Moore, 2005, p.1- 4).

The Sloan Consortium Five Pillars of Quality in Online Programs

- Learning effectiveness - The quality of learning online is demonstrated to be at least as good as the institutional norm
- Cost effectiveness - The institution continuous improves services while reducing costs
- Access - All learners who wish to learn online can access learning in a wide array of programs and courses
- Faculty satisfaction - Faculty are pleased with teaching online, citing appreciation and happiness

- Student satisfaction - Students are pleased with their experiences in learning online, including interaction with peers and instructors, learning outcomes that match expectations, services, and orientations

While the Sloan-C pillars address quality on the program level, the American Distance Education Consortium [ADEC] (2003) presents guidelines for course quality (p. 1-2).

- The learning experience must have a clear purpose with tightly focused outcomes and objectives.
- The learner is actively engaged.
- The learning environment makes appropriate use of a variety of media.
- Learning environments must include problem-based as well as knowledge-based learning.
- Learning experiences should support interaction and the development of communities of interest.
- The practice of distance learning contributes to the larger social mission of education and training in a democratic society.

The ADEC quality guidelines apply not only to the instructor, but also to the student, placing the responsibility of active engagement on the learner. This engagement is an integral component of the learner-centered classroom or Twigg's (2003) "student-engagement approach [in which] learning is less dependent on words uttered by instructors and more dependent on reading, exploring, and problem-solving undertaken actively by students (p. 25)."

The Web-based Information Science Education Consortium (2006) proposes principles and metrics for effective online teaching and learning that address quality at both the level of the course and the program in graduate education for library and information science. The full document is available at http://www.wiseeducation.org/images/principles.pdf

WISE Principles and Metrics Related to Courses

- The school supports the research and development of the emerging technologies in online education.
- Schools provide prospective students with adequate information about expectations and prerequisites (knowledge, software, etc.) and support to be successful.
- Access to library resources is effective.
- There is a clear policy on ownership of course materials developed for online education courses; this policy is shared with all faculty and staff involved in online education at the institution.
- Faculty are well prepared and supported to teach online and have access to and participate in training, mentoring, and sharing experiences.
- Faculty have access to resources (including staff) at their home institutions to find answers to questions and problems related to pedagogy, administration, course development and technical issues.

- Faculty regard online education as a part of their personal and academic goals for teaching excellence.
- Students receive fair, timely, and complete evaluation of their work.
- Course design promotes learning effectiveness.
- Faculty and staff pay attention to factors that can enhance the quality of the learning experience for the student.
- Students are satisfied with online courses.

WISE Principles and Metrics Related to Programs

- The school provides administrative support and resources for the online education program that includes but is not limited to research and development of emerging technologies, and student and faculty services.
- Students are satisfied with administration of the online program.
- Online education courses are scheduled to allow students to complete degree requirements in a timely fashion.
- A learning community is fostered that extends beyond the online classroom.

These principles provide valuable guidelines for establishing and evaluating online courses and programs, but it is also critical to consider the student when defining quality in learner-centered education.

In a learner-centered online program, the quality of the students has a profound effect on the quality of the overall course experience. Online education reduces (or even eliminates) geographic boundaries, allowing schools as well as students to be more selective. This creates the potential for the improvement of the greater student body. For example, a fully online program at a top tier east coast school may attract the most promising west-coast students who they would not have been able to recruit in the past due to the students' unwillingness of inability to relocate. Cavanaugh (2005) also suggests that online courses actually draw higher quality students, based on grade comparisons (table 3).

The quality of students influences the quality of interactions such as exchange of ideas on discussion boards, collaboration on group projects, and peer evaluation of independent work. These elements in turn influence the quality of the overall learning experience. Consortia such as WISE, which selectively admit students to online courses (with vetting criteria that include minimum grade point averages and previous online learning experience), the potential for raising the quality of scholarly discourse is even greater. Highly motivated students drive one another to remain engaged, and without them the learner-centered model of online education would not succeed.

As student satisfaction is often cited as a quality metric for online education, students should have a voice in defining what quality is. In addition to traditional course evaluations, WISE students are invited to nominate instructors who have demonstrated best practices in the online classroom. Common themes in these nominations include:

- Prompt, detailed feedback and responses to inquiries
- Creation of an online community through well-designed group projects, informal student-only discussion boards, and introductory profiles
- Use of innovative/varies delivery options such as wikis, vodcasts, and voice-over PowerPoint lectures

WISE, ADEC, and Sloan-C provide comprehensive and somewhat overlapping guidelines for quality in online education. McGorry (2003) suggests similar guidelines framed by seven constructs: flexibility, responsiveness and student support, student learning, interaction, technology and IT support, and student satisfaction (p.4). Much of the other independent research focuses on maintaining quality while reducing cost. Common issues of concern include:

- Increasing course sizes for economic efficiency at the cost of quality

- Increasing reliance on adjunct faculty, teaching assistants, and supplemental staff in place of full-time faculty

Reliance on non-full-time faculty could potentially reduce quality for several reasons. Instructors with less training and education may be less qualified and capable of teaching. As faculty are forced to rely on support staff to handle increasing course caps or to teach mass-produced courses designed by others they may lose "ownership" of their courses, reducing satisfaction (one of the common quality metrics). Ruth, Sammons, & Poulin (2007) also suggest that as the number of adjuncts teaching in a program increases, graduation rates decrease, indicating that quality is affected (p.34). This factor may have less of an effect on specialized graduate level courses (e.g.: WISE+ courses) in which practicing professionals with immense experience may be better prepared to teach in a specific subject than true academics. Adjunct instruction costs schools substantially less than full time faculty labor; Scarafiotti (2004) cites that use of adjunct faculty results in a cost reduction of up to 69% per course (p.41). As higher education institutions continue to try to reduce expenditures, it will be interesting to see how the adjunct vs. full-time faculty debate unfolds with regard to quality.

Based on the literature and quality metrics defined by several national organizations, the following criteria for quality in online education have been identified:

- Instructor and student satisfaction
- Availability of technology and instructional support for students and instructors
- Timely, thoughtful feedback and responses to inquiries (student/instructor as well as student/student)
- Well articulated outcomes and expectations
- High student success rate for achieving outcomes
- High completion rate and low drop rate
- Support of the online program form the greater system (school, institution, consortium, state, etc)
- Students and instructors have easy access to courses and flexibility

- Courses are economically feasible for schools to offer and are offered to students at fair market value
- Courses are as good as or better than their face-to-face equivalents

Costing Online Education

One common theme across the literature on costing online education is that it is challenging to generalize cost analysis across the broad variety of online programs (ASHE, 2006; Bartley & Golek, 2004; Rumble, 2001) Factors such as program size (influencing economies of scale), level and type, ability to utilize resources from existing face-to-face programs, substitution of lower-cost labor for full-time faculty, and funding influenced by institutional or state politics each have an impact on how establishing an online program will affect the financial situation of a school. While it may be impossible to provide an accurate quantitative cost analysis which may be projected across all online programs, several comprehensive models have been proposed which break down the elements necessary to establish and maintain a high-quality online program at an individual school. Schools which are considering the addition of an online program or which want to evaluate the cost of an existing program will benefit from using these models to identify all costs associated with online education and to illustrate their current financial situation.

Rumble (2001) notes the importance of identifying all costs associated with establishment and delivery or an online program. Full costs include those incurred by all stakeholders in the system: faculty, department heads, institutional administrators and leaders, and students who face the opportunity cost of forgoing face-to-face education in favor of online course delivery in addition to incurring technology and access costs. A "whole systems" approach which breaks the costs of an online education system down is suggested, which includes (p. 76-78):

- Development of online learning materials
- Teaching and assessing students online
- Website access
- Administration of students online (e.g.: IT support, academic advising)
- Providing infrastructure and support for the learning management system
- Planning and managing online education at the macro-level

In addition to the costing model, Rumble (2001) provides a description of the factors which influence the costs of education systems at the macro level which include (p. 76):

- Course populations
- Number of courses offered
- Course lifetime (how many times the course can be offered without substantial re-development)
- Media and Technologies used
- Use of added-cost materials (e.g.: copyrighted/licensed)
- Use of salaried versus casual labor for course instruction and staff support (labor-for-labor substitution)

- Adoption of working practices and technology which reduce labor costs
- Increase in teaching load of academic staff at the expense of other activities (e.g.: research)

Meyer (2005) outlines a far more basic visual representation of cost, the "Framework of Elements and Factors" (p.20). This matrix provides a broad overview of costs without parsing each element into detail. It is clear and useful for presentation purposes, although it is not comprehensive enough for full analysis.

Bartley and Golek(2004) provide a full cost matrix which considers the set of costs associated with every stage of the "Instructional Systems Design model" (Analyze, Design, Develop, Implement, and Evaluate) broken down into one-time costs and per session costs (p.174). Per session costs take into account the number of times the course is offered and how many students are able to participate, factors which have an effect on the return on investment achieved with each course.

Scarafiotti (2004) cites the assisted cost calculation method which focuses on the costs of instruction, academic support, student services, and institutional support broken down further into subcategories (p. 40). Cost analysis may be calculated by course, discipline, or delivery mode, with the end product being "cost per student per credit hour." Other factors including cost of unused capacity and cost "borne by others (e.g.: students)" are considered in this model, making it highly comprehensive.

Each of these methods, with the exception of Meyer's Framework, encourages the comparison of the cost of offering an online course and its face-to-face equivalent, which may provide evidence for the financial benefits of online delivery. Proponents of online education may use this evidence to lobby with institutional administration and funding bodies (e.g.: the state) in support of the establishment of online programs. For example, simple cost comparison between online and campus based programs at a school may reveal that online delivery is actually more cost-effective than face-to-face delivery. This is the case with the University of Texas TeleCampus system where TeleCampus courses cost approximately $40 per semester credit hour less than average on-campus courses (Hardy & Robinson, 2004). In this study, which analyzed expenditures for academic support, student services and institutional support for online students (assuming no variance in instructional cost between online and face-to-face programs), the reason for the cost variance is that online delivery eliminates cost of classroom space and decreases "physical plant" costs. This analysis was used to justify the existence of the TeleCampus program to the Texas Board of Regents (Hardy & Robinson, 2004).

Relationship of Cost to Quality in Online Education

Twigg (2003) notes that in academia, there has long been a forced trade-off between cost and quality, influenced by the trade-off between cost and enrollment numbers (p.1). In other words, as enrollment numbers in a course increase, cost per full time enrolled equivalent decreases, but quality may also decrease. There is discrepancy in the literature regarding the economic efficiency of online learning. Ruth (2006) suggests that online education is a "financial loser" unless enrollment volumes are extremely high, in which case quality suffers (p. 29). Other studies suggest that technology may make it possible

for individual instructors to handle larger enrollment numbers in a given course without a decrease in quality.

Course redesign and integration of technology may alleviate the trade-off between course size and course quality, however that requires substantial planning, investment, and know-how for successful implementation (WISE, 2006, p.35). Technology aided redesign of an online course at Rio Salado College with course completion rate increasing by 6% and the number of students handled by one instructor increasing from 35 to 100, which later reduced to a course cap of 50 based on faculty feedback (Scarafiotti, 2004, p.45). Cost per student in the redesigned course at Rio Salado College was also reduced by thirty-seven percent (Scarafiotti, 2004, p.45). Instructional design and technology was utilized in the redesign of this fully-online course to increase ease of communication with students at critical points during the course and to increase monitoring of student progress utilizing the course management tracking system. A teaching assistant was also used in the redesign to communicate with the instructor based on the course management system data. The integration of a teaching assistant (an issue of concern in the literature) did not result in quality reduction in this case (Scarafiotti, 2004, p.45).

There is no inflexible "perfect" enrollment cap mentioned in the literature with regard to quality. Rumble (2001)cites that a cost-effective enrollment level for a "standard web-based course" amounts to 40 enrollments per year over a four-year period (p. 84); however, while no consistent enrollment cap is defined for graduate level courses, the range suggested in the literature is 15-25 students per section per instructor to maintain high-quality learner-centered online instruction (WISE, 2006). Keefe and Kingma (2006) show that an enrollment of 22 students in a graduate online course maximizes student satisfaction.

With regard to enrollment limitations and the impact of enrollment number on program cost and quality, Scarfiotti (2004) cites the importance of aligning the scale of a program (the number of students served) with the program's scalability (its capacity to serve a given number of students) (p.42-43). If scale and scalability are aligned, the program will be serving the optimum number of students; optimal cost efficiency will be achieved and quality will not suffer. Cost and quality are also intertwined with enrollment with regard to attrition. Several authors (ASHE, 2006; Arnetta, n.d.; Scarafiotti, 2004) note that as quality increases, dropout rate and attrition is likely to decrease. Reduced drops/ and increased rates of completion amounts to higher cost efficiency because scale and scalability are more likely to remain aligned.

Economic Modeling of Online Education

Our analysis will use two possible economic models relevant to quality online education course delivery: a production function model and a cost-benefit analysis. We use data from online and campus course delivery in graduate education in library and information science to compare these two models.

A production function expresses the amount of one or more outputs (cars, books, corn) that can be produced given a set of inputs (workers, buildings, and computers). Some

organizations produce primarily one product (The Ford Motor Company makes cars while the American Heart Association provides information and research on heart health) while other producers have diverse set of products in the industry (Owens Corning makes a variety of building materials while the YMCA provides access to shelters as well as health and fitness programs and facilities). A production function model looks at industry costs, levels of inputs and outputs to measure the efficient combination of inputs for a given level of output. It allows us to use industry data to examine how the combination of inputs is used in production and whether this input combination is different for programs that focus on online education.

An alternative to the production function model is a cost-benefit or cost-effectiveness analysis. This model is the models employed by other authors mentioned in this paper. Cost-benefit analysis measures the costs and benefits of alternatives. Cost-effectiveness analysis measures the economic costs required for a given level of benefits of a product or service. If the benefits—i.e., the educational outcomes--are the same we can compare the costs needed to achieve this same level of benefits for online education with face-to-face education and determine which is more cost-effective.

As noted in the prior section, this is not to say that there is definitive evidence that the benefits or educational outcomes of online education and face-to-face education are the same. This is only an assumption used to enable us to focus on the differences in costs. However, several studies (www.nosignificantdifference.org) have shown either "no significant difference" or evidence of superior results from online education.

Production Function Modeling of Online Education

For the purpose of this analysis we can model a university as producing education resulting from students in online and campus courses. Some universities offer only campus courses, some only online courses, while others offer both campus and online courses. The inputs of a university are the faculty, staff, networks, software, and buildings which are combined to offer campus or online courses.

Consider a university that offers only traditional, campus-based courses and programs. This university employs a collection of full-time and part-time faculty, and builds campus classrooms, offices, and dormitories in support of a student body. If the university decides to begin offering online education, do the university inputs change? Is there a different combination of inputs required to offer one or more programs online?

These choices are part of the history of online education in library and information science. In 1993, Syracuse University began offering online courses. In 1996 the University of Illinois at Urbana-Champaign began an online program in library and information science (LIS) education. This was followed by a number of institutions offering online courses in the 1990's and online programs in 2000. While some of these programs are nearly exclusively online none have completely abandoned their campus face-to-face based programs.

We can use data from the Association of Library and Information Science Educators Annual Reports (www.alise.org) to examine the production function of LIS education for

these institutions. Starting in 1996, ALISE requested that programs file information on "off campus" students. This can mean students taking courses online or at a location other than the student's home campus. The data is muddy in how programs interpret the definition of "off campus students." In the 1990's many programs offered face-to-face courses offsite courses and included these enrollments in this count. However, the significant growth of enrollments in 2002-2005 comes principally from online students which are also included in these counts. So as we compare the current data on "off campus" students we are, in large part, comparing online enrollments with campus enrollments.

A considerable amount of data cleanup was needed from the ALISE statistical books since data on some programs was suspect. Programs that reported "off campus" students were compared to the list of programs with online courses available at the American Library Association website (www.ala.org). Some programs that have thriving online or PhD programs reported to ALISE that there were no students in these programs. Only the 18 programs that offer online courses and the 22 programs that offer campus courses which we believe the data was reliable for were included in this analysis. Programs with students "off-campus" in 2004 include Missouri, Florida State, San Jose, Emporia, Wisc. – Milwaukee, Wayne State, Illinois, Drexel, Syracuse, Clarion, Tennessee, Arizona, Washington, Pittsburgh, Alabama, UNC Greensboro, Kentucky, Rhode Island.

Table 1: Online and Campus LIS Programs

number of institutions	avg percent of off-campus student FTE	total student FTE	off-campus MS student FTE	campus MS student FTE	undergrad FTE	PhD FTE	full time faculty	percentage of PT faculty	student FTE/ faculty FTE	student FTE/ staff FTE
18	35%	376	110	99	103	18	17	23%	15	42
22	0%	233	0	188	17	14	14	20%	14	45

Table 2: Online and Campus LIS Programs with PhDs

number of institutions with PhD programs	avg percent of off-campus student FTE	total student FTE	off-campus MS student FTE	campus MS student FTE	undergrad FTE	PhD FTE	full time faculty	percentage of PT faculty	student FTE/ faculty FTE	student FTE/ staff FTE
10	33%	510	134	95	168	33	23	23%	16	30
13	0%	259	0	198	16	24	16	20%	14	36

Table 3: Online Programs 2004 versus 1996

number of institutions	avg percent of off-campus student FTE	total student FTE	off-campus MS student FTE	campus MS student FTE	undergrad FTE	PhD FTE	full time faculty	percentage of PT faculty	student FTE/ faculty FTE	student FTE/ staff FTE
18	35%	376	110	99	103	18	17	23%	15	42
18	19%	238	40	182	29	14	11	21%	17	50

Tables 1-3 compare a variety of "input" and "output" metrics for institutions with and without online programs.

Table 1 compares the data for the 18 programs with online students and the 22 programs with only campus students for the fall of 2004. Programs with online students have, on average, more students including undergraduate and PhD students but fewer campus students. These programs also have more faculty and a slightly higher percentage of part-time faculty. There is no significant difference between the average student-to-faculty and the student-to-staff ratios.

Online programs have more "output" producing more students in all programs except campus-based students; but these programs do not employ a significantly different combination of "inputs" using more faculty and staff but at nearly the same ratio as small programs that only produce campus-based students. The exception to this is a slightly higher reliance on adjunct faculty for programs that offer online courses.

However, it is unclear if these differences in students, faculty, and staff are the result of programs having online courses or if these are differences in program type or size. Programs may be larger because they have PhD degrees.

Table 2 compares programs with a PhD degree with and without online students. Here, the data present an even larger gap between programs with online courses and those without. Programs with online students and a PhD are larger in student FTE, undergraduate FTE, PhD FTE, and full time faculty. While the ratio of some of the inputs—student to faculty, percent of part-time faculty—are relatively unchanged from Table 1 to Table 2, the student to staff FTE is lower for online programs showing a greater number of staff members are needed. While the outputs—total students, PhD students—are significantly greater, the number of staff members per student is increased. Overall the greater outputs require more inputs—faculty and staff.

Finally, Table 3 examines the programs with off-campus students and how these programs have changed over an 8 year period from 1996 to 2004. This is a time frame in which many of these programs started and increased their number of online course offerings. For the18 programs identified as having a significant online presence in 2004, the percentage of online students, number of students, number of online and undergraduate students, number of PhD's, and number of full time faculty have increased. During this same period, the number of campus students has declined for these programs while the percentage of part-time faculty has remained relatively unchanged. The ratio of students to faculty and students to staff have both decreased, indicating fewer students per faculty and staff member in 2004 than in 1996 for these programs. In this case, the recipe for the mix of inputs of faculty, staff, and part-time faculty has changed a bit. While the same mix of full time and part time faculty is employed, there is a greater number of faculty and staff per student needed for these larger programs that include online delivery.

Another way to look at the "production" of online students is that these programs have a larger and more diverse portfolio of students—campus and online masters, PhD, and

undergraduates. This diversified portfolio strategy enables schools to grow and to temper changes in enrollments in one program with other programs, decreasing the risk of dramatic fluctuations in student enrollments. The diversified portfolio theory of nonprofit finance developed by Kingma (1993) can be applied to this setting, whereby schools have a diverse set of programs to minimize overall enrollment swings.

We can use the results in Table 3 to estimate the faculty and staff needed to "grow' a program. Consider an institution that would like to grow and accommodate an additional 100 online students. An additional 100 students would require 5.9 faculty FTE (100/17); of this 77% would be full time faculty (4.5 FTE) and 23% would be part time faculty (1.4 FTE). While these 100 new students would require 2.4 FTE staff (100/42). Continued growth may change the mix of faculty and staff required for online education.

Of course this examination of the production function of LIS education does not necessarily mean that these programs offer the same "quality" of education to their online students as to their campus students. However, providing more faculty and staff resources per student, without a significant increased reliance on adjunct faculty to provide these online courses is consistent with our conclusions on the inputs required for learner-centered online education. Despite the ability of these programs to rely on more adjunct faculty and higher numbers of students per faculty and per staff member, this has not happened. Instead these programs have shown growth, an increase in the resources devoted to their students, and a more diverse portfolio of students.

Cost-Effectiveness Modeling of Online Education

Face-to-face and online education have some common cost elements. Regardless of the institution, both require faculty to teach and staff to advise students on their programs of study, careers, and financial aid. Although technology was a unique component of online education a decade ago, an institution's face-to-face courses now also require the use of the same learning management system, online library resources, email, and other tools.

Given the convergence of the use of technology in the classroom, there are fewer and fewer resources unique to campus or online courses. Resources unique to campus courses are the bricks-and-mortar expenses including buildings, utilities, and staff required to operate and maintain these facilities. We have already shown the increase in staff resources required for programs with online courses. Resources unique to online education are those required to maintain and increase the quality of offering education online. This includes instructional design staff to help a faculty member build and maintain a high-quality online course and technology staff to insure that it is available and accessible to students.

Table 4: Costs Unique to Format

Face-to-Face Courses	Online Courses
o Bricks and Mortar	o Instructional Designer
o Utilities and Maintenance	o Additional Tech Support

Responsibility centered management budgeting is being used at an increasing number of institutions. RCM brings with it a new and more transparent university budget modeling. This full-cost accounting budget system provides for cost estimates of space, utilities and maintenance. A search of RCM budgeting for universities retrieves space charges at several universities that can be used in our estimate. University space charges vary and depend on the local cost of construction and labor for maintenance.

Annual square footage university charges for insurance, utilities, network fees and maintenance range from $43 to $20 per sq ft a year. Estimates at other universities that are available on the web fall between these two. A search of construction costs at institutions that use RCM and publish their sq ft estimates are remarkably similar. Construction costs are typically estimated at $300 per square foot including furniture. If we assume construction lasts 30 years, $300 amortized over 30 years requires an annual payment of $26.65 per square foot. In total the annual sq ft cost of university space is estimated as $69.65 to $46.65.

In this paper we are comparing online and classroom education for graduate programs in LIS. Graduate campus-based education requires seminar style classrooms. Seminar classrooms require 100 square feet for the instructor and an average of 25 square feet per student. Therefore, a seminar classroom for 25 students requires 725 square feet and has an average annual cost of $33,821 ($46.65 per sq ft) to $50,496 ($69.65 per sq ft).

If a class is booked for a 3 hour period, a typical classroom can support 4 bookable courses a day for 5 days, or 20 bookable course periods a week. With 3 semesters—fall, spring, summer—a classroom can support 60 bookable courses a year. However, classroom utilization rates vary from 65 to 95 percent. Using an average, albeit high, classroom utilization rate of 80 percent a single classroom can support 54 bookable courses a year.

At 54 courses per classroom a year and an annual cost of $33,821 per classroom, the additional cost is $626 per course. At an annual cost of $50,496, the additional cost is $935 per course. This is only the cost of construction, maintenance, and utilities for a campus-based class and does not represent the full cost which would include the supporting faculty and staff.

This estimate also does not include the cost of the property the building is on. The annual cost of this real estate is the opportunity cost of the return on the investment in the property. A web search of property values yield estimates ranging from $1,000 per sq ft per year in Manhattan to $100 per sq ft per year in rural states. If the return on this investment is 8 percent per year, the opportunity cost of this is $80 to $8 annually. Using the most conservative estimate of cost of $46.65 per sq ft, the real estate cost increases the per sq ft estimate by 17% to 174%, increasing the additional per course annual cost from $626 to $732-$1,715 depending on the city the property is located in.

How does this compare to the additional costs of an online program? Quality online programs typically employ an instructional designer and technology support staff. These are staff employed solely for the online program, over and above the support needs of a campus program. 1.0 FTE of an instructional designer in support of online education

may be supported by 0.25 FTE of a technologist. Support for faculty and students is required in the online arena to help with designing and maintaining the course, online materials, and technical issues that arise. An instructional designer may cost $58,950 ($45,000 salary plus 0.31 fringe benefit) while a 0.25 FTE technology support staff may cost $18,012 (0.25 FTE at $55,000 salary plus 0.31 fringe). Using these salary estimates, the total cost of staff support is $76,962 per year.

How many online courses can this additional staff support? At Syracuse University this combination of staff support provides for 80 online courses a year. The average additional cost per course would be $962, in the middle of the estimates of the extra costs per campus course ($732-$1,715).

What are the factors that influence which cost estimate of campus delivery should be used? Campus classroom cost estimates are higher in high-cost urban areas where real-estate and construction costs are high. As a result the cost per classroom will be higher than the cost per online course offering.

Note that these cost estimates also do not include the students' financial or opportunity costs of time of participating in these programs. The cost per student of participation is significantly higher for campus based programs which require relocation to a university campus or frequent travel to class for education.

Conclusions

This paper has examined the literature and data on learner centered online education in library and information science. While it is clear that quality online education requires additional resources, and that LIS programs offering online courses are larger and employ additional resources, it is not clear whether quality campus-based or online education is more expensive. Programs that offer campus-based courses pay additional bricks and mortar expenses, while quality online courses require additional instructional design and technology staff support. It is possible to offer online programs without adequate staff support just as it is possible to offer face-to-face courses in deteriorating buildings that are not sufficiently maintained.

There are clear differences between LIS programs with and without online courses. LIS programs with online courses are, on average, larger in overall student FTE, undergraduate students, and doctoral students and, as a result, have more faculty and staff serving these students. Despite the ability to hire lower-cost part-time faculty to teach these online courses given that programs are not geographically constrained, there has been only a slight increase in reliance on adjuncts in LIS programs.

References

American Distance Education Consortium (ADEC). (2003). ADEC guiding principles for distance teaching and learning. Retrieved April 28, 2008, from http://www.adec.edu/admin/papers/distance-teaching_principles.html

Arnetta, Lenn. (n.d.). *Investigating the relationship between cost, reach, and richness in distance education.* Retrieved March 11, 2008, from http://www.westga.edu/~distance/ojdla/winter74/anetta74.htm

Association for the Study of Higher Education. (2006). Cost-efficiencies in online learning. *ASHE higher education report, 32*(1), 1-115. Retrieved March 20, 2008, from WilsonWeb Database.

Bartley, S. J., and Golek, J.H. (2004). Evaluating the cost effectiveness of online and face-to-face instruction. *Educations technology and society, 7*(4), 167-175. Retrieved March 11, 2008, from http://www.ifets.info/journals/7_4/16.pdf

Cavanaugh, J. (2005). Are online courses cannibalizing students from existing courses?. *Journal of asynchronous learning networks, 9*(3). Retrieved March 20, 2008, from http://www.sloan-c.org/publications/jaln/v9n3/v9n3_cavanaugh.asp

Hardy, D., & Robinson, R. (2004). UT TeleCampus cost study (2002-2003). Presentation delivered at Educause 2004. Retrieved March 20, 2008, from http://www.educause.edu/ir/library/powerpoint/EDU04103.pps

Keefe, S., & Kingma, B. (2006) An Analysis of the Virtual Classroom: Does Size Matter? Do Residencies Make a Difference? Should you Hire that Instructional Designer? *Journal of Education for Library and Information Science.* Vol. 47(2), 127-143.

Kingma, Bruce. (1993) Portfolio Theory and Nonprofit Financial Stability. *Nonprofit and Voluntary Sector Quarterly*, Vol. 22(2), 105-120.

McGorry, Susan. (2003). Measuring quality in online programs. *The Internet and higher education, 6*(2), 159-177. Retrieved March 20, 2008, from Science Direct Database.

Meyer, K.A., (2005). Planning for cost-efficiencies in online learning. *Planning for Higher Education, 33*(3), 19-30.

Moore, Janet. (2005). *The Sloan Consortium quality metrics and the five pillars.* Retrieved March 20, 2008, from http://www.sloan-c.org/publications/books/qualityframework.pdf

Rumble, Greville. (2001). The costs and costing of networked learning. *Journal of asynchronous learning networks, 5*(2). Retrieved March 20, 2008, from http://www.sloan-c.org/publications/jaln/v5n2/pdf/v5n2_rumble.pdf

Ruth, Stephen. (2006) Learning: A financial and strategic perspective. *Educause Quarterly, 1*, 22-30. Retrieved March 20, 2008, from http://www.educause.edu/ir/library/pdf/EQM0615.pdf

Ruth, S., Sammons, M., & Poulin, L. (2007) E-learning at a crossroads: What price quality?. *Educause Quarterly, 2*, 32-39. Retrieved March 11, 2008, from http://www.educause.edu/ir/library/pdf/EQM0724.pdf

Scarafiotti, Carol. (2004). Five important lessons about the cost of e-learning. *New directions for community colleges, 128,* 39-46. Retrieved March 20, 2008, from Wilsonweb Database.

Twigg, Carol. (2003). Improving quality and reducing cost. *Change*. Retrieved May 1, 2008, from Wilsonweb Database.

Web-based Information Science Education (WISE). (2006). *A model for quality online education in library and information science.* Retrieved March 11, 2008, from http://www.wiseeducation.org/images/principles.pdf