Technology
Costing
Methodology
Project

Technology Costing Methodology
Casebook 2001

Western Cooperative
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FIPSE

NCHEMS

Technology Costing Methodology Casebook 2001

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Foreword

The Technology Costing Methodology (TCM) Project is funded by the U.S. Department of Education's Fund for Improvement of Post Secondary Education (FIPSE) and is a joint endeavor between the Western Cooperative for Educational Telecommunications and the National Center for Higher Education Management Systems (NCHEMS).

The Technology Costing Methodology (TCM) project began in September of 1998. TCM's goal is to develop and pilot test an authoritative costing methodology (and related procedures) for calculating costs:

- Within an institution to determine if proposed instructional approaches that make heavy use of technology actually do serve to contain costs; and
- Across institutions, allowing data to be compared legitimately for different instructional or technological approaches, which will benefit legislatures, state-governing boards, state coordinating boards, and federal agencies.

The Technology Costing Methodology Project will have two published works at the completion of this project—the TCM Handbook and the TCM Casebook. The TCM Handbook outlines the policies and methodology utilized to calculate technology costs. The initial feedback indicates that the TCM Handbook will be a useful tool for institutions and system offices to analyze instructional technology costs for decision-making purposes.

The TCM Casebook is a compilation of implementation case studies from a selection of the TCM pilot projects. The TCM Casebook supplements the TCM Handbook. The TCM Casebook is the only public document of the pilot site results. We anticipate that the TCM Casebook will assist those new to the methodology understand how it can be implemented.

In addition to the TCM Handbook and Casebook, the TCM Project received additional funding from FIPSE and from the Andrew W. Mellon foundation to create a Microsoft Excel Spreadsheet that would capture the TCM Handbook procedures in an easy to use format. The result is the TCM Tabulator, located on WCET's Web site:
http://www.wiche.edu/telecom/Projects/tcm/index.htm

The TCM Project had a total of 17 pilots (please see appendix A for a complete list) of which 12 of the case studies are listed here. Not all the institutions were comfortable with publishing their written reports and as such are not included in this document. Other institutions worked on similar issues, and thus only one report per topic was chosen for inclusion in the Casebook. Two of the institutions (University of New Mexico and University of Utah—Utah Education Network) found that the TCM Model did not work for their particular issues, and choose instead to reflect upon the concept of TCM and the workability of the Handbook itself.

The Casebook could not have been produced without the hard work and dedication of the pilot site representatives. Each pilot site was asked to work through the TCM Handbook and then write a report on the outcomes of their endeavors. Thank you to Carole Hayes, Florida State

Introduction

In the process of refining the procedures described in the TCM Handbook, 17 institutions were gracious enough to volunteer as pilot test sites. While the primary purpose of the pilot test activity was to refine the procedures contained in the Handbook, the tests also yielded data of interest in their own right. While the samples are too small to provide definitive answers to key management questions, the preliminary findings are tantalizing. My interpretation of the results suggests that:

- Technology-mediated delivery is more expensive than face-to-face instruction, at least within the parameters of course enrollments and methods tested. There were no instances in which this finding was not true. Research and modeling in other projects has found that **scale matters**—there are conditions under which technology-mediated delivery is less expensive than traditional classroom instruction. Continued efforts must be made to identify those conditions.

- Cost differentials arise for different reasons depending on the method of delivery:

  - ❖ For satellite and television-based delivery, the additional costs can be traced to communications costs.
  - ❖ For online courses, cost differentials arise out of the need to invest in course development activities to make courses adaptable to Web-based delivery.

  As an aside, I would note that relatively small course development costs that are frequently found suggest many institutions are putting classroom-based courses on the Web rather than fundamentally reengineering courses to incorporate different pedagogies that have the possibility of making truly effective use of the available technology.

- There is a tradeoff between planning and development costs (see the Washington State University example, Case 12). Time spent in careful planning and design is more than offset by a reduction in development costs. Think before you leap!

- Course completion rates are affected by "mentoring" activities and strategies. Cost effective incorporation of strategies for accomplishing this particular function is critical to successful online courses (see the Florida State University example, case 2).

- Receive-site costs are real and cannot be assumed to be "free" to provider institutions. Costs borne by others can dramatically affect cost comparisons—and ultimately decisions about the most efficient ways of delivering instruction.

- Most importantly, paraphrasing a 1992 admonition—"it's the people, stupid." Inclusion of technology and other capital costs in the calculation is not the difference maker. These costs pale in comparison to the people costs in spite of the large sticker prices associated with acquisition of the capital items. In the end, the determinants of comparative costs are:

❖ The amount, type, and costs of the human assets utilized in the process.

❖ The unique talents of different kinds of employees and take advantage of the possibilities of differentiated staffing and allow increased scale to be achieved in a responsible manner.

The key decisions are people decisions, **not** technology decisions. Technological capacity presents us with the occasion, but not the reason, to rethink the ways in which students are aided in their acquisition of new knowledge and skills.

Dennis Jones, NCHEMS

Case 1:Eastern New Mexico University
The Cost of ITV

Context
Eastern New Mexico University, located in Portales, New Mexico with branch campuses in Roswell and Ruidoso, New Mexico, is a regionally accredited state institution and the third largest in the state of New Mexico. ENMU-Portales, (henceforth referred to as Eastern or ENMU) the campus that was used for this study, has a student population of approximately 3,600 students.

Given the widely distributed, relatively rural population Eastern serves, distance education is of considerable importance to the institution; so important, in fact, that it is specifically listed in the university's mission statement. Roughly one of every seven ENMU students is participating in classes is doing so via distance education. While the institution offers classes on-site in various communities and via the World Wide Web, the bulk of its distance education is done by way of Interactive Instructional Television (ITV). ENMU ITV courses are available in 17 different communities in Eastern New Mexico, spanning a distance of some 250 miles. Via distance education, ENMU offers over 135 upper division and graduate courses annually, leading to the completion of eight Bachelor's and Master's degrees.

Issue
The Interactive Instructional Television system operates under the authority of Eastern's Vice-President for Academic Affairs and functions with the cooperation of Extended Learning, the university Television Station, the College of Business, the College of Education and Technology, and the College of Liberal Arts and Sciences. The scheduling and rotation of each class is determined by the chair of the department and the dean of that college. Collectively, the deans collaborate to determine the final ITV schedule and to make use of the four ITV presentation rooms.

Eastern faculty are required by contract to teach ITV courses as needed, and many tools are placed at their disposal to help overcome the inherent difficulties involved with teaching at a distance. All ITV classes are taught live in regular campus classrooms that have been augmented (ITV presentation rooms) to include technologies necessary to broadcast the classes; on-campus students take the class simultaneously with distance learning students. (This made it difficult to determine the difference in cost between face-to-face and technology-delivered courses; each technologically delivered course has a face-to-face component involved.) Faculty have access in these presentation rooms to a playback VCR, Internet-equipped computer, "ELMO" document camera, a telestrator, and preview and actual broadcast monitors. Each of these classrooms has two small, remote-controlled cameras, one at the back of the classroom facing the faculty member and another at the front of the classroom facing the on-campus students. In addition to being broadcast to the remote sites, images from this equipment can be easily viewed by students in the classroom through large monitors.

The successful use of this technology requires a good deal of training and skill; and even with the best of both, the operation of this equipment can be a distraction to the actual teaching of the

class. To alleviate this inevitable complication and leave the faculty member free to teach, student operators, primarily broadcast journalism majors who have been trained to operate the equipment, handle the "production" portion of the class. These individuals change the camera angles, camera shots, zoom, pan, and control the switching among the document camera, telestrator, computer, and TV cameras. Additionally, they are available to assist faculty with faxing of materials from the classroom and other administrative tasks.

Eastern has two different types of ITV receive sites: full-service, staffed received sites and unstaffed receive sites. A vast majority of the institution's distance learning students takes courses at full-service, staffed sites. Trained ITV facilitators staff each of these sites. These individuals supervise the individual site and assist faculty and students with the mechanics of taking the course (proctoring exams, faxing, duplicating, mailing, e-mailing, and busing of course material, tests and homework). Additionally, ITV facilitators provide an institutional presence in receive site communities; they assist with program marketing and student registration.

Students taking courses at these full-service sites participate with two-way audio, one-way video (i.e., students can see the professor and on-campus students, but not vice versa. However, students at remote sites can talk with faculty and students in the presentation room and at other sites.)

Eastern joined with Clovis Community College and Eastern New Mexico Rural Telephone Cooperative to bring education classes into rural Northeastern New Mexico. These sites are located in public school facilities and do not have ITV facilitators to assist with course mechanics. Hence, students taking courses at these unstaffed sites have to take responsibility for course mechanics. One advantage of the unstaffed sites is the use of two-way audio, two-way video so faculty and fellow students can see the students at the unstaffed sites.

Methodology
Information for the cost of these courses was determined by polling individuals involved with the program; each person was asked to estimate the annual percentage of their time that was spent working on ITV; this percentage was then multiplied against their actual annual salary (including benefits) for the 1999-2000 fiscal year. (Given that the institution's fiscal year ends on June 30, the salary expenditures for the remaining weeks until that date were estimated based on past earnings.) This figure was then divided by the number of ITV classes taught during the past year. The resulting amount was recorded as the annual cost of the class for that individual's time. These costs were then added and recorded in appropriate areas on the chart.

Non-personnel related costs, such as "Duplication of Materials" and "Travel" were obtained by actual recorded figures, and were divided by the number of ITV classes taught during the year. These costs were then added and recorded appropriately on the chart.

Summary
Several major difficulties were encountered in performing this costing study. As mentioned previously, it was difficult to accurately determine the cost associated with technology-delivered courses given that they are also taught on-campus in a face-to-face setting. Along the same lines,

difficulty was encountered in determining whether the costs for face-to-face courses should be added incrementally to the technology-delivered courses, which in some cases, they were.

This pilot provides a good starting point for determining the costs of technology-based instruction. The study raised good questions and guided a thorough examination of the policies and practices of not only the distance education program but of the institution as well.

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Case 2:Florida State University
　　　An Analysis of Costs Related to Mentor Recruiting, Training, and Support for
　　　Student Cohorts in 2+2 Distance Learning Initiative Courses, Year 01

Context
The Florida State University (FLS) has focused efforts on developing entire distance learning
programs. President Sandy D'Alemberte visited the Open University of Great Britain (OU) in
1996 and was inspired by the school's 30 years of experience and success in serving distant
students. The two institutions collaborated for a period of 2-3 years, each learning from the
other. The major lessons brought to FSU from the OU were the value of team-developed
courseware to enable asynchronous teaching and learning and the role of the tutor in providing
student support. The team approach is designed to ensure that the user, the student, is considered
in every decision about curriculum development and delivery. The tutor, or in FSU's case the
mentor, provides an extension of the institution and a personal presence in a high tech, online
delivery mode. The programs under development at FSU that were opened for enrollment in fall
1999 are the bachelor's degree completion programs in Information Studies, Computer Science,
and Software Engineering. These are dubbed "2+2 Distance Learning Initiative" because
students are all upper division, at least junior level, and partnership with Florida's community
colleges provides a base of student support, advertising, and seamless entry into upper division.
Florida's State University System and Community College System are articulated by legislation
that provides for acceptance to any state university for a student who has earned the Florida
Associate in Arts degree.

During the first year of program development, the Florida legislature allocated funds specifically
for the initial development of the 2+2 Distance Learning Initiative courses. Subsequently,
funding has been recurring to the university with allocations to the Office for Distributed and
Distance Learning (ODDL) to support academic units in development and delivery of materials-
based, mentor-supported courses and degrees. Not all of FSU's distances learning courses are
part of the 2+2 DL Initiative. However, this report focuses only on these degree completion
programs and, specifically, upon the mentor support aspect.

Course development for the first term of three courses began in 1997.   In 1998, the position of
Coordinator of Implementation was established. The function of the Coordinator was to develop
relationships with community colleges, develop student support mechanisms that would be as
much in line with existing processes on-campus as possible, and to develop the mentor profile
along with mechanisms for recruiting, hiring, training, supporting, providing continuing
education, and evaluating them. The latter process is what was analyzed and reported. The time
period considered is the three terms for which courses have been offered, enrolled in, and
supported by mentors. These terms are fall 1999, spring, and summer 2000.

A special feature of the courses developed, as part of the 2+2 Distance Learning Initiative is that
courseware is developed for use, at the instructor's discretion, along a continuum that begins
with traditional face-to-face instruction to the other extreme of completely asynchronous
delivery. All mentor-supported courses also have their on-campus, traditional offering. There
are 18 community colleges with which FSU has partnership agreements that provide students

with information, library services, and proctored secure testing. FSU pays the community college a fee, which is assessed to the student. So, there is variation in student tuition and fees depending on where that student is, on an FSU campus or supported at a distance. Following registration, the ODDL staff divides students into cohorts that are assigned to mentors who have been selected by teaching faculty and trained during a three-day Mentor Training Workshop held on the FSU campus. Lead faculty (faculty of record) can be assigned 8-10 mentors who can each handle student cohorts of 15-25.

Issue

The TCM project was intriguing because during the first year of the implementation of mentor support, staff was evaluating services, communications, student performance, etc. Getting a handle on costs was just another challenge. Participation in the TCM project has forced a careful look at this one aspect of the program. For the time being, our learning curve is so steep that looking carefully at this one, unique aspect of our model is quite challenging and a good beginning.

Methodology

Actual participation in the project took relatively little time, approximately 16-20 hours devoted to reading the handbook, discussing the project, identifying factors as exhaustively as possible, gathering data relevant to the factors, compiling and then analyzing them. The template was extremely helpful. It is important to remember that this is the first year of an innovative program and includes a total of only nine courses in two departments. These are Computer Science and Information Studies. The model of program development provides for a one to three course "roll out" per term. Therefore, it will take four years for all courses in any one program to be entirely developed.

Outcomes

What the data show for this first year is that sections supported by mentors generated 460 enrollments resulting in 1,498 Student Contact Hours (SCH). This translates to 37.5 FTE (Full Time Equivalents). During the past legislative session, all FTE generated by distance learning were funded by the legislature. This was unanticipated because Florida's institutions have enrollment caps. Using current figures, 37.5 FTE will result in approximately $170,000 in state funding. The entire cost of mentor support was found to be $117,600 ($256/student and $78/SCH). Mentor support cost was based on the cost of recruitment, training, travel to FSU for three days, the salary and benefits for a full-time Mentor Coordinator, materials developed for mentors, and their compensation per course per term. The FTE figure is stated conservatively and the expenses were recorded liberally. What this seems to indicate is that, given the scalability of the mentor-supported model, the costs are justified.   We anticipate that enrollments will continue to increase, the numbers of trained and certified mentors will increase, and more courses are being offered each term. Mentor-supported courses resulted in a completion rate of 89 percent for the fall 1999 term and 86 percent for the spring 2000 term. These numbers are remarkably high for distance learning or any independent study model. Surveys of students and follow-up telephone interviews frequently highlight the value added of a mentor.

In Florida, students may fail a course and reenroll in it for a second try at regular tuition rates. The third enrollment is entirely at the student's expense with no state subsidy. This means that the legislature funds some courses twice for the same institution and/or same student. If the higher completion rates can indeed be attributed in part to mentor support, it is also a value to the state to encourage this practice.

Summary
An ongoing concern while working through the method was that this case study does not provide enough information to put it in perspective. The issues of scalability and FTE reimbursement are large in managerial decision-making. It is important to remember just how new this particular program is, which means that care must be taken by both supporters and detractors in analyzing its impacts. Studies such as this TCM project are extremely valuable in helping institutions that are plowing new ground to assess the results of this work. A series of questions in the template forced reflection on how different the results could be at a later date. The learning curve is extremely steep and we might assume that the depth and breadth of our learning on the impact and cost of mentor support would continue to grow for at least three years.

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Case 3:Georgia Board of Regents
　　　　　　　A Cost Analysis of the French Foreign Language Collaborative's Online WebCT
　　　　　　　Course

Context

A decline in student enrollment in French language courses is affecting programs on a number of campuses within the University System of Georgia. While declines in enrollment within lower-level French courses are moderated by the fact that many Arts and Sciences programs of study require them, small programs must often cross-list upper and graduate level French courses. Thus, the decline in students and course offerings not only affects undergraduate programs, but also graduate programs and professional development programs for area teachers. One response to the ebbing enrollment is to decrease the number of upper level offerings. Doing this however, provides an additional hurdle to those studying language and for some students, can delay graduation. Another option—terminating programs—further restricts access to needed foreign language study, limits the variety of program offerings available to students at state universities, and ultimately compels more regional students to migrate to major universities offering full arrays of programs.

Issue

Four institutions—North Georgia College and State University, Valdosta State University, Georgia Southwestern University and Georgia College and State University—have taken a different approach by forming a French Foreign Language Collaborative. The focus of the collaborative is to enable regional state universities to share courses and scarce faculty expertise to make upper level French offerings available to all participating institutions on regular intervals. The foreign language initiative focuses on exploring ways in which technology can be employed to support the development and delivery of upper level and graduate French language courses among the collaborative members.

An initial online course, French Intermediate Grammar and Composition l has been created by a faculty team representing several institutions. A single faculty member has taught the course to students from the participating institutions. Plans are underway to establish more courses that may be developed and delivered in this collaborative approach.

Methodology

The report provides a cost analysis of the development and delivery of the WebCT on-line course, Intermediate French Grammar and Composition I, in comparison to the cost for delivering a traditional classroom Intermediate French course at four separate locations.

The cost analysis also used the French course as a unit of measure; therefore, the analysis did not deal with different course levels and disciplines. In addition, following the TCM Handbook guidelines which specify that only direct cost be utilized for course cost, the analysis did not include indirect cost in the following areas: instruction, academic support, student services, institutional support, plant operations and maintenance.

The French course is one of a number of courses that are supported by the Desktop Learning Project, a special funding initiative of the Board of Regents. The initiative is pioneering a comprehensive system approach to the development and delivery of quality online courses. The primary elements of the comprehensive approach center around three areas—course development, support services, and technology infrastructure.

Course development activities divide into two primary strategies—the production model and the facilitated support model. The production model is a team approach involving faculty experts, instructional designers, and programmers. In this model, the team works to design and produce the course. Funds are allocated to pay for faculty reassigned time, training of team members and programming of the course. The model adheres to standards for online teaching and technology. The System hosts and supports use of the course. This is the model that was used for the French course. The facilitated support model provides training regarding developing and delivering online courses, as well as course hosting and help desk support, but does not provide instructional designers or programming staff. Design and programming are the responsibility of the faculty member.

Support services are those services that must be addressed to ensure that the student who participates in the courses at a distance is provided with comparable services to the student who participates on campus. These include help desk support for students having difficulty getting into their course materials online, behind the scenes 7x24 technical support for the equipment and software, and coordinated access for specialized support such as test administration and book purchasing. The French course benefits from these services.

While many of the institutions provide faculty with access to course development tools, not all campuses provide an infrastructure accompanied by personnel support for a production environment. To ensure that institutions not able to meet technical standards regarding production services are still able to develop and deliver on-line courses, the System has established a course hosting option, which may be used for such services. The System infrastructure includes a WebCT server, a video server, and video production and archiving services. All have redundancy and back-up provisions in place. The French course is hosted on the System server.

All of the above elements depend upon the existing System supported telecommunications network called PeachNet. PeachNet facilitates sharing, exchange of data, and general access for all 34 institutions to one another and to the Internet.

WebCT French Course Costs
The total development and delivery cost for the WebCT French course is estimated to be $57,914. Development costs account for the lion's share of that, approximately $43,767. Included in that figure is $11,000 that The University System of Georgia specifically allocated for the development of the Web-based course by the Foreign Language Collaborative, $2,397 contributed by the participating institutions and another $30,370 expended by the Board of Regents through its Advanced Learning Technologies Unit. Based on discussions with the members of the collaborative, an estimated useful life of four years has been assigned to the WebCT French course. Therefore, one-fourth of the development cost, or $10,942, would be

charged off each school year. The amortization charge for each semester would be $3,647, assuming the course is taught each semester of the twelve-month school year. For spring semester 2000, $3,647 was charged to the delivery cost of the WebCT French course.

Delivery costs for the Web-based French course for spring semester 2000 are calculated to be $14,147. Of this total, $7,956 was expended for personal services, $75 was expended for office and instructional supplies, $2,469 was expended for communication cost, and $3,647 was expended for the amortization of the courseware development cost. The communication cost of $2,469 was based on the use of the WebCT and video servers, maintenance cost of servers, personnel cost, license cost, and student help desk cost. The servers were estimated to have a useful life of three years for computing an annual cost. The annual communication cost was divided by the annual usage hours to arrive at the hourly rate charged to the course based on the hours of student course usage. It appears that for a cost of this nature, it would be best to divide the annual cost by the total users to arrive at an annual user cost for charging out based on usage during the year. Also included in the communication cost is the PeachNet cost, which was based on an annual cost divided by the number of users and then allocated out based on one-third cost for the semester. Facility space and computer lab equipment was not included in the course cost because the students did their class work away from the campuses.

Eighteen students registered to take the Web-based French course, which is a cost per student of $786 for three hours of semester credit. Only nine students completed the course; however, in computing the cost per student for comparison purposes, all eighteen students were used.

Traditional On-Campus French Course Costs
A cost schedule was created for traditional on-campus delivery of the French course to compare all costs associated with the two delivery methods. Developmental costs for the traditional course delivery were not computed in accordance with the TCM guidelines that suggest they should only be considered where specific funds are allocated for that purpose. The inclusion of developmental costs for traditional courses is an issue that should perhaps be reconsidered in the guidelines. The regular classroom French course was estimated to cost $9,377. Included in the cost was $1,135 for use of facilities and equipment.

Outcomes
The total cost of the traditional on-campus French course is estimated to be $4,770 less than that for the WebCT French course

Although the total cost of delivering the WebCT French Course is higher overall than the cost for traditional course delivery, the cost per student based upon actual enrollments is much less ($1,089 per student based on an enrollment of 18 students versus $1,875 per student based on five student enrollments.) This confirms the original goal of establishing the collaborative program since, clearly, if each institution were required to offer the traditional course rather than the WebCT course, overall costs to the **University System as a whole** would be greater.

The results as indicated above would be different depending upon overall enrollments and probably would not be applicable to institutions with more robust enrollment patterns for all courses. In other words, it may work in this specific example only because the participating

institutions do not have large enrollments in French courses.   If a single institution were faced with the costs for both delivery methods as indicated, they might determine it to be more advantageous to run a traditional course rather than develop a Web-based course.

Summary
Not showing development costs for traditional courses may be a flaw in the model.   However, as mediated course delivery becomes more commonplace, developmental costs may become less significant as a factor.

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Case 4:Northwestern State University (Louisiana)
Comparison of the Costs Associated with Compressed Video, Internet, and Face-to-Face Instruction

Context
Northwestern State University, a member of the University of Louisiana System, serves the central and northwest portion of the State of Louisiana. Created in 1884 by State Legislative Act 1, as the Louisiana State Normal School, the institution became Louisiana State Normal College in 1921, and Northwestern State College of Louisiana in 1944. The school achieved university status in 1970 when the name became Northwestern State University of Louisiana.

The University's enrollment includes students from over 40 states and 20 foreign countries. Located in Natchitoches, the oldest settlement in the Louisiana Purchase Territory, the 916-acre campus is located 70 miles from Shreveport, Louisiana. Northwestern Sate University serves the central and northwest section of the state with a wide range of academic, cultural, and athletic programs that enhance the quality of life in the area and throughout the state and region.

Northwestern is accredited by the Southern Association of Colleges and Schools and offers a wide range of undergraduate and graduate programs through its six colleges and thirteen academic units.

Issue
Northwestern applied the Technology Costing Methodology to compare the costs associated with compressed video, Internet, and face-to-face instruction. Northwestern has been a leader in the electronic instruction arena, and by the spring of 2001, will provide nearly 100 electronic courses. With an increasing demand by students, it is understood that the use of electronic course delivery will continue to grow among the academic areas. The desire to provide cost-effective solutions to instruction that will enable Northwestern to meet student needs is the driving force behind the comparison. The primary players associated with the need to conduct the cost analysis are the students. The primary players associated with data collection include persons associated with electronic learning, telecommunications, systems administration, information systems, budget units, faculty, and university administration.

Methodology
The methodology selected was a holistic approach in which teams of individuals gathered data respective to their specific areas. The data that was collected reflected documented expenditures and estimated costs associated with the delivery of each electronic mode. Cost expenditure formulas were formulated in order to calculate costs per each course. The collection format was identified as being the best procedure to gather data that would best identify the expenditures and related costs associated with each delivery mode.

Outcomes

As anticipated prior to the collection of data expenditures, the costs related with the delivery of Internet courses exceeded the costs compared to the delivery of the compressed video format. This is attributed in part to the number of students allowed to enroll in each course. However, when compared to the face-to-face traditional method, the costs associated with the electronic modes are less than that of the selected traditional courses. Thus far, no decisions have been made to alter the delivery selections and methods by which electronic courses will be delivered. However, due to the increasing demand by students who learn at a distance, trends indicate the need to increase the number of courses and degree programs being delivered electronically primarily through the Internet. There has also been an increase in the number of courses being delivered by compressed video through Northwestern's local area network in an effort to meet the demands of the satellite campuses.

Summary

The Technology Costing Model has been effective in that Northwestern has been able to identify collection procedures that document the costs associated with each delivery mode. In addition, by analyzing the expenditures associated with electronic and face-to-face delivery of instruction, a baseline has been established that will be used for future cost comparisons.

The Technology Costing Model is beneficial in that it allows participants to gain perspective about the costs associated with the electronic delivery modes and when making comparisons to the face-to-face format. The formulas by which you make calculations are critical in order to ensure a successful cost analysis. A team approach is also suggested.

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Case 5:San Juan College (New Mexico)
Receive Site Costs Are Real

Context
San Juan College (SJC), located in Farmington, New Mexico, is a comprehensive community college dedicated to providing quality learning opportunities for students and the community. Partnerships with four-year universities are critical in providing programs and courseware beyond the associate degree level. Historically, these courses were delivered to students with in the Four Corners region in a traditional mode, the instructor driving to Farmington to teach the course. Technology has now enhanced the delivery of field-based programs and courses are offered through satellite and video conferencing methodologies.

Issue
San Juan College will explore the costing of being a "receive site" for upper-level university courses being delivered by two-way interactive or video conferencing delivery methods. The decision to focus on two-way interactive/video conferencing over satellite delivered courses was due, mainly, to the increased popularity of these types of courses.

Student learners are demanding the delivery technology to be more interactive than the satellite video and telephone connection. Also, many faculty are more apt to teach with video conferencing technology since it mirrors face-to-face technology.

San Juan College's investment to the delivery of satellite courses was very minor and mainly centered on technical assistance and personal costs, rather than equipment. The sending university usually provides the equipment necessary for receiving the broadcast. In deciding to provide two-way interactive/video conferencing it was immediately obvious that the costs would include dedicated equipment and facilities space, along with associated telecommunication costs and technical support personnel.

Currently, San Juan College has a dedicated classroom for video conferencing. This room has undergone some remodeling to fix some sound proofing issues that would have been done whether the classroom would be for regular use or video conferencing. The new equipment purchased included:

- Polycom View Station V.35 and TV from Vie Tech for approximately $13,000,
- replaced equipment costing $30,000,
- VCR at $450,
- Document camera at $1,600,
- Laptop computer at $2,300,
- Yearly maintenance at $2,300,
- Telecommunications costs include:
    - Switched TI at $2,000 per month,
    - One time installation cost of $1,000,
    - Line drivers at $1,000 to extend the TI to the video conference classroom,
    - Bridging services depending on the connection, averaging at $1,200 per year,

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- Associated long-distance telephone charges for scheduling and diagnostics that averages out to $1,000 per year.

What makes this more interesting is that with the recent state—wide MCI contract SJC has signed, most of these charges are being subsidized through MCI. They will be included as cost borne by others.

Even though end-user training is included on the cost of the equipment, our technicians have learned this basically through cooperative efforts with University of New Mexico, New Mexico Highlands, and New Mexico State University. Others are encouraged to plan for at least a three to five day technical training workshop from the manufactures of the equipment. These costs run $1,500 - $2,000 but are worth the expense, especially in time and continued happiness of technical support personnel.

Historically, each university requests a "site coordinator" from the receive site to handle the administration of the course. These duties usually include scheduling rooms, point of contact for students, and the repository of materials. With two-way interactive/video conferencing, the complexity of the responsibilities has grown tremendously with the addition of technical problems to the other duties. For SJC this has become a concern. The Media Services staff (the former AV folks) was designated as the site coordinators for two-way interactive/video conferencing. The thinking behind this was that we were not going to be offering as many classes and it would be good cross training since they were already responsible for satellite delivered courses. Quickly, it was realized that this was time intensive in dealing with students and the technical requirements. Any institution looking at video conferencing should designate at least a one-half time administration/technical/student services position up front.

Methodology
In many discussions surrounding our costing project, it was soon clear that the methodology to answer the educational and managerial questions being raised were going to be the deciding factor in how we approached our project. The handbook was of great help in defining what is a cost and how we would approach the data collection to determine the cost. Some confusion was experienced in deciding the process of tabulating by course, by semester, or year. Since we already "do" two-way interactive/video conferencing, the questions for us to answer are how much does it really cost per year and could we easily capture the data from our fiscal structure. Because we knew it was important for our institution to respond to our students needs, funds for equipment were just found. It was and is the technical support and monthly communications charges to sustain the initiative that has been our problem. We found that many of the charges were spread over various departments so it was hard for us at any point to say our commitment to two-way interactive/video conferencing has been x amount. Because of the reasons stated above, we have tabulated our data as year costs.

Based on above assumptions and the descriptions in the handbook, it was decided that our **unit of analysis would be based on the delivery method** as opposed to the course unit. From our experience, the costs associated with the alternative delivery method are costs of support and infrastructure. These are very real costs that an institution should be aware of when thinking about multiple delivery methods. Too often the costs associated with direct instruction are given

greater emphasis when in reality the support costs are what can make or break a successful delivery experience.

Outcomes
We finally have a total cost of creating a two-way interactive/video conference room and ongoing costs of support have been defined. Going through the process allowed us to actually put cost numbers to specific functionality. A sidelight is that we have a greater appreciation for what goes on in a two-way interactive/video conference course and how dedicated students are. The data from other schools will allow us to make better and more informed decisions when it comes to expanding our scope of courses in a distance education arena.

Summary
The Handbook is very black and white when it comes to costs associated with direct Instruction (1.0) and those with Academic Support (4.0) and Student Services (5.0 and 5.9). What was interesting was that if the academic support issues were not addressed then direct instruction usually did not occur using technology. In other words, if the connect was not made correctly or if technical problems occurred then students at the receive site usually did not benefit from direct instruction. When this happens, secondary measures need to be implemented and that involves the support personnel who will contact the send institution, be the point of contact if a tape will be sent, and notify students when the tape will be in. It was found that we don't figure these hours into the cost equation very well.

The unused space question is very misleading in its results. It was decided to focus on the hours the room is typically scheduled for courses. Because the courses are usually completion courses for bachelor and master degrees many of the people who would attend are working people. The hours of capacity were figured from 5:00 to 10:00 p.m. Monday through Thursday. The two-way interactive/video conference room is used for meetings, interviews, seminars, training, and also community business use the other hours.

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Case 6: The University of Montana--Missoula
Delivering an Undergraduate Course to a Local Community College
Delivering a Course Online and On-Campus

Context

The University of Montana-Missoula is a comprehensive university offering both undergraduate and graduate programs. For the past several years, off-campus students have been provided access to field-based and/or online programs at both undergraduate and graduate levels through the Center for Continuing Education working in close collaboration with the academic units. These programs initially were self-supporting, however, in the fall of 1998, they were converted to state support. This conversion stabilized programs, lowered student tuition, and provided institutional commitment.

Following is a list of these programs:

- Masters of Education in Educational Leadership (online delivery)
- Masters of Curriculum Studies (Compressed interactive video, online and face-to-face delivery)
- Masters of Business Administration (Compressed interactive video, online and face-to-face delivery)
- MBA Pre-requisite Foundation Courses (online delivery)
- External Pharm D (online delivery)
- Bachelor of Arts in Liberal Studies (Compressed interactive video, online and face-to-face delivery)
- Library Media Endorsement (online delivery)
- Certificate Program for Educators: Computers in the Classroom (online delivery)
- GIS Certificate Program (online delivery)
- Wilderness Management Distance Education Certificate Program (online and Correspondence delivery)

Off-campus programs at The University of Montana are administered jointly between the academic departments and Continuing Education. In the fall of 1998, all off-campus degree programs were converted from self-support to state-support, thereby becoming FTE-generating.

The External Degree Programs are funded through two budgets: a state-appropriated budget pays for instructional and coordination salaries as well as some general operational expenses, and a designated budget, which is funded through Distributed Learning Fees charged per credit, pays for all associated costs.

Because the budget that covers the distributed learning expenses is not actually saving $15/Student Credit Hour for the courses not delivered on campus, this budget will never have a projected positive balance.

Issue
Two projects were selected to which to apply the Technology Costing Methodology: C&I 480 *Collection Development, the Curriculum and Technology* which is part of the Library Media Endorsement program; and ENLT 320, *Shakespeare*, which is part of the BA in Liberal Studies program.

In regards to the history, overview, major players and other contexts relating to C & I 480, the following information is being submitted:

C&I 480, *Collection Development, the Curriculum, and Technology*, was converted to an Internet-based format in Fall 1999 as the first phase of moving the entire Library Media Endorsement Program to online delivery. eCollege, the company hosting UM's portal for Internet courses through umtonline, provided the software for the course. Faculty in the School of Education collaborated with staff at Continuing Education and at eCollege to place the course online.

Course development:
The course instructor worked with eCollege staff to develop the course content. eCollege was paid $3,000 for development costs. Continuing Education provided the funds for development from a state-appropriated budget, then staffed and funded all outreach efforts through a combination of state and self-support funds.

Course logistics:
Continuing Education staff assisted students with admissions, registration, and payment processes. Students had online access to the university bookstore and library. eCollege provided technical support. The instructor was responsible for all academic components of course delivery.

Course funding:
Students paid tuition plus a distributed learning fee. A portion of the distributed learning fee was used to pay eCollege's $40/credit/student fee. The remainder of the fee went to Continuing Education's umtonline account to cover staff time and resources (portal fee of $25/student). Staff was also paid for their time on the course through a state-appropriated account. The instructor taught the course as part of load.

In regards to the history, overview, major players and other contexts relating to ENLT 320, the following information is being submitted:

ENLT 320, *Shakespeare,* was taught at Flathead Valley Community College (FVCC) in Kalispell, MT as part of the BA in Liberal Studies. Students complete Lower Division courses through FVCC and earn UM credit for Upper Division courses taught on the FVCC campus.

This jointly-administered program is funded entirely by UM. FVCC provides classrooms, library services, and a staff person to serve as an adviser and liaison between students and UM; all of these services are paid for by UM, with funds generated from the courses' distributed

learning fees. Faculty and Continuing Education staff is paid through a state-appropriated account.

Courses are taught in the evenings and on weekends, either by FVCC instructors or UM faculty who drive to Kalispell (115 miles one-way). The Liberal Studies department is responsible for hiring and supervising faculty and for more advanced advising issues. The "single point of contact" staff member at FVCC is responsible for advising prospective and enrolled students on academic and administrative issues (assisting them with planning their courses, sorting out transfer credits, obtaining financial aid, paying bills on time, etc.). Continuing Education staff has administrative duties such as paying faculty, maintaining budgets, managing course logistics, promoting the program, and assisting with difficult student issues.

Methodology
For both programs, data were calculated by individual course.

Outcomes
The data indicate that for C&I 480 the online course costs $100 more per credit hour than the on-campus course. For the course ENLT 320, the data indicate that the course at FVCC costs nearly six times as much as an on-campus course.

Summary
This method of analysis was not particularly useful to us in analyzing the cost-effectiveness of our off-campus courses because it did not factor in two things: (1) how much revenue is generated by the off-campus enrollments (while expensive, these courses still generate funds for the university); and (2) the educational access these courses provide to students in remote locations. Continuing Education's mission, as well as the mission of the university, is to provide education to Montanans—these courses are for those students who would otherwise be beyond our reach.

It may be more cost-effective to deliver one course to 1,000 students in a massive lecture hall, but that is not in keeping with the spirit of the institution. As long as we maintain a balanced budget, we want to deliver the highest quality of education possible to as wide-ranging an audience as possible.

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Case 7: University of New Mexico
Indirect Costs of Technology-Based Instruction

Context
The University of New Mexico (UNM) is the largest institution of higher education in the state, with total enrollments exceeding 30,000 students. In addition to the main campus in Albuquerque, UNM includes a health science center, four branch campuses, and two graduate centers. Each year, UNM delivers several thousand credit hours by technological means, including instructional television (satellite, ITFS, and cable), video-conferences, and most recently, Web-based courses.

Problem Description
At UNM, we have delivered courses by instructional television (ITV) for many years, and we have considerable experience analyzing the direct costs of this particular mode of delivery. Although we have less experience with videoconference and Web courses because of their recency, we do not regard analysis of the direct costs of these technologies to be particularly problematic once the critical assumptions are specified. (More discussion of the importance of assumptions is included below.) What we do regard as problematic is analysis of the *indirect* costs of delivering instruction by technological means. Such indirect costs include the costs of student services, library, administration, and equipment and other physical facilities. Unfortunately, the indirect costs of technology-based instruction are given only cursory treatment in the TCM Handbook.

Outcomes
After a fair amount of discussion of the purposes of the TCM and our own experiences to date, we decided not to crunch numbers as part of this project. We believe that a critique of the TCM based on our long experience here at UNM will be a more significant contribution to the project than going through another exercise in direct cost calculation.

Summary
Based on our experience, the TCM Handbook is a good general discussion of direct cost components at the course and delivery mode levels. There is also useful discussion of facilities and equipment cost procedures, as well as an introduction to inter-institutional exchanges of cost data.

We have several suggestions for improvement:

The TCM Handbook does not adequately address the economics of cost, which are more complex than some would-be cost analysts recognize. Perhaps an entire section of the document should be devoted to a discussion of various types of costs, such as direct/indirect, fixed/variable, average/marginal, current/amortized, and incurred/contributed. This section would expand on the useful discussion of the Jewett model. Such a discussion of cost could then be referred to elsewhere in the document as needed to make specific points.

The critically important role of key variables and assumptions is not emphasized in the TCM handbook. The costs of courses delivered by technological means will vary enormously depending on the particular technology used, the rank and compensation of the instructor, and the types of costs included in the analysis. In the case of instructional television, for example, the costs of delivering a course depend heavily on whether it is delivered by satellite, ITFS, or cable. Such key variables have to be made explicit for meaningful comparisons to be made, especially across institutions.

A key variable worthy of special mention is scale. Since some costs are fixed and some variable, the total and per student costs of a course or delivery method will depend heavily on the number of courses offered and the number of students served.

Our experience is that knowledgeable people can be asked how much a specific thing costs and then come up with radically different answers because they include different kinds of costs, make different assumptions about key variables, and employ different allocation methodologies. For comparisons of costs across institutions, use of a common, precisely defined model is essential to achieve valid comparisons. As it is, the TCM Handbook is simply too general to be regarded as such a model. As a practical matter, therefore, the Handbook will be much more useful when it contains detailed models and examples of cost analyses utilizing those models.

As stated above, the TCM Handbook (draft version, August 1999) touches only lightly on the subject of indirect costs. This is unfortunate since, in the words of the handbook itself (page 20), "...many of the costs incurred in service to students are not direct costs of instruction (they are costs of associated support functions)." While we agree with the handbook that measurement of indirect costs is difficult, we regard this as the most important cost issue facing technology-based instruction. It is particularly important to UNM because the New Mexico state funding formula currently does not provide funding for indirect costs of student credit hours delivered outside the boundaries of our campuses, and many—but not all—of these "extended services" credit hours are delivered by technological means.

Three examples will help illustrate some of the issues surrounding the indirect costs of technology-based instruction:

Library resources. Frankly, this subject has been given inadequate attention in the past, but if we are to create and maintain quality technology-based programs, it must be addressed sooner rather than later. The "electronic library" may be the solution, but the costs are great, and traditional libraries will be the norm for years to come.

Student services. Distant students may not use the union building or student health service, but they do present a number of challenges if they are to be served effectively. New approaches to admissions, financial aid, advisement, registration, and tuition payment all must be developed and maintained. The up-front and ongoing costs of providing specialized services to distant students are substantial.

Facilities. Distant students do not require the same kinds of "bricks and mortar" expenditures as on-campus students, but they do require facilities of one kind or another on both the send and

receive ends of the instruction. ITV and videoconference facilities are quite expensive to set up and maintain, and the costs of the computer infrastructure needed to support Web-based courses are also substantial. Moreover, depending on the technology, some of the costs of facilities may reside outside the institution delivering the instruction, thereby creating the need in some cases for third-party compensation for facilities use.

For TCM to realize its full potential, it must address the issues surrounding indirect cost. Perhaps the most effective way to do this would be to commission several institutions each to study a particular element of indirect cost in depth. The resulting studies could then be used to establish rules-of-thumb regarding the indirect costs of technology-based instruction.

In its current form, the TCM Handbook is a great start in addressing a very important and timely subject. We believe that further development of the Handbook will be a major contribution to technology-based higher education.

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Case 8:University of Utah – Utah Education Network
                    The Value of Access

Summary
The Utah Education Network (Network) appreciates the opportunity to have been invited to participate in the WCET Technology Costing Methodology Project. We believe that an attempt to clarify and to standardize, at least to some degree, a method by which the costs of using technology in support of the educational process has real merit and can be of enormous value in the challenging decision-making process of how, when, and to what level it is justified to expend precious and limited resources.

We understand that the inclusion of the Network in the pilot was premised upon the fact that we are the major provider of inter-campus telecommunications services for all of the institutions of higher education in Utah; and thereby, represent a significant portion of the costs associated with providing distance education opportunities to students throughout the state. We also appreciate the fact that the process was also part of the pilot and that it would be refined as experience during the test indicated.

The purpose of this document is to chronicle our experience with the model and the process as it evolved.

One of the challenges that we faced, was that, as the process evolved, the Network's role became more clearly defined in the area of "costs borne by entities outside the university or system office." It became evident that the Network did not fit directly (or even indirectly) into the model as defined. However, we did an evaluation of the kinds of information that might be successfully obtained about how the Network supports higher education's distance education efforts and identified a set of conditions that complicated our ability to utilize any part of the model to determine how costs might be appropriately allocated. The set of conditions include the following:

- Since the Network supports both public (760 schools) and higher education (nine institutions which generally act as hubs for the public education traffic), it is problematic to define the appropriate traffic volumes related to higher education versus public education.
- Both administrative and instructional traffic traverse the network, it is therefore, virtually impossible (without enormous manual reconstruction) to assign relative or prorated costs of administrative versus instruction traffic.
- Many courses are provided to high school students, but who are taking courses for which they will earn college/university credit. These "concurrent" enrollment classes further blur the line between public and higher education regarding how costs for support/facilitative technologies should be allocated.

We again recognize that these issues may be, if not unique, very unusual and that it would be virtually impossible for any model to anticipate every possible variable. However, in Utah, the conditions under which we operate provide enormous benefit to both public and higher education

simply because we have a cooperative/shared network that allows the significant synergy derived from this arrangement to benefit both systems.

The point is that the model seems more focus upon fairly discreet systems and may not have adequate depth and breadth to permit an "easy fit," especially for the circumstances under which we at the Utah Education Network operate.

Our evaluation is that the model, which attempts to carefully identify and describe the costs associated with distance learning courses, is an excellent starting point in the very difficult arena of providing decision-makers with the information necessary to make the best and informed decisions possible. However, it is also a concern that the stated outcomes of measuring cost savings and providing policy makers with reliable and valid data to judge the value of financial investments in technology may be too focused on the "costs" and not adequately representative of the "value" component.

In Utah, for example, most distance education classes are primarily based upon access. In many (if not most) of the instances where distance education classes are provided, they are for students who are not able to take a class in any other way. Simply stated, if they are not able to take the class in a distance (or online) environment, they would not be able to take the class at all, or would be significantly delayed as they waited for another opportunity to attempt to get into an on-campus class.

Traditionally, in Utah, educational technology has been implemented so that students would not be disadvantaged because of their geographic location or the inability of an institution to directly service their needs in traditional classroom settings. It is our recommendation that the model be expanded to more completely address the value of access. The challenge is that decision-makers often rely on the results of models to make, what they hope to be, informed decisions. If the model lacks a very key element, then there is a high likelihood that the decision may be flawed.

We hope that this critique will not be viewed so much as a criticism, but as a plea to enhance the model's value to decision-makers by including the major criteria for utilizing technology in offering distance or online education

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Case 9:Utah State University--Logan
                The Costs of Satellite, EdNet, Online, and Face-to-Face

Context

Utah State University is a Research I four-year, state university founded in 1888 on a 400-acre site overlooking Logan in Cache Valley, northern Utah. More than 20,000 students are enrolled on campus or at education centers throughout the state. About 76 percent of students are working on undergraduate degrees. Typically, some 80 countries and every state in the nation are represented in the student body.

As the state's only land-grant university, USU supports the research and dissemination efforts of Extension agents and specialists in every county. USU has an active distance education component; some 450 distance-learning students received degrees in 2000.

Distance education at Utah State University (USU) traces its beginnings to 1911 when correspondence study, or independent study, was organized to serve the needs of off-campus students. The curriculum was composed of several agricultural courses and a variety of general education courses. Students could enroll in these courses for the modest sum of $2. Textbooks were extra and nearly doubled the cost of taking a course! Enrollments were small when this program started, but in only a few short years hundreds of students in rural Utah and some of the surrounding states were taking advantage of correspondence courses.

From these humble beginnings, USU has emerged as a leader in distance education and has gained an international reputation.

USU currently offers 45 degrees and credit programs to over 10,000 students at a distance. Six master and four bachelor degree programs are delivered electronically over Satellite/EdNet technology and a master's in technical writing is entirely Web-based. The electronic courses and degree programs are delivered to more than 3,750 students in 120 classrooms at 57 different sites each semester. The 57 Utah sites include all USU County Extension offices and Continuing Education centers, six higher education institutions, five high schools, and four correctional institutions. Additionally, increasing numbers of students are venturing onto the World Wide Web to pursue college credits and degrees.

Student services are an essential component of all USU distance education programs. Utilizing the Logan campus Student Services and academic department resources, the various Continuing Education centers and county Extension offices provide nontraditional students assistance in admission, registration, advising, and all other support services required in order to complete their education programs. Much of the success of USU's distance education programs can be attributed to the highly effective infrastructure and the academic support services it provides.

Issue
Growing competition in the field of distance education and scarce faculty resources have encouraged USU Continuing Education Administration to investigate and accurately quantify costs associated with several different distance learning delivery methods. The analysis undertaken by USU was designed to provide these accurate figures for the differing technologies on an intra-university cost level. From the information generated, several decision-making benefits will arise:

- Assistance in the allocation of future resources,
- Assistance in determining the optimal delivery method per differing situations,
- Direction in future accounting measures,
- Direction in future program development and marketing approaches,
- Assistance to USU in evaluating the technologies used in delivering distance courses to students.

Methodology
The study undertaken by USU was designed to specifically fit the needs of Distance Education Administrators at the University and the requirements of the *Technology Costing Methodology (TCM) Handbook.*

In accordance with the *Technology Costing Methodology Handbook: Preliminary Draft (February 2000)*, USU selected the Alternative Unit of Analysis for this study. Instead of using the course as the unit of analysis, the method of delivery is being used as the unit of analysis. Four delivery methods were directly evaluated:

> Satellite – One-way video, two-way audio
> EdNet – Two-way video, two-way audio
> Online – Web-CT Operating System
> Live – Face-to-face instruction

USU deviated from using the course as the focus of analysis for several reasons:

- Existing models and information lent themselves to the Alternative Unit of Analysis method.
- Accounting structure allowed for straightforward access to most of the data needed to complete the cost information.
- Desire of Distance Education Administrators to have information formatted according to the Alternative Unit of Analysis method.

Our efforts focused on collecting all material costs associated with Satellite, EdNet, and Live costs over the course of the 1998-1999 fiscal year (July 1,1998–June 30,1999), and online costs for the 1999-2000 fiscal year (July 1,1999–June 30, 2000). Additionally, total Student Credit Hour (SCH) completed during the same time period was collected. This allowed us to determine costs per SCH for each delivery method. This specific information was of particular interest to Continuing Education Administrators at USU. The findings allowed for cost comparison between differing delivery methods.

To show the complete cost of delivering an SCH via the technology studied, contributions from outside entities were determined. The calculation of these additional costs borne by other entities show the total cost of delivery, which will be of important to USU as well as other institutions of higher education.

All other information generated by USU has been in an effort to conform to the TCM Model. While USU has deviated from the fundamental framework given in *the* TCM Handbook, we nonetheless find our information to fit comfortably in the framework. The method we have used has served our needs and in turn we anticipate will meet the needs of the greater study.

Outcomes
Our greatest interest was in determining the costs that directly affect us. Consequently, we were primarily concerned with institutional costs. As a result, the majority of research time was spent breaking these costs down. Costs borne by other entities were determined by a recent cost study completed by the Utah State Board of Regents. The following table highlights USU's results. A more thorough description of our study can be found in the *USU Technology Costing Model: 2000 Template*.

Cost Expenditures (per SCH)	Satellite	EdNet	Online	Live
Institutional Cost	137.85	138.28	163.38	137.51
Total Cost Borne by Other Entities	66.22	108.67	--	--
Total Cost	**$204.07**	**$246.95**	**$163.38**	**$137.51**

Significance of Findings
On the surface it would appear that the online course/degree approach is most cost effective. However, the following items demand consideration:

- A 1999 survey of USU's distance students indicated that online technology was the least desirable method of receiving instruction.
- The Cost Borne by Other Entities was not added to our online delivery because online development has been borne by the faculty. Faculty may continue to absorb the cost of development if they use the same courseware for their traditional on-campus courses.
- A 2000 USU faculty survey indicated that instructors used some form of Web use in 1,345 courses. This would indicate that the acceptance of online courseware would improve over time.
- The cost per SCH for live instruction is low because we won't allow a course to be taught with low enrollment. However, if every course that is taught over the satellite or EdNet system were also taught live the SCH cost would be six times as great.
- Electronic distance education's greatest virtue is access. By far, the majority of the courses taught through this media could not be taught face-to-face due to low enrollment at each of the sites. The average number of students per site is less than seven.

The study did not analyze level of instruction and degree verses course delivery. Since the income is greater in graduate programs than for undergraduate programs it would be possible to use more costly delivery systems for those graduate programs.

The cost study will now allow the University to more fully analyze the mix of technologies. It could be that the satellite/EdNet delivery could be cut by two-thirds and increase the online instruction by the same percentage. This would allow more programs to be delivered while decreasing costs.

However, it has recently been noted that computer laboratories on the USU Logan campus and several centers and branch campuses throughout Utah are seeing a substantial increase in use by students enrolled in online courses; this is problematic for the following reasons:

- Computer laboratories have been generally developed to serve short-term needs for all course work. This development ties up computer equipment and networks for large amounts of time for single courses.
- Universities do not have enough computer laboratories or network capacity to serve the added online needs.
- The cost of overall instruction could increase substantially if overall enrollment does not increase. The problem will be smaller face-to-face courses and larger numbers of students enrolling in Web-based courses, the net result being more instruction costs for the same number of students.
- Some faculty indicate that more time is spent per SCH through Web based instruction than through traditional classroom instruction.
- Higher education must reassess the need for substantial increases in computer technology and Internet and systems capacity. It may be that all classrooms of the future will have computers at each seat.
- How do institutions of higher education pay for the added technology costs? Perhaps face-to-face instruction particularly for larger classes will always be the most efficient.

Summary
The methodology assisted us in several ways. The following list delineates several benefits that were of value to us. This is likely not an all-inclusive list, but nonetheless highlights the key benefits we experienced.

The methodology provided a framework that enabled us to get information on paper in a useful and organized manner. Much of the information in our study has been available to us for some time. However, the use of that information has been limited because of accessibility issues. By using this methodology, we were able to get the information organized and placed into a useful and accessible format.

Flexibility. We approached the problem differently than what the Handbook called for and what other participating universities did. However, our information still fit into the Handbook's models (for the most part). This is a useful feature because it will allow universities to easily insert information that is tailored to what they have been doing without expending great amounts of effort to change their information to conform to the requirements of the Handbook.

Additionally, it is anticipated that this same feature will make comparability between current and future participating universities a much easier thing.

Closely related to the issue of flexibility, is the managerial utility this provides to Distance Education Administrators at USU. We approached the study our own way to provide certain information that we felt was pertinent and needed by USU. The level of flexibility associated with this project enabled us to tailor the study to meet our needs and hopefully the needs of others viewing our findings.

The process of evaluating costs and placing them in a useful format is a worthwhile venture. It is a time consuming process, but yields valuable information. The process experienced at Utah State leads us to suggest a few things that might be of benefit to other institutions that implement the TCM Handbook.

Make wise use of program directors. There undoubtedly will be some confusion when undertaking a project like this. Program directors can provide valuable clarification and positive affirmation that what is being undertaken doing will work and be beneficial.

Invest ample time in this project. It will not only benefit you, but others.

Adjust the Handbook if necessary. While it is imperative that the study conforms in general to the framework established in the Handbook, it also is wise to tailor the undertaking to fit your needs and provide the utility that you seek.

These are only a handful of ideas. The most imperative points to realize are, first, a grasp on your costs will only help your institution in the future. And, second, the costs of other institutions will help you understand your position and costs better. The TCM Project will assist on both points.

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Case 10: Utah Valley State College
Comparing Course Costs Across Five Modalities

Context

Utah Valley State College is a state college comprised of two interdependent divisions. The lower division embraces and preserves the philosophy and mission of a comprehensive community, while the upper division consists of programs leading to baccalaureate degrees in areas of high community demand and interest.

Utah Valley State College is dedicated to providing a broad range of quality academic, vocational, technical, cultural, and social opportunities and experiences designed to encourage and assist students in attaining their goals and realizing their talents and potential, personally and professionally. The institution is committed to meeting student and community lower division and upper division needs for occupational training; providing developmental, general and transfer education; meeting the needs for continuing education for personal enrichment and career enhancement; and providing diverse social, cultural, and international opportunities, and student support services.

UVSC is the fastest growing college or university in Utah. The institution has 300 full-time faculty. The total headcount for enrollment for fall 1999 was 20,062. Total FTE enrollment was 12,770. Enrollment has increased 8-10 percent per year in recent years. Over 70 percent of the students come from Utah County, over 90 percent come from the state of Utah, 7 percent come from other states in the U.S., and approximately 2 percent come from other countries. The mean age of students is 21.7. The institution operates 1 million square feet of open space in 20 buildings on its campus.

UVSC has a 15-year history of offering courses via distance learning and technology based courses.

Live Interactive. The institution has offered live interactive courses for fifteen years. These courses are two-way video, two-way audio originating from a technology classroom on campus and broadcast via microwave or fiber optic cable to as many as 23 simultaneous sites throughout the state. Fall 1999, the institution conducted 13 interactive courses involving 1,100 students. UVSC provides a proctor at each receive site. Each instructor communicates with students via facsimile, Web-based materials, and e-mail. Faculty compensation for an interactive class is usually load plus overload. The course is taught face-to-face to a group of students in a multimedia classroom. That group of students is the load assignment. Faculty receive an additional per-head dollar amount for each student in remote sites. Other personal costs include a campus technician and proctors at remote sites. The largest cost for interactive courses is the investment in equipment and lease fees for fiber and microwave. These costs are shared by the institution offering the class and the statewide Utah Education Network.

Television. UVSC has offered courses on broadcast television for the past 10 years. Taped in an on-campus television studio, these courses are re-broadcast successive semesters on one of Utah's public television open access channels. Eleven television courses were offered fall 1999,

reaching 520 students. Television courses are supplemented with a Web site, student chat sessions, and e-mail. Faculty compensation for a broadcast course is entirely overload, based on a per-head dollar amount. Course development costs include studio time and equipment, studio staff, and development stipends for faculty. Another large cost is some percentage of the costs to the Utah education Network for staffing, development, and operation of the public television station.

Internet. UVSC is in its third year of Web-based Internet courses. Fall 1999, 24 separate Internet courses were offered to 535 students. Much of the development effort for these courses is done in a campus faculty resource center called the Multimedia Creations. Faculty compensation for Internet courses is a per-head dollar amount of overload. Development costs include a course design team and some software and equipment costs. The costs to put the course one the Web are not large.

CD ROM Software. UVSC is completing its fourth semester of offering mathematics and English courses using commercial propriety software from a company called Academic Systems. These courses are taught in computer classrooms, with much of the content, drill, and practice occurring on the personal computer. These courses are primarily taught as load. Extra costs to the College include the costs of a computer classroom and stipend amounts for faculty training. There are no costs outside the institution.

Methodology
For purposes of the TCM study, UVSC selected six courses that were taught spring 2000 in a traditional classroom setting in at least two of the four other modalities. The study compares similar costs across the five modalities.

Outcomes
The method of delivery that had the lowest cost per SCH was the traditional classroom. This occurred in part because it was not possible to include a cost per classroom other than annual operating and maintenance costs. If brick-and-mortar replacement costs were included, these costs would conceivably be much higher. Traditional classroom delivery lacked three costs which occurred in the four types of technology-delivered courses—higher faculty costs, course development costs, and costs of specialized equipment.

Costs per Student Credit Hour (SCH) were quite low for Web-based Internet-delivery courses. No classroom costs occurred, and there was very little in terms of specialized equipment needed to deliver the course.

Courses delivered over broadcast television was costly because of course development costs and higher incentive-based faculty costs.

Courses that were interactive or delivered using proprietary CD-ROM software were costly because not only was a classroom utilized, but also a special classroom was required. Interactive classes utilized a statewide network, which also added fixed costs.

Summary

It is apparent to this investigator that UVSC has offered courses via technology without the cost of delivery as a decision variable. UVSC intended to expand access, to improve instruction, and experiment with technology, but with little consideration for relative costs. This pilot study may help the UVSC evaluate its course delivery efforts, viewed in terms of cost delivery.

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Case 11: Washington State Board for Community and Technical Colleges
An English Composition Course Delivered Four Ways: Face-to-Face, Telecourse, WAOL, and College-Delivered Online

Context

For more than 20 years, Washington Community and Technical Colleges (CTC) have been using video and telecommunications technology to deliver courses at a distance. Within the past five years, colleges have been using the Internet for content delivery and interactivity. During Fall Quarter 1999, enrollments in online courses surpassed telecourse (pre-recorded video) FTEs.

The state's 34 CTCs have joined together as the Washington Online (WAOL) consortium. Faculty from across the system have cooperatively developed 20 online courses that transfer to the state's four-year colleges within an Associate Degree. Starting fall 1998, colleges have been pooling WAOL enrollments such that one class section will contain students from many colleges. Students enroll through their home college. The home college retains the FTE credit and tuition revenue. The college that teaches the course is reimbursed at $40 per credit by students' home colleges. During fall 1999, WAOL enrollments accounted for 23 percent of all online enrollments in the CTC system. The remainder of the online enrollments was in locally owned and delivered courses.

Issue

The TCM Handbook was used to compare costs based on four modes of delivery—face-to-face, telecourse, WAOL, and college-delivered online. To manage the scope of this pilot project, comparisons were limited to Fall Quarter 1999 English composition courses offered by colleges in the Spokane district.

Methodology

Two focus groups were formed, one to provide information about Instruction and the other with expertise in Student Services. Participants were invited based upon their firsthand knowledge of expenditures in their area, as determined by financial officers at the Spokane district. They received written materials before their focus group meeting. The materials described the TCM project, the model, the information requested, and the methodology.

Within each activity area, participants received four sets of spreadsheets that represented each of the delivery modes. The Instruction group had two sets of spreadsheets for the activity areas of Instruction and Academic Support. The Student Services group also had two sets of spreadsheets for Student Services and Student Access Services. During the focus group meetings, the spreadsheets were projected on a large screen and completed based upon the information provided.

On March 23 at Spokane Falls Community College, the Instruction Focus Group met in the morning, and the Student Services group met in the afternoon. Both focus groups were also attended by the Vice President for Financial Affairs of the Spokane District, the Managing Director of WAOL, the Chief Budget Analyst at the State Board for Community and Technical

Colleges (SBCTC), and the Director of Distance Learning at the SBCTC. The focus groups were audio recorded and subsequently transcribed for analysis.

This methodology was selected because it would bring those with direct knowledge about costs together at one time, making the collection of data efficient. The focus group format was also selected to provide a forum by which to draw out forgotten or hidden costs during the course of discussion.

Outcomes
The methodology itself, the act of unbundling costs within activities, helped participants think about evaluating distance learning in new ways. It helped to consider how the costs of specific activities could be mediated through additional collaborations across institutions, by expanding collaborative course development and pooled enrollments. It also is helping us consider efficiencies in combining student support services, by activity, for all CTC distance learners.

By evaluating multiple modes of delivery, focus group participants were provided real-time comparisons of how they were spending their money. Within the Instruction focus group, participants discovered that telecourses represented the best value for their instructional dollar.

Having two focus groups, one for Instruction and the other for Student Services, it provided the organizers the opportunity to compare their assumptions and perceptions of each group. Whereas the Instructional focus group could detail their time and effort and its related costs, the Student Services group tended to consider it all in the course of their "regular work." Similarly, the Instruction group could identify related compensation, or lack thereof, yet the Student Services group did not identify increased compensation related to the delivery of services at a distance. Furthermore, the Student Services group considered distance services really "no different" than face-to-face services.

Although the focus group method did give the participants permission to fully discuss and discover the costs of distance learning, it was difficult to keep them on task. This was especially true of the Instruction group. It became apparent that we provided a much needed forum for the participants to express their frustration at being under-funded and unacknowledged. If this method were to be used again, scheduling a series of focus groups, to both allow for the emotional venting, as well as to collect the required information. As it turned out, three hours did not provide sufficient time to collect all the information needed.

In the morning session, we only had one faculty member. Alone, she was not able to provide sufficient information. More faculty input is needed. Also, by comparing four modes of delivery, we found that many of the discrete unbundled costs were the same. This resulted in a lot of repetitive data collection. Learning from the morning session we changed our collection strategy for the afternoon Student Services group, to "tell us what is different in this mode of delivery from face-to-face."

For the most part, the members of the focus groups were participating as a favor to the VP of Finance. They lacked a personal or professional interest in the outcomes of the groups.

Summary

When using this methodology, keep the scope manageable and use it to provide information that you really want to know. Make sure that you enlist those with firsthand knowledge of costs. For those who participate, make sure they see how this analysis will benefit them directly. When decision-makers use the cost analyses that result from this methodology, they should use it as one piece of information in context with the mission and policies that govern the educational enterprise, including a commitment to quality learning environments.

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Case 12:Washington State University
The Costs of Developing Courses and Teaching Online

Context
The Center for Teaching, Learning & Technology and the Extended Degree Program at Washington State University (WSU) collaborated to use the Technology Costing Methodology (TCM) to analyze and improve WSU's pilot Program Development Process. The Program Development Process was used to develop 10 courses for the fall 1999 semester. All or some of the students in each of the 10 courses were distance learners. All courses relied on technologies for student access. All courses were developed for first time delivery, so the process and courses were prototypes.

The TCM costing process complemented the Center for Teaching, Learning, and Technology's previous cost assessments using the Flashlight Cost Model. The addition of the TCM approach has been, therefore, consistent with WSU's commitment to using technologies effectively and efficiently.

WSU is committed to a five-step assessment process for all courses developed using the Program Development Process. Instructors are surveyed to determine their goals for the course. Two formative surveys are conducted of students, the first to determine student goals and access to technology, the second to determine students' experiences with interaction. Instructors go through a focus group to assess the job of the course development team and finally, the costs of each course are assessed using activity-based costing techniques as introduced in the TCM Handbook. The focus groups and cost assessments provide benchmarks for improvement.

Finally, we realize that the benchmark assessments of courses adapting new technologies may be used for comparisons with courses taught in traditional modes. However, such comparisons should be done cautiously since the history of evaluation illustrates the enormous variation among purportedly similar modes of instruction, often times as much or more variation within teaching modes as there is between different modes. Our primary purpose in using the TCM model, therefore, has not been to determine if integrating new technologies into instruction for distance learners is cheaper or better, but to determine how we can improve the efficiency and effectiveness of our efforts.

Issue
10 courses were analyzed, all were taught during the fall 1999 semester. The following information outlines the courses under investigation:

- An interdepartmental, multidisciplinary team developed the 10 courses.
- Courses analyzed were from eight departments.
- The course development team was composed of members from Extended Degree Programs (EDP), the Center for Teaching, Learning, and Technology (CTLT) and the Student Advising and Learning Center (SALC).
- Time estimates were gathered from 40 faculty and staff.
- 169 students completed the courses in the analysis.

Methodology

Activity-based Costing (ABC), which the TCM is based on, was used to analyze costs. ABC is an accounting system that assigns costs to products based on the resources they consume. The traditional accounting system is still used and the ABC structure is an add-on or "shadow system" to be used when specific information is needed for a decision. Ten activities were used for this analysis. The focus of this TCM analysis was the WSU course development process so the activities chosen follow the "course development lifecycle." A brief "activity dictionary" is included in Table 1.

Table 1 – Activity Dictionary

Activities Chosen to Reflect the Course Development Lifecycle

Activity	Summary Description
1. Faculty Development	Faculty work with professional staff on new models of teaching or specific technology concerns; or a student technical assistant, hypernaut, introduces faculty to technology resources such as threaded discussion lists and other features of the online course environment
2. Course Design	Course development team works with faculty on syllabus generator, course goals, grading rubrics, et. al.
3. Speakeasy	Time spent setting up activities in the online learning forum—the Speakeasy Studio
4. Worldware	Time spent on Word files, HTML pages, or similar "worldware" programs.
5. Multimedia	Time spent programming JAVA or FLASH animations, etc.
6. Video	Video pre, field, studio, and post production and set maintenance
7. Copyright Research	Acquiring copyrights or reviewing Web sites, videos and course material for possible copyright infringement
8. Text Editing	Reviewing course material for grammar and accuracy
9. Delivery and Maintenance	Teaching the course and any updates made during the course, grading and interacting with students on the Web, via e-mail, telephone, or other methods
10. Assessment	Cost of surveys of instructors and students and gathering of information for cost analysis

The following expenditures were estimated by activity:

- Payroll (direct labor),
- General administrative,
- Extended Degree Program (EDP) administrative,
- Center for Teaching, Learning, and Technology (CTLT) administrative,

- Estimated plant maintenance and depreciation (10 cents for each dollar paid to an instructor or developer).

Table 2 Illustrates estimated expenditures of the 10 courses before allocation to activities. Some of the expenditure types accrued to specific activities while other expenditures occurred in almost all activities for all the courses (e.g., salary and wages).

Table 2 - Average Expenditures per Class and per Student
"Traditional View"

Traditional Expense Accounts	Average per Class
Total Direct Labor Hours	*546*
Salary and Wages	$ 8,264
Benefits	1,801
Total Payroll	$ 10,065
Video tape & travel cost	$ 150
Allocation of administrative labor	579
Assessment Costs	544
EDP Administrative:	
Marketing	60
Advising	186
Registration	276
CTLT Administrative:	
Equipment	50
Goods & Services	574
Telephone	8
Travel	27
Carry forward	63
Computer Services	1
Payroll	1,402
Plant Maintenance / Depreciation	27
TOTAL COST	**$ 14,012**
Average Number of Students Per Course	16.9
Average Cost per Student	$ 829

The average cost per student per course (of the 10 courses delivered during the fall 1999 semester) was $829 per student per three-credit course. The average cost per student per three credit course for all WSU students was $751 (per the 1997-98 Washington State Higher Education Coordinating Board Education Cost Study). The 10 courses were the first courses WSU developed for online learning that used the new course development process. These were, in effect, prototype courses. The average cost per student per distance course is expected to decline as the process is refined and enrollments increase.

Outcomes

The following activities were consolidated:

Design combines the Faculty Development and Design activities.
Develop combines activities for developing Speakeasy studios, "worldware" programming, multimedia programming, video production, copyright research and text editing.
Deliver reflects time spent teaching the course, grading student work, adjusting content to meet learner needs, and other activities associated traditionally with "office hours," such as interacting with individual and groups of students on the Web, via e-mail, telephone or other methods,
Assess refers to the cost of developing, implementing, and analyzing surveys of instructors and students and gathering of information for the cost analysis.

Table 3 summarizes the cost of each course by major activity, i.e., by Activity Based Costing (ABC) view. This view provides more useful information for analyzing and refining the course development process.

Table 3 – Cost Estimates By Major Activities – "ABC View"

Course	Design	Develop	Deliver	Assess	Total	Direct Hours	Students
AS (SE)	$2,845	$2,575	$ 7,123	$961	$13,504	888	30
ComSt (SE)	2,167	5,718	5,195	975	14,055	574	14
CrmJ (SE&V)	5,941	3,721	2,275	928	12,864	269	4
C / S (S&V)	6,396	2,054	3,651	922	13,023	482	14
Soils (S&V)	5,574	3,802	5,783	996	16,156	470	9
Dec S (SE)	3,524	3,548	6,546	953	14,570	597	12
Fin (SE)	3,210	3,432	3,832	956	11,430	456	14
HD (SE)	3,206	3,151	4,250	1,001	11,608	631	24
HD (SE & V)	2,679	8,699	5,579	941	17,898	545	32
MIS (LS)	5,825	3,491	4,675	1,026	15,017	546	16
Averages	$4,137	$4,019	$4,891	$966	$14,012	546	17

"SE" stands for Speakeasy, "V" means class used videos, "LS" means course used List Serve

Table 4 summarizes the proportion of cost by each activity. This table indicates the variability of the costs of each activity as a percentage of total expense.

Table 4 – Average Proportion of Total Expense by Major Activity

	Design	Develop	Deliver	Assess	Total
AS (SE)	21%	19%	53%	7%	100%
ComSt (SE)	15%	41%	37%	7%	100%
CrmJ (SE&V)	46%	29%	18%	7%	100%
C / S (S&V)	49%	16%	28%	7%	100%
Soils (S&V)	34%	24%	36%	6%	100%

Dec S (SE)	24%	24%	45%	7%	100%
Fin (SE)	28%	30%	34%	8%	100%
HD (SE)	28%	27%	37%	9%	100%
HD (SE & V)	15%	49%	31%	5%	100%
MIS (LS)	39%	23%	31%	7%	100%
Average	30%	28%	35%	7%	100%

"SE" stands for Speakeasy, "V" means class used videos, "LS" means course used List Serve

To analyze the implications of the cost/activity distribution in the preceding tables, correlation's were run on direct labor hours of each major activity and revealed the following:

- The total cost of each course is most strongly correlated to development.
- There is a moderate inverse correlation between design and development time, which means more time on design yields less time on the more expensive development time.
- There is a strong correlation (.735 with a ρ-value of .015) between the number of hours spent on the course (including Design and Development) and the number of students who enrolled in that course. However, the correlation between the cost of each course and the number of students enrolled is almost zero, which indicates the relatively "fixed" nature of most of the costs.

Discussion and Next Steps
The correlations make sense. Development time is the most expensive, requiring more personnel and equipment. The inverse correlation between design and development throws into relief the importance of planning and, to a considerable extent, the costs of not doing so. Design time saves time in both development and delivery. The correlation between the number of hours spent on the course and the number of students enrolled in the course reflects some amount of anticipation on the part of developers and an increased audience. But more clearly it reflects the time spent teaching more students and, consistent with reports now coming from around the country, the recognition that facilitating online learning generally increases the time faculty spend interacting with students. Finally, the "fixed cost" nature of designing and planning a course was verified.
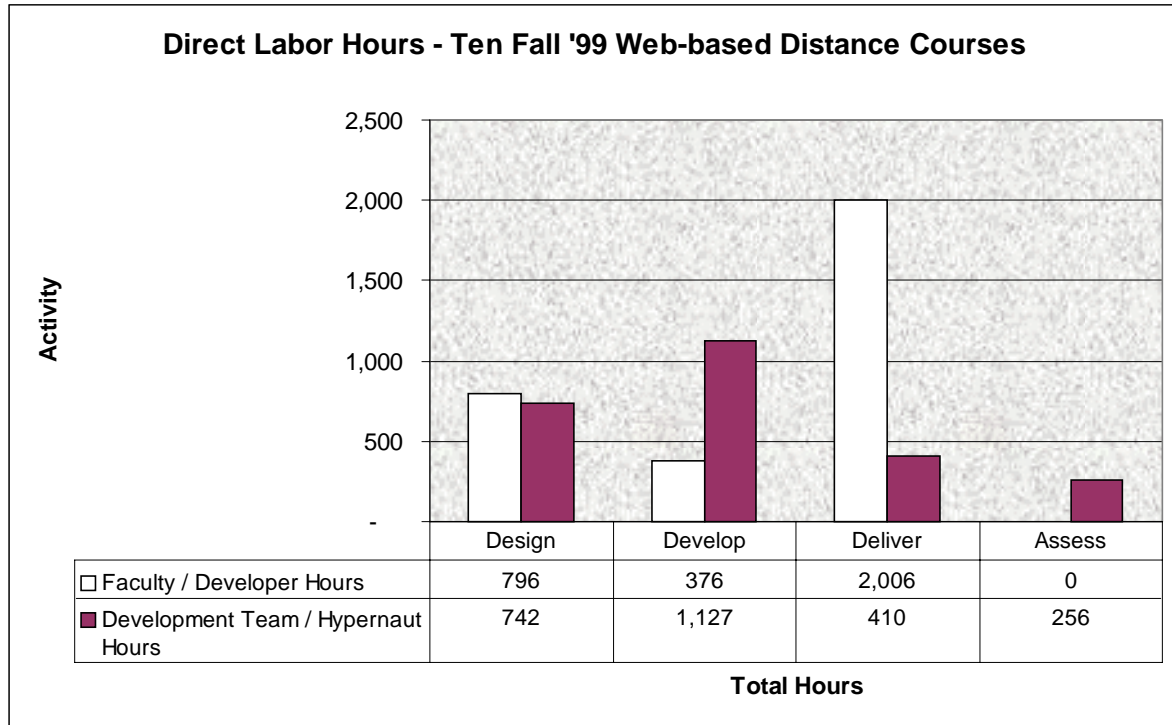
It is also interesting to note that the design and development phases, on average, consumed slightly more than half (58 percent) of the resources. WSU plans to continue this study for spring and fall 2000 courses. Several of the courses that were analyzed in this fall 1999 study will be taught again. It is important to track the cost of design on additional offerings of the course as faculty gain experience teaching online and as courses are taught by different faculty. It is expected that design and development—or redesign and redevelopment—will be less intense; faculty will optimize their instructional techniques.

One of the main conclusions that can be drawn is that the proportion of costs consumed by each activity is unique from one course to another and so the total cost of each course is unique. It is therefore premature in the evolution of the integration of new technologies with teaching and learning to make generalizations about cost differences between courses that use new technologies and traditional courses that do not.

However, the analysis of averages does suggest that shifting the focus from course costs to the activities in developing those courses should yield increased efficiencies. The finding that an increase in design time indicates less time on the more costly development and delivery time, for instance, has important ramifications for the course development process and accompanying policy. As we improve the allocation of resources and incentives for faculty to participate more fully in course design and to spend less time in course development, we can anticipate additional efficiency gains.

Chart 1, Hours by Major Activity, reflects a grouping of activities designed to track and improve the course development process. It clarifies the development goal so that over time faculty time on design should be increased. Correspondingly, we anticipate fewer faculty and development team hours on development, fewer development team hours in delivery, and, in order to improve effectiveness as well as efficiency, more faculty hours on assessment.

Chart 1 - Hours by Major Activity

Direct Labor Hours - Ten Fall '99 Web-based Distance Courses

	Design	Develop	Deliver	Assess
☐ Faculty / Developer Hours	796	376	2,006	0
■ Development Team / Hypernaut Hours	742	1,127	410	256

Total Hours

Summary
The TCM study has given WSU useful information and insight into its course development process. WSU plans to use this information and the TCM model to compare the cost of subsequent courses to the fall 1999 course and to support policy changes that will encourage more design time.

There is evidence that the TCM model as it was applied at WSU gave cost estimates that make intuitive sense. After the analysis was first computed, costs of activities were combined into four "major" activities. A correlation analysis was done on those costs, total time devoted to the

course and the number of students who completed the course. This argues for future applications of Activity Based Costing (ABC) methods "on top" of the existing accounting system.

Traditional costing systems provide little indication as to where major business cost contributors lie. Activity-based Costing as used in the TCM helps to more closely estimate the specific elements or "drivers" of those costs.   In the WSU case, approximately $100,000 of salary, wage, and payroll expenditures can be better analyzed and managed by identifying the activities where faculty and development team professionals allocate their time.

The courses analyzed in this study were developed and assessed by an interdepartmental team. ABC focuses on activities rather than traditional departmental costs; therefore, WSU can better focus and manage cross-functional processes by adapting ABC.

WSU plans to continuously and systematically refine and improve the application of the TCM model and other assessment techniques and to continuously improve both the effectiveness and efficiency of courses that use new educational technologies.

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APPENDIX A
TCM Pilot Sites (17)

FLORIDA

       Florida State University

GEORGIA

       Georgia Board of Regents

LOUISIANA

       Northwestern State University (Louisiana)

MONTANA

       University of Montana--Missoula
Montana State University--Billings
Montana State University--Bozeman
Flathead Valley Community College (Montana)

NEW MEXICO

Eastern New Mexico University
Western New Mexico University
San Juan College (New Mexico)
       University of New Mexico

OREGON

Portland Community College (Oregon)

UTAH

University of Utah—Utah Education Network
Utah State University--Logan
Utah Valley State College

WASHINGTON

Washington State University
Washington State Board for Community and Technical Colleges