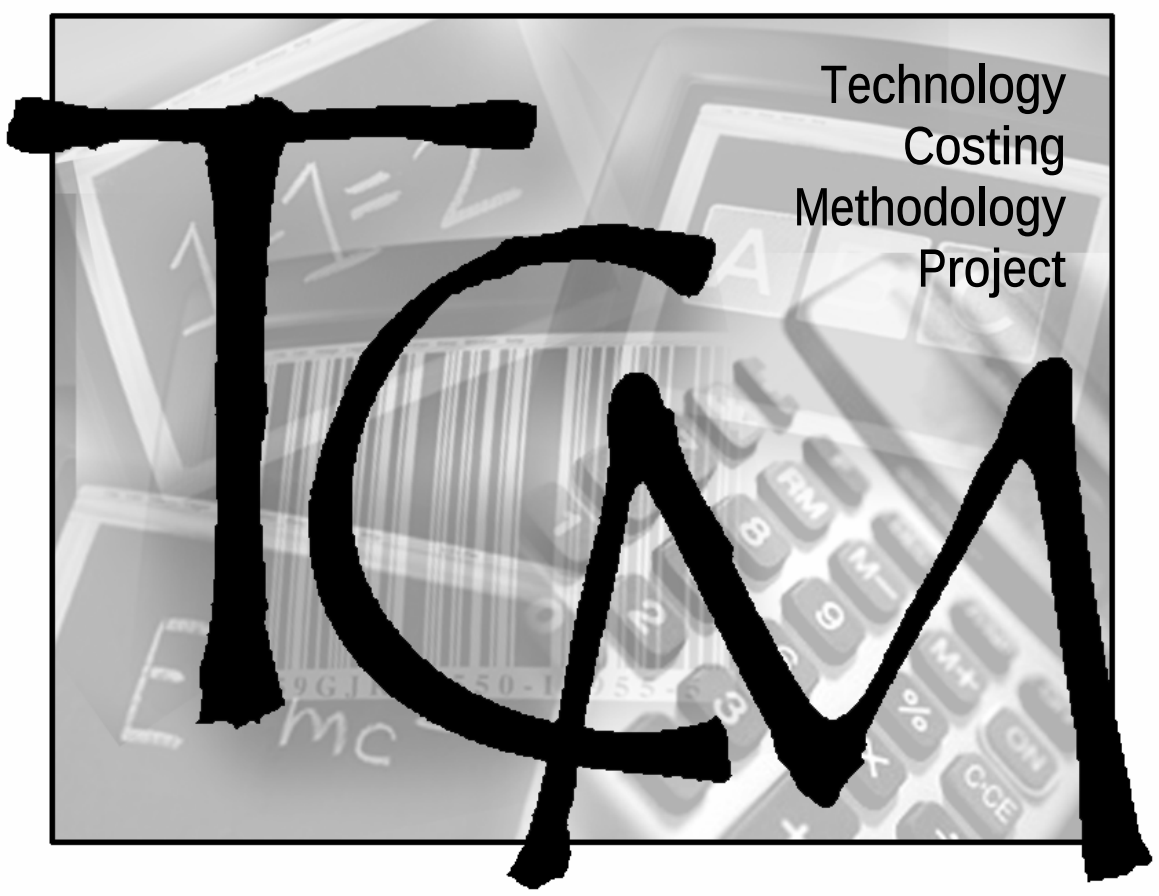

Technology Costing Methodology Handbook—Version 2.0

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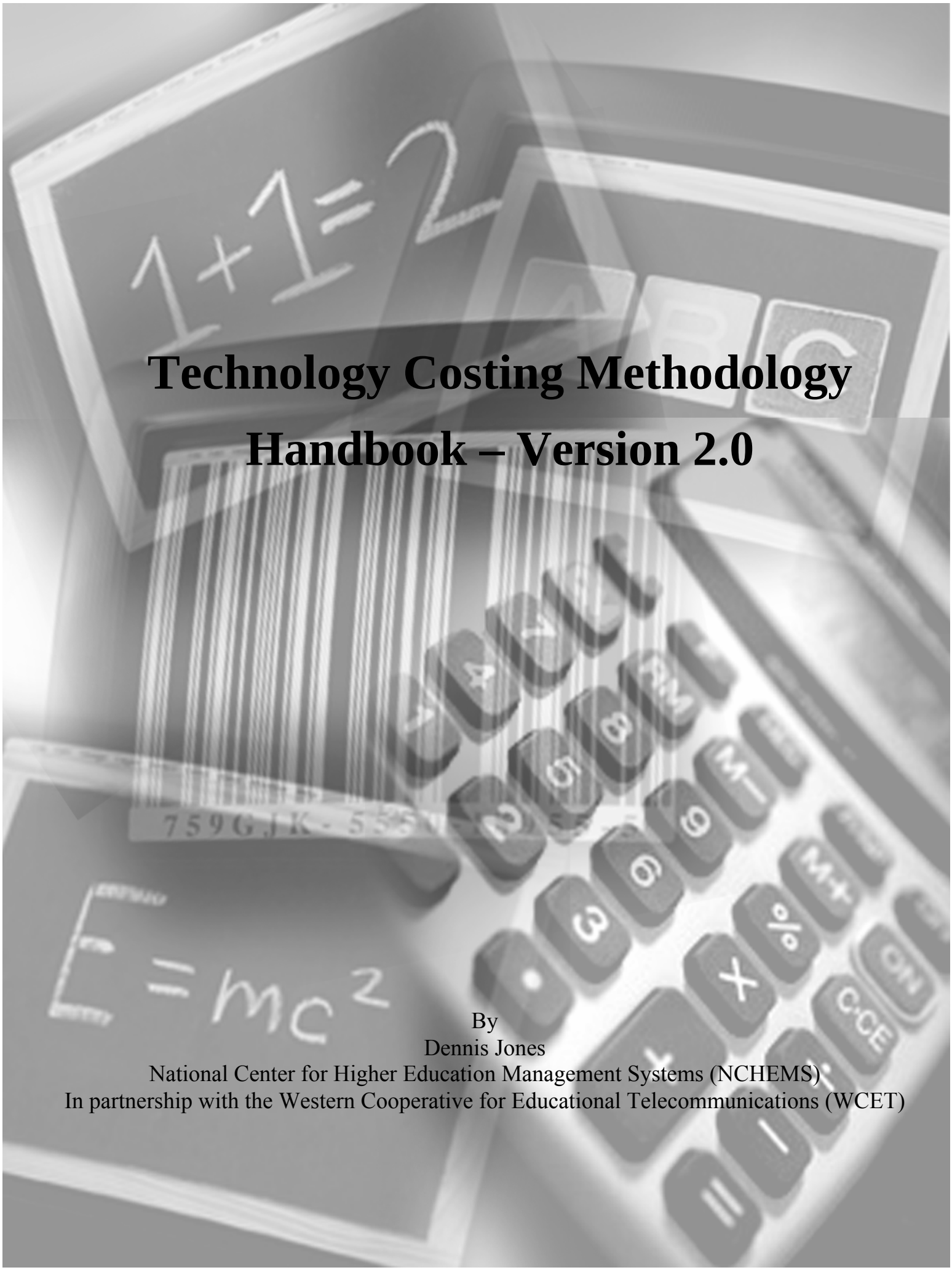

Technology Costing Methodology Handbook – Version 2.0

By
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PREFACE

In the mid-1990s, a series of questions arose regarding the cost of using various forms of information technologies (IT) to deliver instruction to students. Legislators in one state wanted data on the effectiveness of their investment in a statewide telecommunications network. Faculty in another state were concerned about the cost of implementing the new educational technologies. Another state's governor imposed performance audits on all state entities, including cost analyses. More specific questions included:

- What are the per student costs associated with alternative forms of instructional delivery? How do costs of alternative methods compare to more traditional, face-to-face classroom instruction?

- Under what conditions, if any, do alternative instructional delivery modes become cost-effective? For example, are there enrollment levels at which electronically mediated instruction becomes more cost-effective than classroom delivery?

At the time, no one would admit to having answers to these reasonable questions. Although numerous cost studies of IT had been undertaken, they were uncoordinated and *ad hoc* in nature. Certainly, there was insufficient empirical evidence to yield rules of thumb that could inform managerial decisions.

When these costing questions were posed to Dennis Jones, President of the National Center for Higher Education Management Systems (NCHEMS), he responded to the effect that cost analysis to determine the relative "effectiveness," "performance," or "savings" associated with various forms of instructional delivery cannot be done without a generally accepted methodology.

No such methodology existed at that time. Consequently, the Western Cooperative for Educational Telecommunications and NCHEMS proposed — and the Fund for the Improvement of Postsecondary Education (FIPSE) funded — the TCM project in order to provide

> …an authoritative costing analysis tool, including standard definitions of cost categories, for institutions and multi-institutional agencies to: a) analyze the costs of instructional approaches that make heavy use of technology; and b) to legitimately compare cost data for different instructional approaches.

A good deal has happened since publication of the *TCM Handbook, Version 1.0* in 2001. Three years later in 2004, the occasion of the second edition of the Handbook is an appropriate place to take stock of what has happened with the TCM Project, to present a set of findings and conclusions, and to suggest a future direction for the TCM Project.

Current status of the TCM Project

The *TCM Handbook Version 1.0* (2001) was developed in consultation with 17 higher education institutions. In all, 12 institutions undertook specific pilot tests of the TCM methodology (reports on the 12 test sites are contained in the *TCM Casebook, 2001*). A second round of funding from FIPSE expanded the TCM Project to include eight more institutions that provided a wider diversity of costing situations. In addition, a supplemental grant from the Andrew W.

Mellon Foundation provided funding to develop the *TCM Tabulator,* a spreadsheet program to facilitate TCM computations, and to further explore the theoretical implications of the TCM data that had been collected (Jewett, 2002, Jewett and Henderson, 2003). The *TCM Tabulator* is an interactive spreadsheet program that greatly eases campus implementation of TCM and its related cost-data-gathering activities.

A conference on TCM implications, jointly sponsored by WCET and the Southern Regional Education Board, entitled "Costing and Financing Instructional Technologies in Higher Education: Practical Lessons and Policy Implications," was held in Washington D.C., in May 2002. A completed project evaluation report (Wallhaus, 2003) addresses how the TCM has been used by colleges and universities. TCM training materials will be available in 2004. In addition to this second version of the *TCM Handbook*, a second *TCM Casebook* is also being published. These materials are available at the TCM website <http://www.wcet.info/projects/tcm/> , along with continuing updates on the project.

The TCM is a tool for cost analysis

TCM is a tool for analyzing educational technology costs. TCM is *not* a set of accounting protocols. Since campuses vary widely in their accounting software and procedures, creating an accounting tool useful to more than a handful of institutions would be impossible. TCM is *not* a cost/benefit analysis. Since definitions of "quality" and "benefits" vary widely, these determinations are left to the individual campuses that implement TCM with the *caveat* that cost comparisons that do not take quality aspects into consideration can be worse than useless.

1) The TCM is the *only* costing methodology designed with the expressed intent to create a standardized way to compare the costs of alternative modes of instructional delivery (i.e., classroom and various applications of information technology). TCM allows costing data from campus accounting systems to be transformed into a standard format for making cost comparisons. It was developed with advice from a broad range of higher education administrators (financial, academic, media/computer, student affairs, etc.) and state level agencies. The methodology received wide review and comment before the Handbook was published. The TCM also builds upon earlier cost comparison work done by Bates (1995), Rumble (1997), and Jewett (1998). It has the further advantage that its development is led by Dennis Jones of NCHEMS, who had a key role when the Program Classification Structure (PCS) was first developed and the earlier classroom instruction cost studies were undertaken.

2) The TCM is consistent with the Program Classification Structure (instructional program, research program, community service program, academic support program, student services program, etc.) developed by NCHEMS in the 1960s. As such, it is consistent with higher education financial reporting systems. It is worth noting that when the PCS was originally developed, classroom instruction was essentially the only mode of delivery employed in higher education in the U.S.

3) The TCM is comprehensive in its perspective on costs, making provision for all types of institutional costs to be identified and measured (including, for example, capital costs, costs borne by others, and costs of unused capacity). The comprehensive nature of the TCM

provides the basis for a continuing process to resolve additional conceptual cost issues as they are identified.

4) The TCM focus is on the collection of detailed cost data related to the instructional and academic support programs and especially related to the use of alternative means of course delivery. The explicit intent of TCM is to allow comparable and reliable estimates of the costs of these alternative modes that can inform campus management decisions.

5) The TCM provides a set of rules and assumptions for making specific cost calculations that can be used to assist management decisionmaking. A central component is the use of activity analysis as a way of assigning resource costs to courses. It also provides advice on how data can be collected and how much detail should be sought (e.g., the rule of materiality).

6) The TCM incorporates a theoretical model ("mini-BRIDGE") that serves as both a guide to organizing and interpreting the cost data obtained and an hypothesis regarding the basic cause-and-effect relationships that are relevant for cost comparisons (Jewett and Henderson, 2003). TCM provides the capability of not only making comparisons of the specific costs at a given enrollment level when offering a course by different methods but also provides the user with estimates of the parameters of a cost model that allows comparisons of costs at various enrollment levels. This is a considerable advantage given the different cost structures of classroom and the various mediated technologies.

Differences between TCM Handbook Version 1.0 and Version 2.0

The differences between Version 1.0 and Version 2.0 of this Handbook are mostly editorial, based upon feedback from pilot sites and those who have implemented this methodology. Most of the changes involved clarifying the wording in the instructions and adding additional examples. New to this version are:

- This preface includes summaries of the findings of the TCM and TCM/BRIDGE projects.
- The conclusion of Chapter 2 has been rewritten to better explain the connection between the TCM cost estimates and the mini-BRIDGE model.
- Appendix D describes the principles of activity-based costing.
- The *TCM Tabulator, Version 2.0* is being released in conjunction with *TCM Handbook, Version 2.0*.

The new version of the *TCM Tabulator* reflects the changes made to this version of the Handbook. To address needs expressed by users, two new products will also be released:

- The *TCM Tabulator EZ* – a shorter version of the TCM Tabulator intended for new users who wish to practice or for those who want to create shorter reports.
- The *TCM Tutorial* – a step-by-step tutorial designed to help all users improve their effectiveness and efficiency when using the TCM Tabulator.

Conclusion

I trust that you will find the *TCM Handbook Version 2.0* to be a valuable tool to analyze the educational technologies at your institution. The goal was to create a Handbook that would give enough direction to ease your analyses, but still provide enough flexibility to meet the unique

circumstances found on your campus. Judging from the feedback from our pilot sites, I believe we met that goal.

Russell Poulin
Associate Director
Western Cooperative for Educational Telecommunications
September 2004

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TCM Pilot Campus Conclusions/Findings
Adapted from Dennis Jones, *TCM Casebook 2001*, pp. *v-vi*.

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:

- Within the parameters of course enrollments and methods tested, technology-mediated delivery was more expensive than face-to-face instruction in 10 of the 12 cases that provided complete cost estimates. There were two instances in which mediated instruction was less expensive (Georgia, Case 3 and Louisiana, Case 4). 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 Internet 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 (Washington State University, 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 (Florida State University, 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 that 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 opportunity, but not necessarily the motivation, to rethink the ways in which students are aided in their acquisition of new knowledge and skills.

TCM/BRIDGE Project, Conclusions/Findings*
Adapted from Frank Jewett, "Applications of the 'Mini-BRIDGE' Model to TCM Cost Data," WCET, May 2002, pp. 4-5.

Jewett visited eight of the original TCM pilot sites. Six of the cases had collected sufficiently detailed cost date to allow completion the modeling work. The primary objective was to develop a model (tool) to assist in interpreting and comparing the TCM cost estimates for various delivery modes. One of the primary outcomes of the project was the application of the TCM cost data to the "mini-BRIDGE" model to make cost comparisons, e.g., classroom and mediated course costs at various levels of course enrollment. Such a tool provides campuses with the capability of using the TCM cost data to project the levels of course enrollments necessary to recoup initial technology investments.

Conclusions that emerged from the work included:

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* During the course of the TCM/BRIDGE Project, an agreement was reached between the Chancellor's Office of California State University and WCET that, (1) allowed WCET to host the BRIDGE project on its Web site, and (2) clarified the ownership of the BRIDGE project as future versions are created. This agreement essentially provided a new home for BRIDGE and ensured its continuing availability to users.

- All six cases illustrated that technology-mediated courses (of whatever type) tend to have *higher* fixed costs and lower *variable* costs than classroom versions.

- The distinction between (fixed) course-related costs and (variable) enrollment-related costs is central to understanding the scalability of courses. As enrollment increases, fixed costs are spread over larger numbers of students and causing average cost per student to decline. It is these fixed costs, coupled with increased enrollment, that give rise to economies of scale.

- Because of these economies of scale, mediated instruction can be less expensive than classroom instruction if course enrollments are sufficiently large. Five of the six cases demonstrated that this outcome is possible.

- One case demonstrated that course sharing among campuses is a way to reduce fixed costs.

- One case collected data to demonstrate that there is a "learning curve" effect in converting classroom courses to online courses. The cost of a first conversion tends to be greater than subsequent conversions.

- Adding course revenues to the analysis presents a more complete picture for planning purposes, especially for extension or other self-supporting units.

Evaluation of the TCM Phase II Pilot Tests
Adapted from Robert Wallhaus' evaluation report, pp. 5-7

TCM is an important tool for supporting resource allocation decisions both internal and external to programs and institutions. TCM can be used effectively in formulating tuition and fee policies, in analyzing the trade-offs across different instructional delivery modes, and designing technology-based courses and programs. Knowledge of cost patterns, combined with information about learning outcomes and student satisfaction, is also fundamentally important in making decisions about the extent and direction of institutional investments in new technologies. There is little question about the value of the TCM in these different contexts, which attests to the strong interest in TCM expressed in statewide sessions to introduce the costing methodology and in conferences sponsored by WCET and other organizations across the country. The following conclusions and suggestions, gleaned from the TCM evaluation, are presented to guide the further development of this important planning and management tool.

<u>The TCM Tabulator</u>
Every effort should continue to be made to ensure that the Tabulator is "user friendly," based upon what is learned by the WCET staff and consultant as technical assistance is provided to schools as they implement TCM. This would include facilitating data input and report generation. The utility and feasibility of including a "notes file" in the Tabulator should be explored so that it provides easy tracking of the decision rules that were used in making

expenditure allocations to activities and courses. Further, development of a Tabulator "users' manual" or "help" search capability should be considered.

The ability to enter program level data directly into the Tabulator would facilitate its use when an entire technology-based program is delivered and costs can be isolated at the program level. Similarly, guidelines for costing programs should be added to the *TCM Handbook*.

The BRIDGE model is a very useful tool for simulating the costs and economies of scale associated with different delivery modes and enrollment levels. The output of the Tabulator can be viewed as the input to BRIDGE. The capability of effectively linking these two tools would enhance the utility of both.

Assignment of personnel expenditures

The most difficult step in the TCM process is the allocation of faulty and staff compensation across courses and activities. In their initial implementation, institutions usually have no historical basis for assigning these expenditures; nor do they have experience in carrying out activity analyses to support these allocations.

Two suggestions are made to help overcome these difficulties. First, there are some institutions that have developed faculty/staff interview protocols or surveys for conducting activity analyses. These methodologies could be documented and made available to institutions interested in implementing TCM. Second, as more institutions implement technology-based costing, a data base reflecting compensation allocations associated with different delivery modes and activities could be established. When a critical mass of data has been accumulated, it would provide a "first order estimate" of costs that could be used by other institutions as they carry out their assignment analyses. Such a database could also be used to refine the BRIDGE model default parameters.

Multiple steps in the costing process

The assignment of expenditures to activities and courses is sometimes a very straightforward, one-step process (for example, the purchase of a web-based course from an external vendor). On the other hand, these assignments become more complex when a number of faculty share equipment, facilities, and courseware in the delivery of different courses. In these situations, there can be multiple steps in the assignment process. To illustrate this point, examples of different expenditure assignment situations are presented in Appendix A of the Handbook. While the *TCM Handbook* provides comprehensive structures for defining objects of expenditure and activities, filling in the matrix in Table 3, Step 5 of the *TCM Handbook* is not as straightforward as it first appears. It is suggested that the *TCM Handbook* include guidelines for making different kinds of expenditure to activity and course assignments; and/or, include examples, such as those presented in Appendix A, as a supplement to the *TCM Handbook*.

Link to BRIDGE

Gaining insights into the costs of technology-based delivery systems is an important first step in making decisions about the modes of instruction that will be supported in the future, the amounts of tuition and fees that will be charged, whether to expand or redesign existing delivery systems, etc. But, once historical costs have been analyzed, it is important to look at resource allocation

trade-offs, economies of scale associated with different time frames and enrollment levels, and the relationship between costs and student learning outcomes. The BRIDGE model is an important tool for examining these decision alternatives. As suggested previously, an important next step in the development of TCM would be to link the Tabulator output to BRIDGE and to utilize the results of TCM implementations to refine the BRIDGE default parameters.

Involvement of the decisionmakers

Institutional and academic leadership, and faculty, were not actively involved in many of the pilot test implementations. Rather, the task of implementing TCM was assigned to mid-level administrative offices such as continuing education, budget, or technology support. Consequently, there was little evidence that the results were used to support institution-wide decisions or decisions within the academic units. Clearly, this detracts from the utility of TCM and indeed makes it difficult to sustain efforts to use TCM. It is suggested that the importance of involving institutional and academic leadership (and identifying organizational steps to ensure that involvement) needs to be emphasized in the *TCM Handbook*, and/or through training and implementation assistance efforts described below.

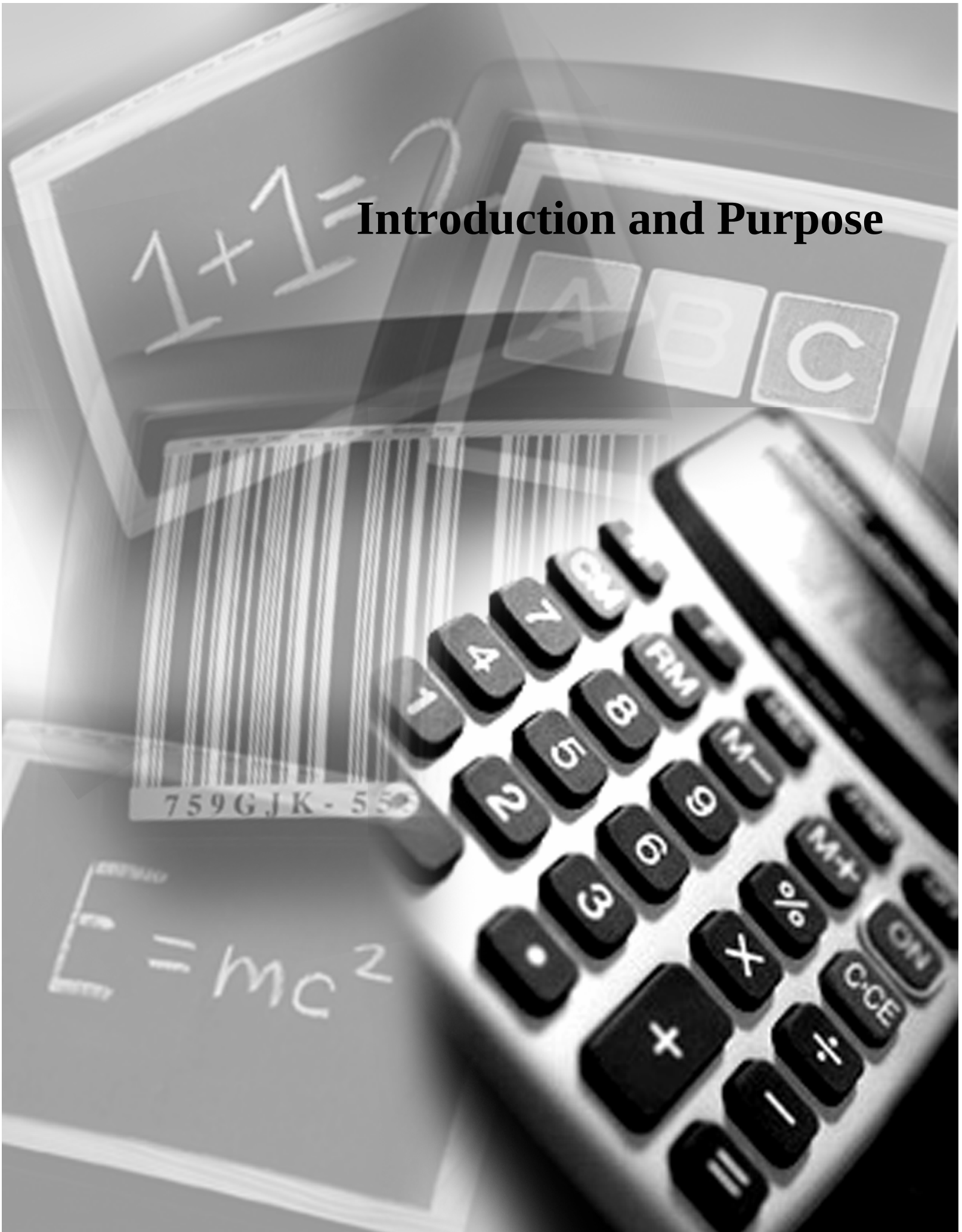
Training and Technical Assistance

While it is clear that institutions see the importance of gaining better knowledge of the costs of technology-based delivery modes — and recognize that the TCM is the direction that needs to be taken to do so — there is also a sense of wheel spinning and frustration in the implementation process. Many institutions need help that extends beyond the *TCM Handbook*.

It is suggested that WCET and NCHEMS develop a training program to support institutions interested in implementing the TCM and that the individuals who deliver this training also be available for on-site technical assistance. After an initial investment in design and development efforts, such a training and technical assistance program could become self-supporting.

Summary

In summary, a valuable tool has been developed by WCET and NCHEMS that is conceptually and technically sound. However, additional steps can be taken to further enhance the utility of this work, which is critical as colleges and universities across the country attempt to plan for and manage the expanding use of technology-based education.



Introduction and Purpose

I. INTRODUCTION AND PURPOSE

The methods by which higher education institutions are delivering instruction are changing rapidly. The advent of the Internet, the World Wide Web, the CD-Rom, and interactive video that is reasonably reliable and of high quality has provided faculty with an expanded set of instructional tools — tools that let them bring information resources, simulation capabilities, and other enhancements to their instructional activities. These advances have also created an explosion of experimentation with, and commitment to, alternative modes of instructional delivery. These changes are also a consequence of some high-profile organizations successfully demonstrating that there is a substantial market for instruction delivered in ways that most educational administrations and faculty would find unconventional and maybe even unacceptable. The University of Phoenix, the British Open University, and other such enterprises are examples of such successful ventures.

This diversification of delivery mechanisms also reflects an increasing responsiveness to client expectations and needs. Clients for higher education are increasingly place-bound, largely because effective performance on the job and as a member of society requires learning throughout life. Once settled with work and family obligations, individuals have limited ability to go to the providers of higher education. If they are to be reached, the providers will have to go to them. While these place-bound adults are expanding the domain regarding **where** learning opportunities will be delivered, all clients are pressing provider organizations on the issue of **when** these opportunities will be offered. Many colleges and universities find that a preponderance of students enrolled in distance-delivered courses are simultaneously enrolled in on-campus courses. This fact points to time, rather than place, as being a critical variable for these individuals.

Whatever the motivation, the volume of instruction being delivered either (a) off-site, or (b) on-site but with considerable technology enhancements has reached a level at which both educational and managerial questions are being raised. While a faculty member meeting with a group of students in face-to-face interaction remains the modal form of instruction, alternative forms of instructional delivery (those involving no direct personal interactions or those in which technology plays a major adjunct role) are expanding rapidly. Among academics, the debate rages about the effectiveness — or quality — of these newer approaches to instruction. While the debate will continue, it is too late to turn back. Recent history suggests that both the variety of offerings and the number of individuals availing themselves of these alternative forms of instruction will not only increase but will increase dramatically. The alternatives are entering — and in some circumstances, becoming — the mainstream.

As these alternative forms of delivering (or augmenting) instruction become more common, they cease to fly beneath managerial radar. At many institutions, these alternatives historically have been treated as "experimental" or "demonstration" approaches to the delivery of instruction. As

such, they were frequently ignored in a managerial context. Alternatively, they were treated as "projects" funded from special allocations of resources, often from sources outside the institution. As such there was a fiduciary interest in accounting for associated costs, of the type typically reported to a funder of any grant or contract. However, as these new (to many institutions) forms of delivery have become more commonplace, decisionmakers understandably are asking questions that they previously had not asked.

1. What are the per student costs associated with alternative forms of instructional delivery? How do costs of alternative methods compare to more traditional, face-to-face classroom instruction?
2. Under what conditions, if any, do alternative mechanisms become cost-effective? For example, are there enrollment levels at which certain instructional methods become much more cost-effective than other approaches?
3. What are the learning results? Are they as good as those achieved through classroom modes? Does the widespread finding of "no significant differences" hold in this particular case? Are learning outcomes different, not just in level but in kind?
4. What are the levels of user satisfaction, from the perspective of both clients and faculty?

There are too few answers for these reasonable questions. Certainly, there is not sufficient empirical evidence to yield rules of thumb that can inform managerial choices. This is not to say there are **no** data available about the costs of alternative methods of delivery. Indeed, many of the ongoing alternative delivery activities — be they experimental, or now mainstream — have developed cost or expenditure data of some form. Further, there have been efforts to capture some of these fugitive data and to:

- Develop comparative statistics regarding costs of instruction delivered through various modes (Bates and Rumble)[1],
- Model cost behavior of different instructional modes at different enrollment levels (Jewett)[2].

These studies have made enormous contributions to an understanding of cost variations across different modes of delivery. As significant as the contributions of these studies are, however, they suffer from the limitations of the data on which they are based. In the cases of the comparative studies, the authors had little choice but to use whatever data were readily available. As is common in such instances, the available data resided in record systems kept in accordance with very different data categories, definitions, and data entry protocols. As a consequence, the authors were required to adjust these data as best they could in order to achieve some measure of comparability. Such post facto adjustments were pragmatically necessary if their studies were to

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[1] A.W. (Tony) Bates, "Technology, Open Learning, and Distance Education," Routledge, 1995. Greville Rumble, *The Costs and Economics of Open and Distance Learning*, Kogan Page, 1997.

[2] Frank Jewett has developed a simulation model (called BRIDGE) to compare the costs of expanding a campus using mediated instruction versus using classroom instruction. Copies of the BRIDGE model are available at the WCET projects website <www.wcet.info/tcndownload.asp>.

proceed. Their work would have benefited enormously from a measure of standardization in the categories and definitions of the data on which their studies were based.

In Jewett's work in modeling the costs of alternative delivery across eight case studies, the data used were those available in the budget and accounting systems of the various campuses involved, augmented by information about faculty workload policy and salary schedules, equipment inventories, and special communications costs. For the BRIDGE cost simulation model, he used default values based upon systemwide data from the California State University. While these data are generally comparable from campus to campus (even across states), and over time, it is also true that these data reflect the experiences — and the idiosyncrasies — of a single institution. A good deal more credence could be accorded the results if they were benchmarked against the experiences of other institutions operating within a different set of internal rules and regulations.

These comments and observations are not intended to denigrate the pioneering work that these studies represent. Rather, the intent is to make a case for more — and more comparable — data about the costs associated with delivering instruction in various ways.

Decisionmakers need internal data that allows costs of alternative modes of delivery to be compared. There is a fairly long history of calculating costs of instruction under an assumption of traditional classroom delivery. In the generally recognized approaches to costing, mode of delivery is almost never explicitly considered; there is an assumption that instruction will be conducted on-campus, in a classroom or laboratory, using face-to-face methods of instruction. This assumption is no longer appropriate.

Purposes of this Handbook

Given the emergence of alternative delivery modes, there is need for costing methodologies that:

- Make delivery modes explicit,
- Consider the full range of costs associated with each mode so that valid comparisons can be made,
- Provide decisionmakers with information about the conditions under which different delivery modes have a comparative advantage.

Objective 1: The first objective of this Handbook is to present a costing methodology that responds to an institution's internal need to define delivery modes, identify the full range of costs for those delivery modes and develop analytical data for cost comparisons.

The development of these internal cost data is a necessary first step for decisionmakers. However, they also need a context within which they can interpret the results—they need "benchmark" information. Only by compiling data from many more of the "natural experiments" now underway will it be possible to develop a body of conventional wisdom about the patterns in variation of costs across:

- Different modes of delivery,
- Varying enrollment levels within each of the different modes.

By accumulating such data over time, general rules will likely emerge — rules of thumb, such as those regarding differential costs of instruction in different disciplines and at different levels that emerged from cost analyses conducted in years past. These rules of thumb (such as those that help us understand the typical relative costs of lower-division versus graduate-level instruction in a given discipline or of upper-division instruction in psychology versus that in engineering) do not provide precise guides. They do, however, provide decisionmakers with information that serves them well when more detailed analyses are either not possible or not warranted. For instance, most decisionmakers expect lower-division nursing courses to cost roughly twice that of lower-division social science courses. The same level of intuitive understanding does not exist regarding the relative costs of delivering a 30-student, lower-division social science class by regular classroom instruction versus interactive video. The objective is to work toward a situation in which this level of understanding is widely shared.

There are two paths by which this objective could be pursued. The first is to devise and utilize a common record-keeping system in which those wishing to conduct cost analyses would keep their operating (transactional) data. Data kept in a standard way, if analyzed using similar procedures, would yield the kinds of comparable information that policymakers constantly seek. While this alternative has many desirable characteristics, it is rejected as being infeasible. Institutions have made heavy investments in data systems designed to serve their day-to-day operational needs. These data systems differ considerably for a variety of reasons, not the least of which are the accounting and reporting requirements of state and local governments that provide the majority of funding to many institutions. Given the competition for scarce revenues, there is almost no chance that institutions will abandon these data systems in order to adopt a replacement that would simplify some analyses but complicate the majority of their day-to-day activities.

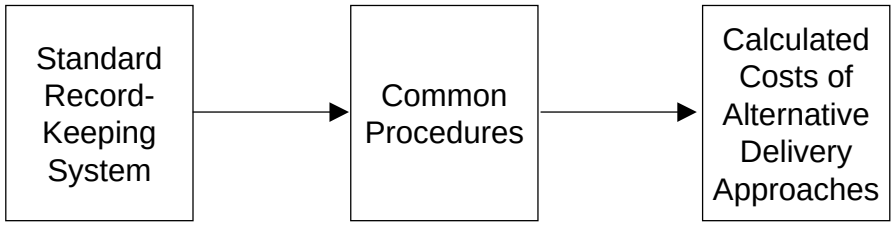
The outright rejection of one alternative leads to the second as the one to be investigated further. In the second:

- Institutions continue to keep their basic data in existing, diverse record-keeping systems,
- These data are translated into a common set of data structures and categories. This translation step itself will typically require some form of analytic activity,
- Data in these common data structures are manipulated/analyzed in accordance with a set of "conventions" designed to produce the information deemed most useful to policymakers and other users.

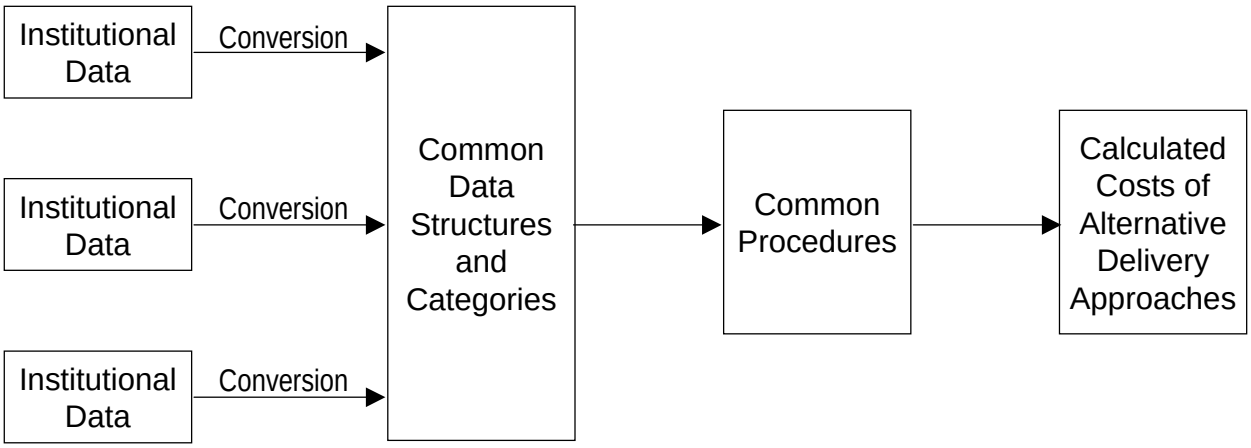
These two alternatives can be described diagrammatically as follows.

FIGURE 1: Data Structure – 2 Alternatives

Alternative 1



Alternative 2



Objective 2: Therefore, the second purpose of this document is to propose a set of procedures by which data from multiple institutions can be placed in a reasonably common framework and exchanged or compiled.

With this objective in mind, the document contains:

- A proposed common data structure,
- Definition of the data categories and elements necessary within this data structure,
- Specifications of the conventions and common procedures required for entering data into the suggested data structure,
- Suggestions/examples for converting these data into the kinds of analytical cost information needed by decisionmakers.

Given that each institution will start the process from its own unique point of departure, it must devise its own procedures for making the conversion to the common data structure as indicated in the diagram for Alternative 2 above. While these conversion routines cannot be specified, hints as to how these translations might be done are provided wherever possible. These

conversion routines will most likely be implemented through use of a series of look-up tables — for example, tables that describe the translation of the institution's departmental numbering scheme to the U.S. Department of Education's Classification of Instructional Programs (See Appendix A) schema recommended for use in inter-institutional exchange.

Some Conceptual Issues

The ultimate objective of this Handbook is to help analysts develop information that will be of assistance in the decisionmaking process. This creates complications immediately. The nature of the use/decision determines the nature of the information that is required. Since there potentially are large numbers of different kinds of decisions, there is potential need for a wide variety of information. To keep the task manageable, several choices that provide focus have been made. These choices, along with some related conceptual matters, are discussed in the balance of this section.

1. The Use of Direct Costs

A conscious choice has also been made with regard to handling of so-called "indirect" costs, costs that are **directly** associated with support functions of various kinds but only **indirectly** associated with instructional activities. Common costing parlance would have:

Direct costs of instruction + direct costs of support activities = total costs
Direct costs of instruction + (allocated share of direct costs of support activities = indirect cost)= full costs of instruction

In this Handbook, the choice has been made to reveal the direct costs of instruction and the direct costs of associated support activities, but only where these costs can be identified. This Handbook does not attempt the allocation of direct costs of support activities (commonly referred to as indirect costs) in order to yield the full cost of instruction. This choice was made (1) because it is direct costs that are managed, and (2) to avoid the effort involved in allocating costs to obtain results that are seldom of managerial utility. As a consequence, the Handbook does **not** provide procedures for allocating support costs — administration, physical plant operating and maintenance, etc. — back to instruction.

2. The Use of Historic Cost Data

This set of choices has two components. First, the methodology is based on historic costs — the use of actual institutional data rather than some theoretical or "ideal" cost factors. While the use of historic costs is the basis for the methodology presented, some aspects of standardized costing are suggested as simplifying alternatives at several points. Further, the costing framework presented lends itself to standard costing applications — that is, it can be used not only with actual institutional data, but with "desired" values as well, a useful exercise when one wants to examine the effects of changing a key variable in the costing equation.

3. The Recognition of Fixed and Variable Components of Cost

Average cost calculations (e.g., total cost divided by enrollment or FTE), by themselves, are not sufficient for analyzing the costs of delivery modes based upon information technology (IT) because these modes have fundamentally different cost structures. Many (if not most) forms of

IT instructional delivery have a significant fixed cost component (related, e.g., to specialized equipment, communication, or production costs) that is not present in classroom instruction. In addition, the variable cost component of IT delivery may also be substantially different from that of classroom delivery. Thus in calculating costs of alternative modes of delivery it is essential that we attempt to identify and estimate both the fixed and variable components of costs prior to calculating average costs.

The model that underlies the costing schema proposed in this Handbook is borrowed from Jewett.[3] The model recognizes:

- Course-related costs — the (capital and operating) costs associated with offering the course, regardless of the numbers of students enrolled in the course,
- Enrollment-related costs — the (capital and operating) costs that vary in accordance with the numbers of students enrolled in the course.

[3] Jewett, Frank. (2000). "A Framework For the Comparative Analysis of the Costs of Classroom Instruction vis-à-vis Distributed Instruction," in M. J. Finkelstein, et al., *Dollars, Distance and Online Education.* Phoenix, AZ: ACE/Oryx Press. Subsequent applications of this model to TCM cost data from several of the TCM pilot institutions is contained in Frank Jewett, TCM/BRIDGE Project: Applications of the "Mini-BRIDGE" Model to TCM Cost Data, WCET, 2002, <wiche.wcet.edu/telcom/projects/TCM/TCMbridge>. A specific application at Washington State University is further discussed and illustrated in Frank Jewett and Tom Henderson, "The TCM Project: Collecting and Interpreting Instructional Cost Data," pp.15-27, *Planning for Higher Education*, Sept-Nov 2003.

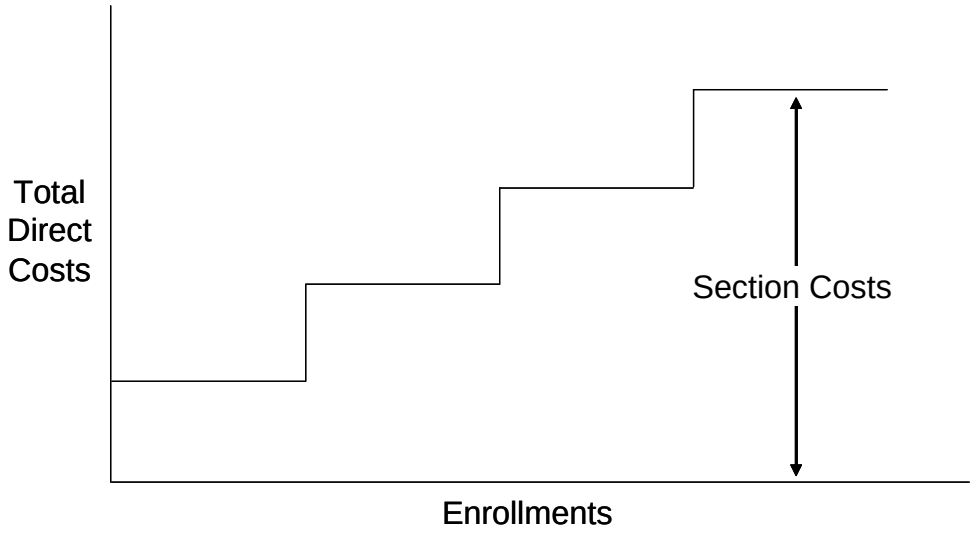
A simple form of this model is illustrated in Figure 1. As defined here, *the underlying model we are working with should be considered a hypothesis whose usefulness will be confirmed by how well it assists in the cost analysis.* Without such a hypothesis as a guide, it is very difficult to organize the analysis or to define useful data. As with all hypotheses, this one is subject to revision or refutation as new information and findings become available.

FIGURE 2: The Underlying Model

There are three elements to the underlying model:

a. For courses in which additional student enrollments are accommodated by adding course sections and for which there is no common course experience (i.e., a common large lecture).

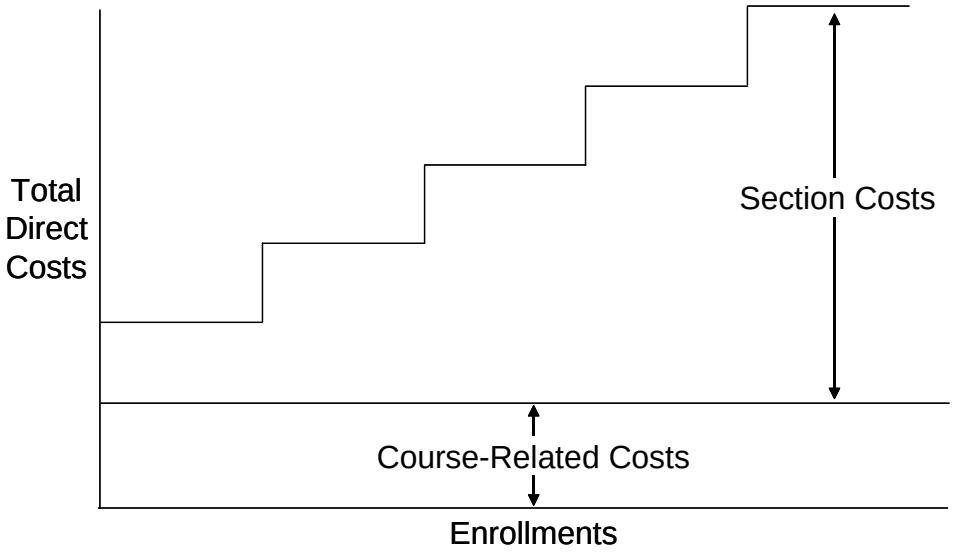
   As enrollments increase, total direct costs similarly increase, but as a step function. Once there is a pre-determined number of enrollments, an additional course section is added.[4]



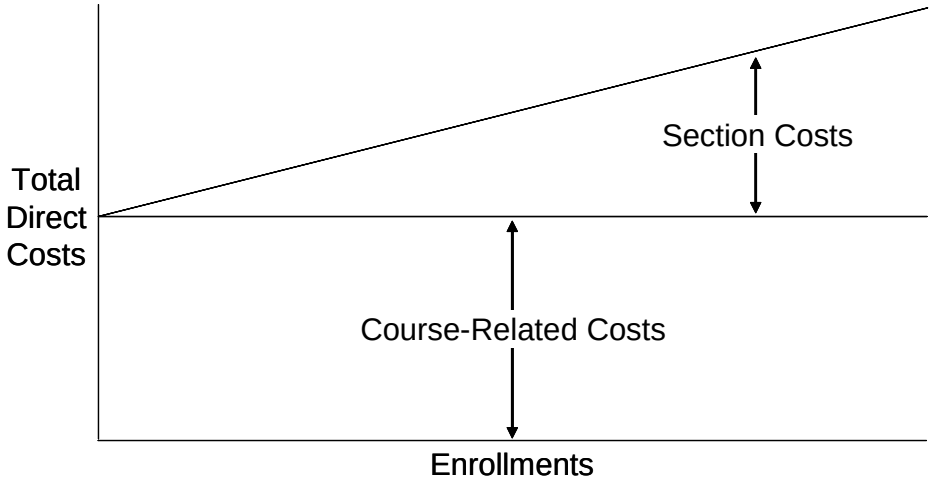
[4] For planning purposes the "break point" enrollment at which an additional section is added is often a single number thus generating a set of sections of equal size. After-the-fact section enrollments will differ according to how many students actually enroll in each section.

b. For courses in which adding more discussion sections accommodates additional students but for which there **is** an associated set of course-related costs (i.e., a common large lecture).

   Total direct costs are again a step function, being increased with the addition of discussion section and a pre-determined enrollment level. However, the common lecture provides a fixed cost underlying the added (marginal) costs of the discussion section.

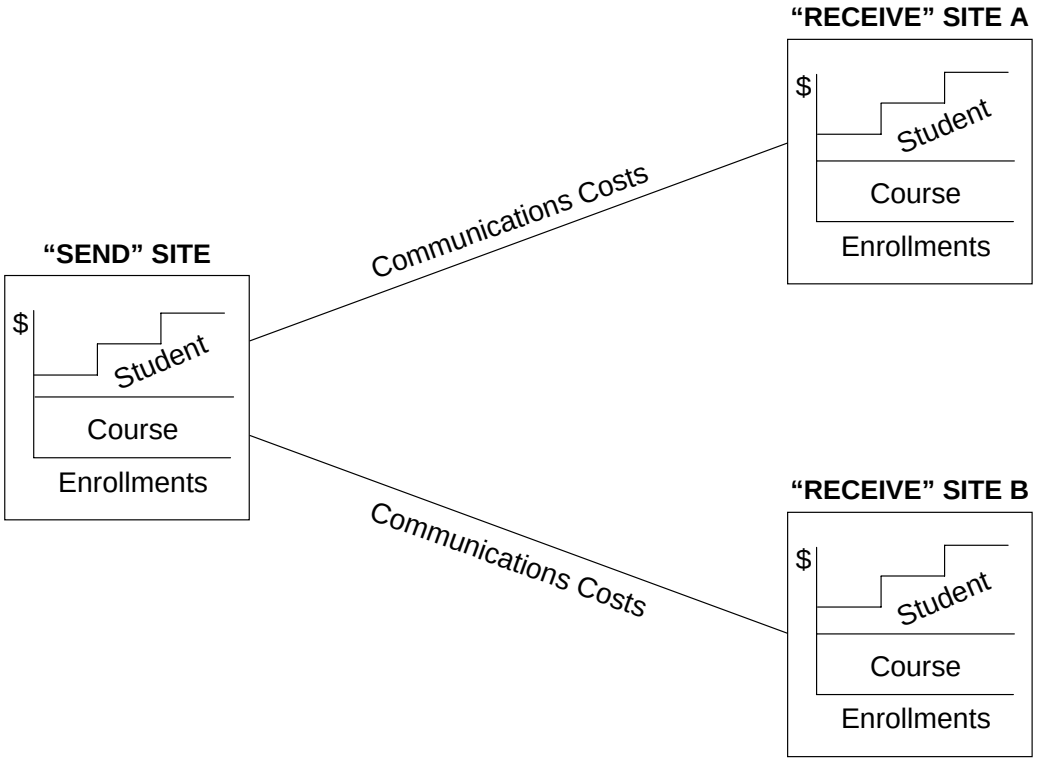


c. For courses (such as Internet-based courses) for which there may be high course development costs but for which additional students can be added without consideration of "sections."



The working model also recognizes that both course- and student-related costs can occur in multiple locations simultaneously. This phenomenon is illustrated in Figure 3. **Figure 3 should be edited to replace "Student" with "Enrollment."**

FIGURE 3: Costs Incurred at Multiple Sites



This diagram reflects conditions in which (for example):

- Course development costs are borne at the "Send" site,
- Multiple sections of the course, with their associated enrollment-related costs, are also incurred at this site,
- Course-related costs (for example, those associated with maintaining receive site capability) are incurred at each receive site,
- Costs associated with multiple sections are incurred at distributed sites,
- Costs of communication between the sites are incurred.

4. Institutional Decisionmakers as the Primary Audience

Much of the impetus for this Handbook came from state-level policymakers who are asking questions such as:

- What are the relative costs and benefits of alternative modes of instructional delivery?
- What are the likely costs of using alternative delivery modes to extend access to students in remote areas of the state?

Answers to many of their core questions, however, require development of institutional-level data. At this early state of costing methodology development, procedures are written as though the audience were institution-level decisionmakers. To the extent that the needs of state-level decisionmakers are coincident with those of their institutional counterparts, this Handbook is

responsive to their needs. A state system office could also coordinate efforts to set analytical data needs with the Handbook. However, full treatment of the issues of primary interest to state-level users will require further developmental work.

5. Units of Analysis

One of the more vexing problems in any cost analysis process is the specification of the appropriate unit of analysis. This Handbook addresses this topic on multiple levels:

- **The course.** The Handbook begins by treating the course as the unit of analysis. It is at this level that one of the basic questions (What are the costs of alternative modes of delivery and under what conditions are various modes cost-effective?) can be addressed. This is the easiest unit of analysis to work with and probably yields the greatest payoff, at least in the short run.
- **The organization unit.** Some institutions have created separate units to house the majority of their "distance-delivered" courses. Others assign the delivery of most "alternative-mode" instruction to Continuing Education Departments or similar units. The Handbook provides a mechanism for segregating the direct costs of such units so that the overall unit costs of such entities can be compared with the overall unit costs of on-campus instruction.
- **The method of delivery.** Finally, there are many managerial questions that revolve around mode of delivery. What are the costs of Web-based courses versus the costs of interactive video courses? The course-by-course analysis addresses this question at one level of specificity. An alternative is to look at the overall cost patterns associated with all courses that use a common mode of delivery. Such analyses help ensure that all costs associated with a particular delivery mode get incorporated into the calculation and avoid the "total is less than the sum of the parts" phenomenon when certain costs are parsed among individual courses. The Handbook treats this topic briefly as well.

6. A Foundation in Activity-Based Costing

The focus of this section is to:

- Identify the set of activities necessary to provide alternative modes of instructional services,

- List the objects of expenditure associated with the resources employed in carrying out these activities,

- Recommend procedures for converting object expenditure data into activity cost data.

Costing in higher education historically has been done at the program or functions level — the familiar categories listed below at the heart of the process:

- Instruction,

- Research,

- Public Service,
- Academic Support,
- Student Services,
- Institutional Support,
- Operation and Maintenance of Physical Plant,
- Scholarships and Fellowships.

These are the categories in which data are reported to the National Center for Education Statistics (NCES) and that are incorporated into nearly all audit reports. The procedures presented in this Handbook respect these standard categories, but move beyond them to an additional level of detail to better describe how instructional services are actually designed, produced, and delivered to students. For example, instruction is disaggregated, or "unbundled," to reflect the following activities:

- Curriculum Planning/Course Design,
- Instructional Materials Development,/Production/Acquisition,
- Course Content Delivery,
- Tutoring/Mentoring, Interaction with Students,
- Assessment of Learning (including assignment of course grades).

The conceptual framework for costing activities presented here is relatively simple. The amounts of various inputs associated with each of the listed activities areidentified and the related amounts of object expenditures are placed in the appropriate box (see Figure 4).

FIGURE 4: Framework for Costing Methodologies

	Activity A	Activity B	Activity C	Total
Object A e.g., salaries	$	$	$	
Object B e.g., office supplies	$	$	$	
Object C e.g., equipment	$	$	$	
Total				

This basic framework stays the same throughout the Handbook . Depending on the unit of analysis, the key dimensions (activities and objects of expenditure) are expanded or contracted to encompass the subcategories required; procedures for entering data are similarly adjusted. When data exchange is the objective, standardized/conventional definitions are presented for both data categories and procedures.

Although the concept of activity-based costing is relatively simple, its application may become complex. This is especially so in regard to the estimation and measurement of faculty (and other high level professional) effort. While this Handbook is not the place for a comprehensive discussion of all the issues involved, it is appropriate to provide some context and to mention some of the important issues in keeping with the TCM objective of providing useful data for management decisions.

Multiple types of activities

Regular, full-time, tenured or tenure-track faculty are expected to participate in a wide variety of activities: to instruct students, to do research in their subject fields, to participate in campus governance, to provide service to the local community and their professional community. The mix of these activities varies depending upon both the type of educational institution and the

particular interests and aptitudes of the individual faculty. Measurement of effort devoted to specific activities is complicated because of joint products, e.g., research may generate major benefits for the instruction of students.

Bundled workload expectations

Because of the way classroom instruction has evolved over the years, the workload expectation for a faculty appointment may be stated as a certain number of courses per year and some level of research activity. Within the classroom format, faculty are responsible for offering the courses that are delivered to students. Thus, the cluster of different tasks associated with offering a course is often aggregated under a heading such as "direct instructional workload." While this convention is reasonable when a single faculty member is responsible for all of the tasks in a classroom setting, it also tends to obscure the fact that the various types of instructional tasks can be identified separately and that the advent of electronically-mediated instruction allows for various tasks to be unbundled and performed by various individuals, including faculty.

Costing by assignments vs. costing by activities

For classroom instruction, costing on the basis of assignment may be completely adequate for planning purposes because faculty and administrators are familiar with expectations of the efforts related to such assignments. For example, for faculty expected to teach eight course sections per year, annual salary may be divided by eight to estimate the cost of a section. If the expectation is four courses and an equivalent amount of research effort, division by eight still yields an estimate of the course cost. It should be noted that this approach automatically allocates a proportion of faculty effort associated with any shared governance activities to the course cost.

At this stage of development, we have little basis for determining the amount of effort associated with carrying out the various unbundled types of instructional assignments related to mediated courses. In fact, determining what would constitute "reasonable" assignments is one of the major costing issues related to mediated instruction.

Developing activity cost data for mediated instruction

Estimates of the amount of effort faculty and other professionals devote to the specific instructional tasks undertaken to provide a given type of mediated instruction can be based upon expert opinion (e.g., department administrator), interviews with selected faculty and other professionals about the effort they expended on various activities, or comprehensive surveys of all faculty and other professionals involved in the activity. All of these options require additional effort, particularly a comprehensive survey.

(Appendix D contains additional material related to using activity-based costing.)

7. Costs Borne by Others

The procedures presented in this Handbook yield the costs to the providing institution of alternative modes of instructional delivery. However, there are numerous instances in which some of the costs associated with the delivery of a course are borne by others. For example:

- Students may be required to own their own computers and thereby bear a (potentially substantial) portion of the technology costs,
- Other institutions serve as receive sites and provide space, equipment, and a variety of support services at no cost to the institution delivering the course,
- A state agency "owns" the communications network and provides free access to institutions.

In all cases, these goods and/or services do not enter into the institutional cost calculation—they are free goods to the institution. At the same time, they represent an exposure to risk for the institution; the cost equation could change drastically through the actions of third parties. The partner institution may begin to charge for services provided or the state agency may decide to recover its costs from the institutions using its network. The procedures presented in the Handbook recognize these as free goods but also require that the implicit costs of such free goods be estimated. With these data, it is possible to calculate actual costs to the institution **and** the costs that would be incurred if the ground rules changed.

8. The Costs of Unused Capacity

Final cost figures can be heavily influenced by decisions made about allocation of costs of some of the productive assets, especially by physical assets. It is rare that assets such as television studios, interactive video-equipped classrooms, etc. are used to the fullest extent possible. This creates a methodological dilemma: should total costs of the asset be allocated on the basis of **actual** use or of use at **full** utilization. That is, if a room were being utilized 20 hours per week and the full utilization were determined to be 80 hours per week, is the cost per hour calculated by dividing the cost by 20 or by 80? The convention adopted in the model is that:

- The cost is calculated on the assumption of full utilization (in the example above, the divisor would be 80),
- The costs associated with the unused 60 hours are accumulated under the label of "Costs of Unused Capacity."

This approach gives managerial impetus to reducing this cost.

The same dilemma arises when courses are underutilized, that is when enrollments are smaller than the theoretical maximum for the course. The average cost per student in a class can be halved if the enrollment is doubled. Here, the convention in the Handbook is to calculate costs per (actually enrolled) student. Sensitivity analyses can be performed by comparing this number with costs per student under conditions of maximum enrollment.

9. The Costs of E-Mail and World Wide Web

There are some costs of productive assets required to teach some technology-based or technology-enhanced courses that are not explicitly recognized in the procedures presented in this Handbook. Chief among them is the costs of e-mail and of access to the World Wide Web. It is recognized that these are not free goods; the institution is incurring a substantial cost to maintain these services. However, they are ubiquitous across the campus. Everyone uses these tools and their use extends across nearly all functions and activities within the institution. It is suggested that costs of these services be incorporated into the calculations described in this Handbook only when:

a. Procedures for allocating such costs have been developed at the institution and are in general use. If such procedures are in general use, existing conventions should be applied here. If these costs are not routinely allocated to functions and/or activities within the institution, no extra effort should be expended to do so in carrying out the procedures described in this Handbook.
b. Separate capacity has been created to serve the unit or mode of delivery for which costs are being calculated. If overall costs of serving the continuing education unit or all Web-based courses are known, for example, then appropriate allocations should be made and the costs recorded.

10. The Costs of Adding Capacity

For managerial purposes, it is important to understand the point at which capacity of general utilities such as e-mail and Web access is exceeded. While they are treated as "free goods" for costing purposes, increases in volume of technology-dependent instructional delivery may create a requirement for significant new investments. The purpose of noting this fact is **not** to suggest a change in costing methodology; from the perspective of costing courses or units, these items should still be treated as free goods (except under conditions as noted in 1 and 7 above). Management should not be misled by these cost numbers into thinking that volume can be increased without incurring additional costs for providing these services. The appropriate analysis is not refinement of the costing methodology. Rather, it is analysis of technological capacity to identify when the next "step-function" investment will be required.

Basic Assumptions

The procedures presented in this Handbook reflect a set of basic assumptions. So that there are no misunderstandings, they are made explicit here. They include:

1. The procedures are analytic procedures, not accounting procedures. The objective is not to create a record-keeping system (although the result may be to influence the content of record-keeping systems in some instances). Rather, the agenda is to suggest analytic conventions and approaches that can be used to organize data in a way that informs internal decisionmaking.

2. As a corollary, the intent is to produce results that have utility to decisionmakers rather than results that conform to accounting and auditing standards and principles. Thus, the goal is to develop conceptually sound, meaningful estimates rather than numbers that

fully reconcile to accounting records. This is not an excuse or argument for sloppiness; rather, it is a recognition of the costs associated with transforming data into information and the rapid escalation in costs associated with marginal (and usually unnecessary) improvements to monetary precision in this regard. The intent is to generate results that are considerably better than back-of-the-envelope estimates, but not as precise as those that could be obtained if all transactional costs were accounted for at the course level.

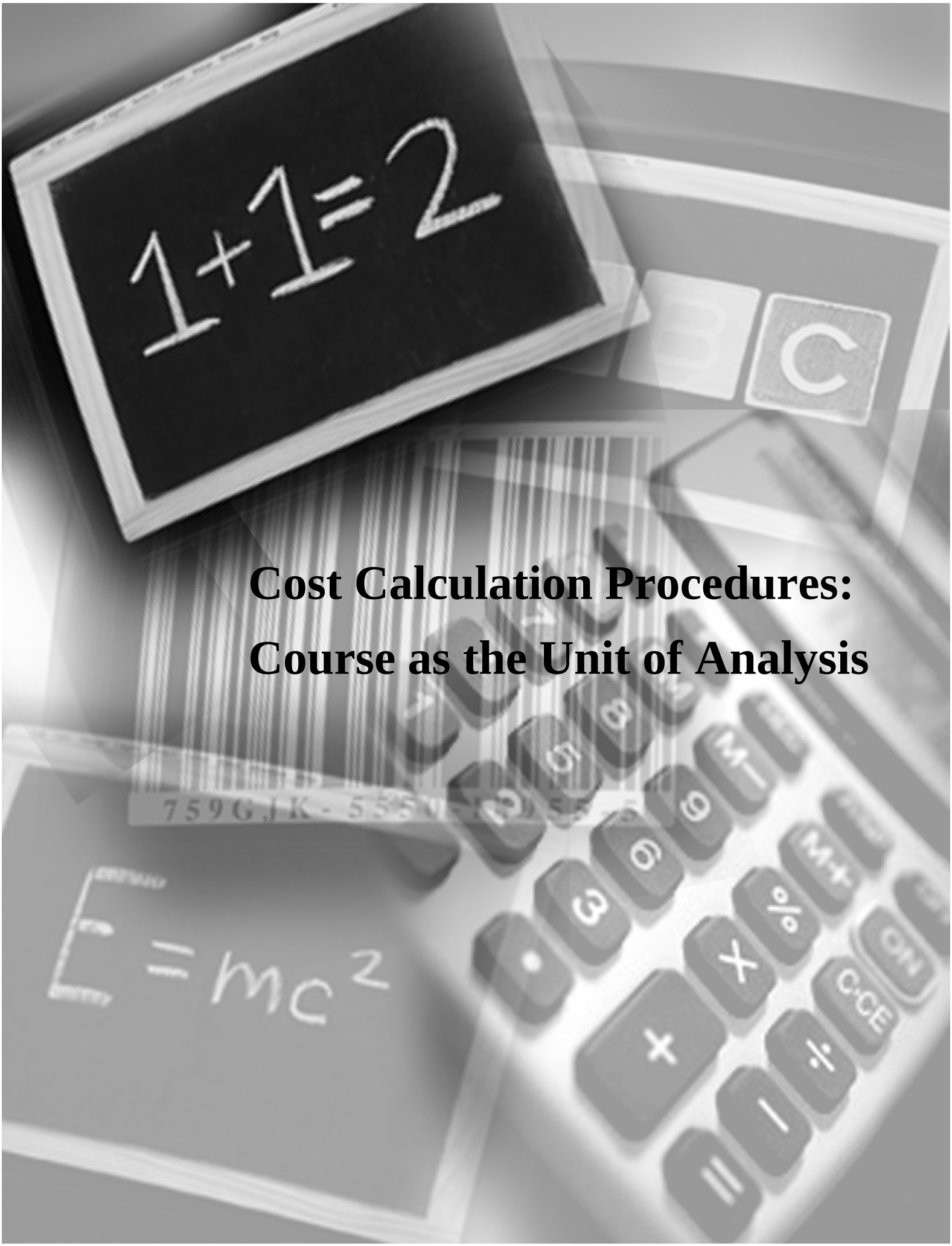
3. The procedures constructed must be applicable to all kinds of instructional delivery, from the most traditional face-to-face instruction in a seminar to asynchronous learning through courses delivered over the World Wide Web. Indeed, a primary objective is to calculate costs-of-delivery methods that many would consider "non-traditional" in relationship to costs associated with delivery in a regular classroom setting.

4. Since the criterion is managerial utility, the eventual need is to have a costing framework that allows capturing data on both delivery method and scale (number of students enrolled). This will shed light on the question of whether there are conditions under which a seemingly cost-effective approach loses its comparative advantage vis-à-vis other approaches (and vice versa). While a single institution can develop data on alternative methods using only data originating from within, most institutions will be unable to calculate scale effects over a sufficiently wide spectrum to be useful. It is in this arena that comparable data from multiple institutions—data developed in conformance with a common underlying model—can have their greatest utility.

   Therefore, in order to understand cost behavior in ways that have managerial meaning—and to protect against charges of inappropriate comparison—the methodology must recognize distinctions in the following areas:

   - Discipline,
   - Level,
   - Delivery method,
   - Scale—variations in costs per student that arise because the number of enrollment varies.

The balance of this Handbook is devoted to a description of procedures for calculating costs. Section II describes the set of procedures that can be used to calculate costs where the course is the unit of analysis. These procedures allow institutional conventions to prevail; there is no absolute requirement for standardized/common data structures and definitions. Section III takes the same concepts a step further and specifies data categories and calculation conventions for calculating costs of alternative units of analysis — organizational units and modes of delivery. Section IV contains definitions of data categories and calculation routines recommended for use when the objective is interinstitutional exchange and comparison.



Cost Calculation Procedures: Course as the Unit of Analysis

II. COST CALCULATION PROCEDURES: COURSE AS THE UNIT OF ANALYSIS*

The procedures presented in this section have been organized in two important ways:

A. They utilize the course as the unit of analysis. Some of the complexities associated with other units of analysis (for example, an organizational unit devoted to distance education) are avoided at this juncture. These issues are addressed in Section III.

B. They presume that the resulting data are strictly for internal use within a campus and not between campuses. Therefore, while the procedures must be conceptually consistent with procedures used to calculate cost information intended for exchange or comparison with data from other institutions, there is no imperative that common data structure and definitions be used. The standard data categories and definitions suggested for use when exchanging information are discussed in Section IV.

Within this simplifying set of assumptions, procedures for calculating costs at the course level consist of the steps described below.

Overview of seven steps necessary for calculating costs at the course level:

Step 1. Identify courses for which cost calculations are to be made.

Step 2. Write a prose description of the delivery mechanism being used and the kinds of resources being utilized.

Step 3. Establish the activity structure that describes the course.

Step 4. Identify the array of resources utilized in offering the course.

Step 5. Assign costs associated with various objects of expenditure to the elements in the activity structure.

Step 6. Calculate the costs of underutilized capacity.

Step 7. Summarize the results of steps 1-6 into Table 4:

Panel A: Course descriptive data, including course units and enrollment

Panel B: Course cost data

Panel C: Average cost data derived from Panels A and B

Panel D: Costs borne by others and costs of unused capacity.

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* A version of this section was published as Dennis Jones' and Frank Jewett's "Procedures for Calculating the Costs of Alternative Modes of Instructional Delivery," Chapter 11, in M. J. Finkelstein, et al., *Dollars, distance and online education*, 2000, Phoenix, AZ: ACE/Oryx Press.

Step 1. Identify courses for which cost calculations are to be made.

In this discussion, the term "course" should be interpreted as being a "unit for which learning is certified/transcripted upon successful completion." Since the objective is to identify cost patterns associated with alternative modes of delivery, a course (an entity with a particular identifying number) should be treated holistically. A "course" comprised of a lecture, numerous discussions, and laboratory sections should be viewed as a single course with multiple components to its method of delivery. Similarly, courses with numerous stand-alone sections should also be treated as a single course within a particular mode of delivery.

This step identifies the course(s) under investigations, therefore it is important to note the following descriptors: course title, course number, CIP code, course level, credit hours awarded for completion, distinguish type of credit (quarter, semester, other), and if the course is part of a degree/diploma/certificate program. Initially, this selection should reflect choices based on:

a. Importance to Decisionmakers

Are institutional decisionmakers faced with pending decisions concerning specific courses or further utilization of the method of delivery represented by these courses?

b. Need for Baseline Data

When dealing with cost issues, it is important to have a control/comparison group that allows the resulting cost data to be placed in a broader perspective. In the longer run, it is the intent that these procedures fuel the ability to trade cost data across institutional lines — to have external comparisons for costs associated with delivery of particular kinds of courses delivered in particular ways. In the short run, and for many institutional decisions, the need is for information that compares the cost of teaching a course in the traditional face-to-face classroom mode and those costs associated with alternative delivery formats. As a result, courses offered in multiple formats are particularly useful candidates.

c. Materiality

Analytic time and energy should not be wasted on issues of no consequence. Instead, they should be devoted to generating data and findings that inform decisions of real importance. For most institutions, this will mean identifying a relative handful of courses — and an associated control group of courses, if at all possible — for which costs will be calculated.

d. Representatives

Given a format, courses tend to be taught in essentially the same way. For example, interactive video courses at an institution tend to be offered using a similar set of protocols, as do web-based courses, etc. As a result, there is seldom a need to calculate costs for all courses that might be delivered in alternative formats.

Analytic energy should be devoted to calculating costs associated with delivering those courses that are representative of the larger set.

e. Scale

There is strong evidence that course enrollment is a dominant determinant of the cost-effectiveness of alternative modes of delivery. As a result, it is particularly useful to calculate costs of the largest courses being offered in alternative formats and those of courses of "typical" size.

Step 2. Write a prose description of the delivery mechanism being used and the kinds of resources being utilized.

This step has two purposes. First, it provides the basis from which others — including those in other institutions if data are exchanged — can understand the results of the cost calculation. Second, it helps ensure that the cost calculations will encompass the full range of appropriate items. In order to help frame the subsequent analyses, a description should allow an understanding of:

- The activities being conducted in order to deliver the course,
- The organization or organizational units (whether inside or outside the institution) responsible for the activities,
- The resources (both capital and operating) used in performance of the activities.

This description should be inclusive of required support services (such as technical support for technology-intensive courses) as well as resources, if any, required at remote sites, or individual students must provide that.

Step 3. Establish the activity structure that describes the course.

As indicated in the introductory chapter of this Handbook, the costing methodology essentially involves describing a two-dimensional matrix (activities on one dimension and objects of expenditure on the other) and then filling in the cells of this matrix. As a result, establishing the activity structure for the course(s) for which costs are to be calculated is a critically important step in the process.

Table 1 lists the set of potential choices. In calculating the costs, only those relevant to the course in question should be utilized. When the unit of analysis is a single course, it is typical that the appropriate activity structure will consist of components drawn from (1.0) Instruction and (4.0) Academic Support.

TABLE 1: Costing Activity Structure

1.0 Instruction

- 1.1 Curriculum Planning/Course Design
- 1.2 Instructional Materials Development/Production/Acquisition
- 1.3 Course Content Delivery
- 1.4 Tutoring/Mentoring, Interaction with Students
- 1.5 Assessment of Learning Including Assignment of Course Grades

4.0 Academic Support

- 4.1 Computing Support
- 4.2 Telecommunications Support
- 4.3 Library/Information Support Services
- 4.4 Assessment Support Services
- 4.5 Academic Logistical Support
- 4.6 Academic Administration
- 4.7 Academic Personnel Development

5.0 Student Services

- 5.1 Academic Advising
- 5.2 Counseling and Career Guidance
- 5.9 Student Access Services/Student Records
  - 5.91 Advertising and Marketing
  - 5.92 Recruitment
  - 5.93 Admissions
  - 5.94 Financial Aid
    - 5.941 Financial Aid Counseling and Evaluation
    - 5.942 Records Maintenance and Reporting
    - 5.943 Student Employment Services
  - 5.95 Student Records

6.0 Institutional Support

This activity structure is based generally on the NCHEMS Program Classification Structure, an organizational structure used in the IPEDS surveys of higher education institutions conducted by the U.S. Department of Education and by many states. That structure, however, is designed to reflect institutional **functions** (e.g., instruction). To make the distinctions necessary for calculating costs of alternative forms of instruction, additional detail in the form of **activity** distinctions is required. This is especially true for the instruction function where the following activity categories are recommended:

- Curriculum Planning/Course Design,
- Instructional Materials Development/Production/Acquisition,
- Course Content Delivery,
- Tutoring/Mentoring, Interaction with Students
- Assessment of Learning (including assignment of course grades).

These activities are defined in Appendix B. For purposes of ascertaining costs for any particular course, the initial step is to determine whether these activities must be separately identified. These distinctions are not necessary for the majority of course sections[5] in which a single individual is responsible for all of them and delivery is traditional, face-to-face in a classroom setting. In this case, the effort of providing instructional services to students is essentially bundled in the workload activities of an individual instructor. For many courses, however — especially for courses taught using various modes of information technology — different resources are associated with these activities, and a further distinction must be made. This is so because information technology provides the potential to unbundle faculty instructional workload into its component parts that can be performed in alternative ways and have different cost implications.

Curriculum Planning/Course Design, and Instructional Materials Development/Production/Acquisition (items 1.1 and 1.2 in Table 1) are classified as "course-related" and Tutoring/Mentoring, and Assessment of Student Learning (items 1.4 and 1.5) are classified as "enrollment-related." The classification of Content Delivery (item 1.3) depends upon the particular situation. The cost of a live studio and a satellite channel, for example, would be treated as course-related; help desk or postage charges for delivering materials to individual students would be treated as enrollment-related.

The point of the distinction between course- and enrollment-related costs is that from the perspective of an individual course, course-related costs are fixed; they represent costs the campus must incur if the course is to be offered. Enrollment-related costs are not fixed at the level of the individual course; they vary as the number of students enrolled varies.

The activities classified as course-related costs may contain another distinction — that between operating and capital expense. To the extent that course materials are purchased outright or produced as part of a separately identified project with the intent that the materials be used over a period of several years, the related costs should be identified as capital expenses. These capital expenses should not be treated as a charge against the current year's operation but should be amortized in accordance with the procedures discussed for courseware/software on pages 33-34 of this Handbook. The costs of maintaining courseware (whether to update the software or the course content) or the cost of leasing the courseware are appropriately treated as operating expenses.

Beyond the instruction program, however, questions about whether to include or exclude functions/activities from the calculation become less black and white. This is due largely to the necessity of making judgments between direct costs of instruction versus direct costs of associated support programs. While, in the end, decisions to include or exclude certain items are necessarily judgment calls, the following considerations can help inform that judgment.

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[5] A section is one specific offering of an individual course, e.g., Economics 100 offered Fall term 2003 at 9 a.m.in Founder's Hall, room 109, is a section of Econ 100. Several sections of the course may be offered in any given term or during an academic year.

a. Ability to Specifically Assign Costs

Direct costs of instruction are best conceived as those that can be explicitly tied to a specific course, while direct costs of associated support programs typically can be assigned only on the basis of some pro-rata share. Thus, if a faculty member makes use of the educational media center to get advice about how to develop a Web page for a course, the cost would normally be considered a direct cost of a support function (Academic Support). If, however, the educational media center undertook a project to develop courseware for a particular course on a "project" basis, that cost would appropriately be considered a direct cost of that course.

b. Materiality

In many situations, much effort is required to relate costs directly to instructional cost objectives, with the results not being substantially different from the identification of cost as direct costs of support function. Therefore, an important factor for consideration in the assignment of costs is the added expense of identifying costs as direct rather than "indirect." The expense of making a precise assignment of costs as direct must be weighed against the precision required in satisfying the purpose for which the cost information is to be used.

If costs are direct but particularly difficult to assign or allocate, it may be useful to arbitrarily assign a very modest cost — e.g., $100 — as a placeholder. This act ensures that the item is not ignored and puts it on the list with an estimate that can be improved later if additional precision becomes important. This set of judgments can easily introduce variations into the results. On the other hand, trying to account for every penny in the cost calculation can result in analytic costs far beyond the value of marginal improvements in results. The best advice is to err on the side of simplicity and add detail only in those few instances where either potential materiality (size of the potential change) or the politics of the decisionmaking process demand it.

Step 4. Identify the array of resources utilized in offering the course.

The second dimension of the two-dimensional cost matrix is objects of expenditure — the different types of resources that are used in delivering the course. Table 2 lists the potential objects of expenditure.

TABLE 2: Objects of Expenditure

1. Compensation
   - Executive/Managers
   - Other Professionals
   - Instruction/Research/Professionals/Faculty
     - Tenure-Track Faculty
     - Non-Tenure-Track Faculty
     - Teaching/Graduate Assistants
   - Technicians
   - Clerical Staff
   - Trades Workers
   - Service Workers
2. Operating Expenses
   - Office and Instructional Supplies
   - Travel
   - Communications
     - Voice/video/data connect time charges
     - Satellite transponder time charges
   - Duplication of Materials
     - Print
     - Audio
     - Video
   - Postage and Other Distribution Services
   - Contract Services
     - Consulting
     - Purchased services
   - Licenses—payments for the use of proprietary:
     - Courseware
     - Software
     - Databases
   - Rent
   - Minor Capital Items
3. Capital Items
   - Facilities
   - Equipment
   - Telecommunication Infrastructure
   - Courseware/Software
   - Professional Development
4. Costs Borne by Others
   - Other Institutions
   - State Agencies
   - Students
   - Other

The definitions of these objectives of expenditure categories are contained in Appendix C.

As with the list of activities, not all of these different kinds of resources will be utilized in delivering any particular course. As a result, an initial task in the costing process is to use Table 2 as a checklist and identify those objects of expenditure that must be incorporated into the cost analysis process for the course(s) under consideration.

Step 5. Assign costs associated with various objects of expenditure to the elements in the activity structure.

Combining the elements of Tables 1 and 2, as shown in Table 3, creates the cost matrix around which the suggested methodology is constructed.

TABLE 3: Objects of Expenditure

OBJECTS OF EXPENDITURE	ACTIVITIES*					
	1.0 Instruction		4.0 Academic Support	5.0 Student Services	6.0 Institutional Support	Total
	Course Related 1.1, 1.2, 1.3	Enrollment Related 1.3, 1.4, 1.5				
1. Compensation • Executive/Managers • Other Professionals • Instruction/Research Professionals/Faculty Tenure-Track Faculty Non-Tenure-Track Faculty Teaching/Graduate Assistants • Technicians • Clerical Staff • Trades Workers • Service Workers						
2. Operating Expenses • Office and Instructional Supplies • Travel • Communications Voice/video/data connect time charges Satellite transponder time charges • Duplication of Materials Print Audio Video • Postage and Other Distribution Services • Contract Services Consulting Purchased services • Licenses—payments for the use of proprietary: Courseware Software Databases • Rent • Minor Capital Items						

TABLE 3: Objects of Expenditure

OBJECTS OF EXPENDITURE	ACTIVITIES*					
	1.0 Instruction		4.0 Academic Support	5.0 Student Services	6.0 Institutional Support	Total
	Course Related 1.1, 1.2, 1.3	Enrollment Related 1.3, 1.4, 1.5				
3. Capital Items • Facilities • Equipment • Telecommunication Infrastructure • Courseware/Software • Professional Development						
4. Costs Borne by Others • Other Institutions • State Agencies • Students • Other						

* With appropriate detail from Table 1 as determined in Step 3

In simple terms, the task is to add cost information, **as appropriate**, to the matrix shown in Table 3. The "as appropriate" is emphasized to reinforce the point that, for many courses, there will not be entries in many of these rows and columns—or even in most of them. For simplicity, the matrix for each course for which costs are being calculated should be constructed using only those activities and objects of expenditure appropriate to that course. The extended lists presented in Tables 1 and 2 should be used as a checklist rather than suggestions that all of these entries are needed to describe any one course.

With this framework (matrix) established, the task for Step 5 is to enter cost figures into this format. Since the procedures are analytic rather than accounting devices, several shortcuts and conventions should be considered in making these entries. Suggestions for making these entries are presented below. They are organized by object of expenditure; however, it should be remembered that costs should be estimated for each activity, as appropriate, for each object of expenditure.

a. Instruction/Research Professionals

Instruction/Research Professionals are those individuals typically labeled as "faculty" and graduate assistants/teaching paraprofessionals. Differing practices of institutions regarding who is and is not considered a faculty member requires the use of this more precise term as defined in Appendix C. Suggestions regarding procedures for attaching costs of instruction/research professionals to the activity structure include:

(1) Use data that is based upon assigning costs to each course as the basis for the calculation unless the institution already has a fully functioning faculty activity reporting system in place. If, for example, the institution has a four-course teaching load for each of two semesters, assign each course one-eighth of an individual's load for the year. If the normal teaching load is two courses per semester, with 50 percent of the faculty members' time allocated to research and public service, then each course would still represent one-eighth of an individual's load for the year. The same algorithm applies for graduate students.

(2) Be concerned initially that the total resource commitment of an individual to course is accurately captured and reflected. Then distribute this total across activities only if this distinction is important (i.e., the individual does not perform **all** the activities associated with the course). If distribution of costs across activities is appropriate, it is suggested that percentage allocations be made based on information obtained from a knowledgeable source (the individual involved, or a department chair).

(3) Provide entries for such items as materials development only if there is a clearly established basis for determining costs — for example, faculty members are given release time to develop course materials or assessments. If the materials developed are intended to have a useful life of more than one year and/or they are to be used in teaching the course multiple times, an appropriate allocation must be made. Suggestions in this regard are treated in the part of the capital section dealing with acquisition/development of courseware.

In the absence of identifiable time (and therefore, costs) that can be associated with the creation of an asset, there is little need to cost these elements separately.

(4) Use average compensation by type of personnel when making cost calculations. Since overall costs are so heavily influenced by the personnel component, using actual compensation of the specific individual teaching the course may yield a result that is attributable more to the accident of personnel assignments than to actual costs. Using averages (or, better yet, medians) serves to remove this source of variation. This will lead to greater comparability of results, both inside and outside the institution. In instances in which faculty are paid a "premium" to teach using alternative delivery modes, the value of this premium should be reflected.

(5) Keep track of FTEs of human resources used as well as the dollar cost. This allows elimination of price differences in making comparisons.

b. Other Employees

(6) For technicians and other support personnel, include costs only for hours that can be tied directly to the course in question. For example, it is usually possible to specifically identify hours devoted by technicians operating the equipment for interactive video communications. In calculating costs, again it is recommended that costs be calculated as:

cost = assigned hours x average compensation/hour.

Costs of staff who keep the computer systems running, but cannot be tied explicitly to the course, should be treated as direct costs of academic support (an "indirect cost") rather than as a direct cost of instruction.

(7) Clerical and other support staff would normally be considered as part of the indirect cost component and would not be entered into the format. The only exceptions would be instances where staff is explicitly assigned to projects associated solely with a single course or a set of courses. An alternative is to prorate departmental support staff across faculty positions. As a consequence, each faculty position, or fraction thereof, comes with its own share of clerical and other instructional support staff.

c. Supplies and Expenses

(8) *Office and Instructional Supplies* — Include expenses directly attributable to the course. Where costs cannot be directly assigned to a course, it is often possible and practical to:

- estimate per-faculty costs for course-related (office) supplies,
- estimate per-course enrollment costs for instructional supplies.

and to use these costs in the calculation routines. The only caution here is that costs of supplies in some courses (e.g., lab courses) can be much greater than costs of other courses in the same discipline. A per enrollment cost calculation can quickly indicate whether these costs are material.

(9) *Trave l*— Again, only expenses directly related to the course should be included Typical in this category are expenses associated with faculty traveling to an off-campus site to teach a class. For ease of calculation, it is appropriate to estimate:

travel costs = costs/trip x number of trips required.

(10) *Communications* — These costs are usually determined on the basis of cost per hour of connect time or of transponder time. Again, for analytic purposes, it is appropriate to estimate this cost as:

communication costs = cost/hour x number of hours.

For transponders, it may be appropriate to calculate per course costs by calculating:

lease cost of transponder per year ÷ number of courses at capacity use.

In any event, it is not necessary to obtain this number by actual compilation of accounting data.

(11) *Duplication of Materials* — Many alternative forms of delivery rely on use of materials — print, audio, video, CD-ROMs, etc. — specifically designed for the course. This cost component includes the cost of reproducing the materials for student use. Costs of developing the materials in the first instance (costs of creating the "Masters" from which duplicates are made) are not included here (they are included as a capital item). Calculation of the cost in this area is appropriately done by estimating cost per unit and multiplying by number of units.

(12) *Postage and Distribution Services* — Include here the estimated costs of mailing or otherwise distributing course materials identified above. Again, the costs included are only those directly attributable to the course; other postage costs are appropriately considered an indirect cost.

(13) *Contract Services* — This category includes costs of consultants and purchase of services under contract. This category excludes purchases of services of part-time faculty members, a cost treated as part of personnel compensation.

(14) *Licenses* — Included in this category are fees paid for the use of proprietary courseware, software, databases. For inclusion in this category, expenditures must be made solely for purposes of supporting the course in question; for example, software designed and used expressly for teaching a basic accounting course, calculus, etc. In some instances, license fees are established on a per-student basis. In this case, the cost estimate is simply the product of cost per student and number of students. In other instances, site licenses are granted without reference to number of users. In still other cases, there is a base license fee with an additional per-student fee. In these latter cases, costs are determined by calculating the per-student costs (including students in all sections of the course for which cost estimates are being developed) and multiplying by number of students.

(15) *Rent* — This category includes costs of using space in facilities not owned by the organization providing the instruction. Typical would be rents associated with delivering a course at a high school or other off-campus site. The calculation is as follows:

cost = annual cost/square foot x number of square feet x
(total hours of course use/total hours per year of room availability).

The total hours per year of room availability is the product of the number of hours per week the room **could** be used and the number of weeks per year the room **could** be assigned. Both components of this calculation (these standards should reflect institutional choice) are basically institutional (or state) policy variables.

(16) *Minor Capital Items* — Items having a useful life in excess of one year but having an acquisition costs of less than $1,000 (e.g., calculators, fax machines, etc.).

d. Capital Items

Historically, capital costs have not been calculated as an element in higher education cost studies. This is particularly true of facilities costs, but can also be true of equipment costs and costs associated with acquisition of courseware and course-specific materials that have a multi-year life. However, one of the hallmarks of many of the alternative modes of delivery is the substitution of capital for labor — that is, the use of technology to do some part of the instruction function that had typically been done by a faculty member. As a consequence, meaningful comparisons of alternative delivery mechanisms require explicit recognition of capital costs. This applies regardless of mode of delivery. The general rule is that costs of **all** capital items should be converted to an annual cost, no matter how access to them is obtained (purchase, lease, or home grown).

(1) *Facilities* — Almost all forms of delivery require some type of facilities. Further, many alternative forms of delivery require either the construction or use of special purpose facilities (e.g., television studios or "smart" classrooms) or a direct expenditure for lease/rent of off-campus facilities. Rental costs were discussed above. To keep the comparisons on a level playing field, facilities costs associated with traditional classroom instruction should be included in the calculation. The calculation of capital costs of owned facilities can take alternative forms:

$$\left[\begin{array}{c}\text{Cost per square foot}\\ \text{to construct space}\end{array} \div 50\right] \times \begin{array}{c}\text{Square feet of}\\ \text{space used}\end{array} \times \left[\text{hours used} \div \begin{array}{c}\text{hours of}\\ \text{capacity}\end{array}\right]$$

OR

$$\left[\frac{\text{Total replacement value}}{\text{Net assignable sq. ft.}} \div 50\right] \times \begin{array}{c}\text{Square feet of}\\ \text{space used}\end{array} \times \left[\text{hours used} \div \begin{array}{c}\text{hours of}\\ \text{capacity}\end{array}\right]$$

In both of these equations the number 50 is the suggested convention for number of years of useful life over which capital cost is distributed. In this calculation, hours used is calculated as the number of hours/week multiplied by the number of weeks the class meets. In the absence of more appropriate

institutional data, it is suggested that the conventions discussed in Section IV be employed.

In those instances where facilities are provided "free" by a third party, it is recommended that either, (1) a rental value be established, or (2) an estimated annual capital value be calculated in accordance with the formulas described above. These costs should be treated as "costs borne by others" (see section e below).

(17) *Equipment* — As noted earlier, it is most useful to consider costs of equipment in aggregate, rather than per unit, terms. For example, there may be a need to calculate the costs of equipping:

- A send-site interactive video facility,
- A receive-site interactive video facility,
- A computer lab (perhaps of various standard sizes used on the campus).

At this point, the calculation becomes:

[cost of the facility ÷ years of useful life] x [hours used ÷ hours of capacity].

Concerning this calculation and in the absence of more appropriate institutional factors, it is suggested that the conventions indicated in Section IV be utilized.

Hours of use for computer facilities should be estimated on the basis of number of hours (total for the courses) in which a class physically meets in such a facility (recognizing that this number may well be zero) plus the estimated number of hours a typical student would use the facility outside of formal class. Thus, if the course meets in a computer lab for three hours per week and (all) students are expected to (or typically do) use the facility an additional six hours per week, the effective demand on the facility is nine hours per week. Such unscheduled use argues for basing the hours of capacity on a use level considerably higher than the 30-40 hours of use normally used as the basis for determining **scheduled** room use.

(18) *Courseware/Software* — In the case of software/courseware, costs should only be included if:

- The material is expressly for the course for which cost calculations are being made. Thus, costs associated with acquiring general-purpose software — e-mail, word processing, spreadsheets, etc. — would not be included, even if they were used regularly by students in the class.
- The expenditure covers a multi-year period. If costs are limited to year-to-year expenditures for licensing, the costs should be reflected under licenses in the Supplies and Expenses category.

In addition, it must be recognized that these particular assets can be acquired in multiple ways:

- Purchased,
- Leased,
- Locally developed.

In instances where courseware/software is locally developed, an overall development cost should be calculated. This is only true, however, if the material was developed as part of a "project" which received a specific allocation of personnel, technical support, etc. If the material was developed without explicit recognition — no release time for faculty, or assignment of time of graduate students, technicians, etc. — the developmental costs should be ignored.

Where costs are identifiable, through purchase or local development, they should be assigned in accordance with the following algorithm:

[acquisition cost ÷ years of useful life] x [no. of students in class ÷ no. of annual users].

For purposes of these calculations and in the absence of more definitive institutional data, the convention of a useful life of four years should be assumed.

(19) *Professional Development* – Expenditures specifically identifiable as supporting the development of knowledge or skills of faculty and staff (e.g., expenditures for teaching/learning centers, sabbaticals, computer training, etc.).

e. Costs Borne by Others

In many instances, some of the costs associated with delivering a course are borne by parties other than the organization providing the instruction. For example:

- A statewide agency may cover all communications expenditures without charging costs back to the provider,
- A "receive-site" organization may provide space and equipment free of charge,
- A vendor may provide courseware at no cost (or at a substantially reduced cost) in return for the provider serving as a beta test site for the product,
- Students may have to pay for their own computers and ISP access.

In some instances this arrangement is complicated by quid-pro-quo arrangements, e.g., a receive site provides space free in cases in which the sending institution pays for equipping the room. In such instances, it is suggested that:

- The sending institution calculates the amortized cost of equipment and includes this figure in its costs,
- The rented (or amortized) cost of the "free" space be calculated as suggested above and treated as a cost borne by others.

These "foregone" costs should not be included in the summary of the costs of delivering the course. However, it is recommended that the true costs of these free or reduced rate components be calculated according to the procedures identified above and recorded separately. This will serve two purposes. First, it will provide decisionmakers within the institution an indication of their exposure — the additional costs they would have to incur if the ground rules changed. Second, it will aid comparisons in instances where the comparison provider is not receiving the benefits of reduced rates.

Step 6. Calculate the costs of underutilized capacity.

Course cost calculations as specified in the previous steps include costs for facilities and equipment for only those hours actually used for delivery of the course in question. If the facilities and equipment are fully utilized (or nearly so), this yields a result that is not misleading for decisionmakers. However, if these resources are severely underutilized, the resulting course cost as calculated can provide decisionmakers an incomplete (and understated) picture of the costs associated with alternative modes of delivery. In order to overcome this potential problem, two courses of action are available.

Alternative 1 – Calculate costs of unused capacity.

In this alternative, the costs of unused capacity are calculated and appended to the cost of delivery calculations as additional information to be considered in the decisionmaking process. The calculations are the same as those indicated in Step 5d above except that hours **not** used is substituted for hours used in the calculation.

[hours not used = hours of capacity – hours actually used].

Alternative 2 – Distribute total costs over the hours of actual use.

As an alternative, total costs of the resources can be allocated to those courses using them. In this instance, the right hand component of the cost calculation would be altered to:

[hours used for course ÷ total hours used].

The result would typically be an increase over the costs calculated during Step 5.

Alternative 1 is probably more appropriate if full utilization can be reasonably assumed in the short run. If this assumption cannot logically be made, Alternative 2 is a more appropriate path to information useful in a decisionmaking context. The cost of unused capacity is appropriately calculated for on-campus classrooms as well as the more specialized facilities used for alternative modes of delivery. If data are developed for inter-institutional use, a convention on which alternative is to be used must be established a priori.

Step 7. Summary of Data and Calculation of Average Costs.

Table 4 summarizes all the data and calculates various measures of average costs:

(i) Enter course information including enrollments in Panel A.

(ii) Enter cost totals from Table 3 in Panel B (course-related and enrollment-related costs will not be available for courses delivered via regular classroom instruction, and may not be available for mediated courses).

(iii) Sum the program costs across each row to obtain the total direct costs shown in Panel B.

(iv) Divide the total costs shown in Panel B by the enrollment and SCU shown in Panel A to obtain the various measures of average cost in Panel C. (Illustrative data have been entered in Panels A and B that are used to calculate the averages in Panel C.)

(v) Enter costs borne by others (from the last rows of Table 3) and costs of underutilized capacity (calculated at Step 6, above) in Panel D.

Panel C provides basic management information about average course costs. Column 1 shows "average cost per (student) enrollment" and "average cost per SCU," the average cost data that have traditionally been used as the cost indicators for classroom instruction.

If total course related and enrollment related costs for the mediated course(s) are available, calculate "average course related cost" and "average enrollment related cost" in columns 2 and 3 of Panel C. Total course related costs ($6,100 in Panel B) correspond to "fixed costs," costs that are not sensitive to enrollment changes. To the extent fixed costs constitute a substantial share of the cost of the mediated course, the cost structure of the course is characterized by economies of scale (average fixed costs - shown in column 2 of Panel C - decline as enrollment grows - this occurs because the fixed costs are spread over more and more students). Enrollment related costs correspond to "variable costs," costs that are sensitive to enrollment changes. "Average enrollment related cost" ($184 in column 3 of Panel C) is an estimate of "average variable cost," a proxy for incremental or marginal cost, the cost of adding an additional student enrollment to the course.

The cost estimates in Panel C relate directly to the basic cost model (mini-BRIDGE) described in Chapter I (pp. 6-ff).[6] In particular, if the course is classroom mode offered in sections, the average cost per student enrollment in column 1 of Panel C is an estimate of the slope of a line that approximates the step function shown in Figure 2(a). The total course related costs in Panel B ($6,100) are an estimate of the Course Related Costs for a mediated course or a lecture course with discussion sections as shown in Figures 2(b) and 2(c). The average enrollment related cost ($184) from column 3 of Panel C can be used to calculate total Enrollment Related Costs (=average enrollment related cost times enrollment) shown in the same figures. The average enrollment related cost is also an estimate of the slope of the cost function shown in Figure 2(c). Thus, TCM cost data can be used to estimate the parameters of the basic cost model that allows comparisons of the cost of mediated and classroom courses over a range of enrollments. The model illustrates that the question of whether classroom or mediated instruction is "more expensive" may have a different answer depending upon the annual or per term enrollments of the courses being compared. The model is flexible and can be adapted to a variety of situations including those illustrated in Figures 2 (a), (b), and (c) and Figure 3.

Finally, it is appropriate to repeat the *caveat* stated earlier in regard to the cost model. "As defined here, *the underlying model we are working with should be considered a hypothesis whose usefulness will be confirmed by how well it assists in the cost analysis*. Without a hypothesis as a guide, it is very difficult to organize the analysis or to define useful data. As with all hypotheses, this one is subject to revision or refutation as new information and findings become available.

[6] For additional discussion of the mini-BRIDGE model see Jewett (2002) and Jewett and Henderson (2003).

Table 4: Cost Data Summary and Average Cost Calculations

Panel A: Course Information (example data shown in parentheses)

Course title, number and abbreviation, CIP code, course units (semester or quarter)	(Intermediate Microeconomic Theory, Econ 100, 2204, 3 units, semester)
Year and term	(fall 2004)
Course delivery mode	(25% classroom lecture, 75% Internet)
Course enrollment	(45)
Course student credit units (SCU (course units x enrollment)	(135 = 3 x 45)

Panel B: Cost data from Table 3 (example data shown in parentheses)

	Programs:				
	Instruction	Acad. Supp.	Stud. Serv.	Instit. Supp.	Total
Direct costs	($10,000)	($4,000)	($300)	($100)	($14,400)
Course related direct costs	($2,000)	($4,000)		($100)	($6,100)
Enrollment related direct costs	($8,000)		($300)		($8,300)

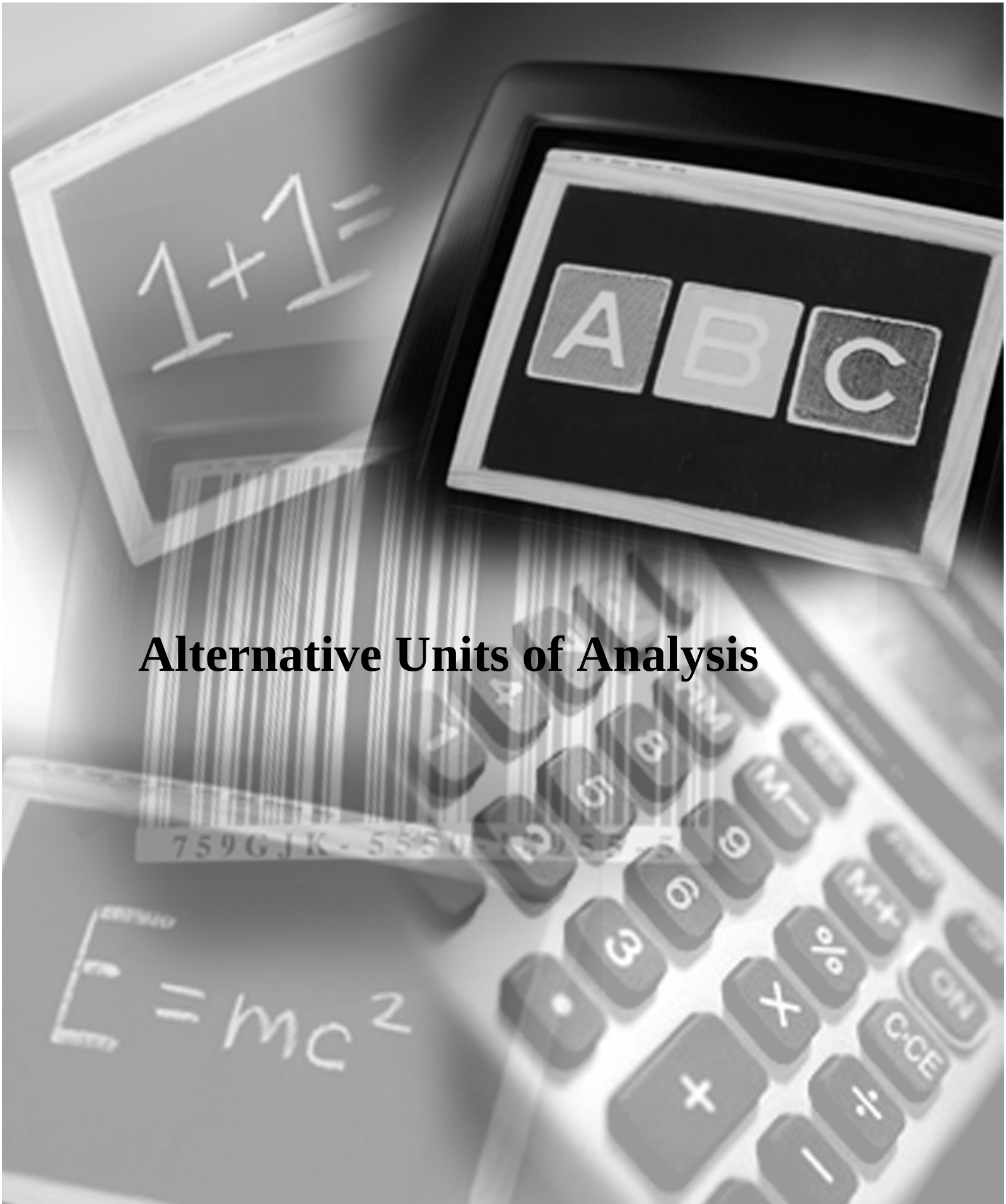
Table 4: Cost Data Summary and Average Cost Calculations (continued)

Panel C: Average costs calculated from Panels A and B (results using example data from Panels A and B shown in parentheses)

Avg. cost per student=total direct cost/enrollment ($320 = 14400/45)	Avg. course-related cost per student=total. course-related cost/enrollment ($136 = 6100/45)	Avg. enrollment-related cost per student=total enrollment- related cost/enrollment ($184 = 8300/45)
Average cost per SCU=total direct cost/SCU ($107 = 14400/135)	Avg. course-related cost per SCU=total Course-related cost/SCU ($45)	Avg. enrollment-related cost per SCU=total Enrollment-related cost/SCU ($61 = 8300/135)

Panel D: Supplementary cost information

Estimated costs borne or contributed by others (bottom rows of Table 3)	
Estimated costs of unused or underutilized capacity from Step 6	



Alternative Units of Analysis

III. ALTERNATIVE UNITS OF ANALYSIS

The costing methodology described in Section II focuses on the course as the unit of analysis. This choice was made because costing at this level is relatively simpler and because it was felt that it is at this level that decisionmakers will find the greatest utility, at least in the short run. Clearly, other possibilities exist, most specifically ascertaining the costs of:

A. Methods of delivery — the costs associated with all courses taught in a single format (interactive video, Web-based, etc.),

B. Organizational unit — the costs associated with an organizational unit such as a department/college of off-campus instruction or distance delivery.

These alternative units of analysis are particularly important when decisionmakers confront a specific set of issues. It could be, for example, that the institution is faced with decisions about committing to Web-based courses and reducing historic reliance on interactive video. Or, the institution is attempting to develop a tuition and fee policy for off-campus instruction.

When faced with such questions, comparative information about costs of delivering individual courses provides only a partial answer. Many of the costs that must be considered in addressing these issues extend beyond consideration of direct costs of instruction. They **can** include costs for activities such as:

- Academic support — the costs associated with organizational units or activities established especially to support technology-based (or enhanced) instruction. Such units might include instructional media development, faculty development, and technology operations.
- Student services — the costs associated with recruiting, enrolling, counseling, advising, and providing other services required by students who are pursuing their educational objectives through alternative modes of delivery or under the auspices of separate organization units (e.g., departments of distance education).
- Administrative costs — the costs of those offices established specifically to manage and oversee the provision of instruction and related support services through alternative means (e.g., the administrative staff of departments of distance education—the equivalents of deans offices that oversee delivery of on-campus instruction).

The conceptual structure for determining the costs associated with these alternative units of analysis is exactly the same as that for calculating costs of delivering individual courses—that is,

a two-dimensional matrix with activities being one dimension and objects of expenditure being the other. The only differences are that:

- The array of activities incorporated within the procedures is more extensive. As noted above, they include costs associated with academic support, student services, and academic administration as well as those costs associated directly with instruction.
- The objects of expenditure categories will be slightly expanded. In particular, costs associated with a wider variety of personnel must be accommodated. For example, in ascertaining costs of a unit charged with overseeing off-campus instruction, costs of administrators and clerical staff as well as faculty and technical support staff must be factored into the calculations.

In some cases, operations of alternative forms of delivery are so integrated into the fabric of the institution, and so widely diffused within it, that calculation of the overall costs of a particular mode of delivery is exceedingly cumbersome. It requires separation and accumulation of costs buried in numerous units within the institution. If this is the case, a managerial question must be raised as to whether the benefits of the information justify the costs of acquiring it.

There are instances, however, where a cost analysis of a specific mode of delivery or of a particular organization unit is relatively straightforward. The conditions that contribute to a feasible analysis at this higher level include:

- A commitment to a single alternative for most of the instructional activity in question. For most institutions, this now means a commitment to either interactive video or to Web-based courses,
- An organizational, and therefore accounting, structure that allows straightforward access to much of the data needed to complete the analyses. Specifically there is a separate unit (or units) responsible for marketing, admission, accounts receivable, etc. for students enrolled through this alternative mechanism.

Overview of nine steps necessary for calculating alternative units of analysis:

Step 1. Identify the delivery mechanism and/or the organizational units for which cost calculations are to be made.

Step 2. Write a prose description.

Step 3. Establish the activity structure for the analysis.

Step 4. Establish the list of objects of expenditure to be included in the analysis.

Step 5. Assign costs associated with various objects of expenditure to the elements in the activity structure.

Step 6. Calculate the costs of underutilized capacity.

Step 7. Sum the component costs to calculate the total costs associated with the method of delivery or the organizational unit.

Step 8. Record the number of students served and student credit hours generated as a result of the delivery method or organizational unit.

Step 9. Calculate costs per student and per credit hour.

A condensed version of the analytic procedure is as follows:

Step 1. Identify the delivery mechanism and/or the organizational units for which cost calculations are to be made.

Step 2. Write a prose description of the size and nature of the enterprise for which the cost calculation is to be made. This step is particularly important because it establishes the domain of the analysis and identifies the organizational units and activities that are to be included, either in whole or in part.

Step 3. Establish the activity structure for the analysis.

This will be, essentially, the same activity described in Table 1, Section II in the previous section. The difference will be the expanded list of activities that will be included within the analysis. The more aggregate the unit of analysis the greater the number of components in the activity structure that will have entries that are material in size and nature. It is suggested that the full array of activities listed in Table 1 be used as a checklist and those that are **not** to be incorporated in the analysis crossed off the list.

Step 4. Establish the list of objects of expenditure to be included in the analysis.

Review the list of activities and identify the objects of expenditure that must be recognized. The full range of possibilities is included in Table 2, Section II. Those not relevant should be eliminated from the list.

Step 5. Assign costs associated with various objects of expenditure to the elements in the activity structure. When assigning costs, allocate only the portion of the costs associated with the related activity. Fill in the matrix with data in only the cells that are relevant.

Depending on the organizational and accounting structure, it may actually be easier to do analyses at this level of detail since whole categories of data can be moved into the data structure without allocation and further analysis. In such analyses, assignment of costs can be conducted generally as follows:

a. Salaries of Professional (Exempt) Staff

The sum of salaries and wages and fringe benefits. Applies only to payments made to individual who are employees of the organization — not those paid as independent contractors.

- *Salaries and Wages* — Payments made to individuals who are employees of the organization in recompense for their services. This item excludes expenditures for College Work-Study and for employee fringe benefits.

- *Fringe Benefits* — Includes retirement plans, Social Security taxes, medical/dental plans, housing plans, unemployment compensation plans,

group life insurance plans, workers' compensation plans, and other benefits in-kind with cash options.

(1) Faculty and graduate assistant salaries should continue to be allocated to instruction by department/discipline and course level as before. It is typical that a central office would have a roster of faculty for each course delivered and the compensation basis for each course — part of regular (in-load) compensation, overload, per course, etc. Part-time faculty can be compiled and categorized in much the same way.

(2) Executive/managers compensation can be identified and assigned directly to relevant component of the activity structure.

(3) Other professionals compensation can likewise typically be tied directly to a location in the activity structure—academic advising, program administration, etc.

b. Other Salaries

Salaries for technicians will typically be lodged in the appropriate place within academic computing or audiovisual services. If these activities are not directly under the administration of the "alternative delivery" organization, the choices are to:

(1) Allocate them into the unit on some pro-rata (use-oriented) basis.

(2) Sum the per-course costs (especially for video-delivered alternatives).

(3) Ignore them and treat them as an indirect cost borne by the larger enterprise.

It is likely that computer costs will have to be treated as indirect costs while costs of audiovisual support can either be wholly absorbed within this analysis or assigned a pro-rata share on some reasonable basis.

Compensation for clerical employees can typically be assigned directly into a single activity within the activity structure. In instances where a small clerical staff provides services across a variety of functions/activities, it is recommended that compensation be assigned into the academic administration activity.

c. Supplies and Expenses

For all objects of expenditures:

(1) *Office Supplies* — to academic administration and instructional supplies to instruction.

(2) *Travel* — to instruction for the portion involving faculty travel to off-site locations and academic administration for the balance.

(3) *Connect Time* — for audiovisual courses and satellite transponder time to instruction and the balance of communication (telephone, etc.) to a central account — academic administration.

(4) *Duplication of Materials* — course materials to instruction and general copying to academic administration.

(5) *Postage/Distribution of Materials* — the portion clearly attributable to distribution of course materials to instruction and the balance to academic administration.

(6) *Contract Services* — assigned as appropriate on a "project-by-project" basis.

(7) *Licenses* — those attributable to specific courses should be assigned to instruction (at the appropriate discipline and level), those for general use within the Alternative Delivery unit to an appropriate activity — typically computer support, audiovisual support or administration, and all others considered indirect costs of the larger enterprise.

(8) *Rent* — assigned as appropriate. For example, rent for classroom space at a remote site should be assigned to instruction (at a high level of aggregation; disaggregation to discipline and level can come later if the need arises at the decisionmaking level). Similarly, rent for administrative office space at remote sites should be assigned to academic administration.

(9) *Minor Capital Items* — Items having a useful life in excess of one year but having an acquisition cost of less than $1,000 (e.g. calculators, fax machines, etc.).

d. Capital Items

(1) *Facilities* — Costs associated with facilities should be assigned within the function/activity structure at a high level of aggregation. To the extent that space is used solely by the alternative delivery organization, costs can be calculated and assigned to either academic administration or to other elements within the activity structure. To the extent that facilities are shared, the calculation described in the previous section should be employed.

(2) *Equipment* — The same algorithm used in the previous section should also be employed. To the extent that computer labs and other technology-intensive spaces are utilized solely by the alternative delivery organization, the entire cost of the facility (at the 1.0 Instruction level) should be assigned. (See Appendix C for definition.)

Costs of other equipment, office computers, etc., should be assigned to academic administration using the algorithm indicated in Section II.

e. Costs Borne by Others

As with the procedures for costing at the course level, the costs of free or reduced-rate elements should be noted and summarized separately. The purposes served by this compilation are the same as noted previously:

- It provides decisionmakers with a measure of exposure in case of changed circumstances,
- It provides additional information in instances when data are exchanged.

Step 6. Calculate the costs of underutilized capacity.

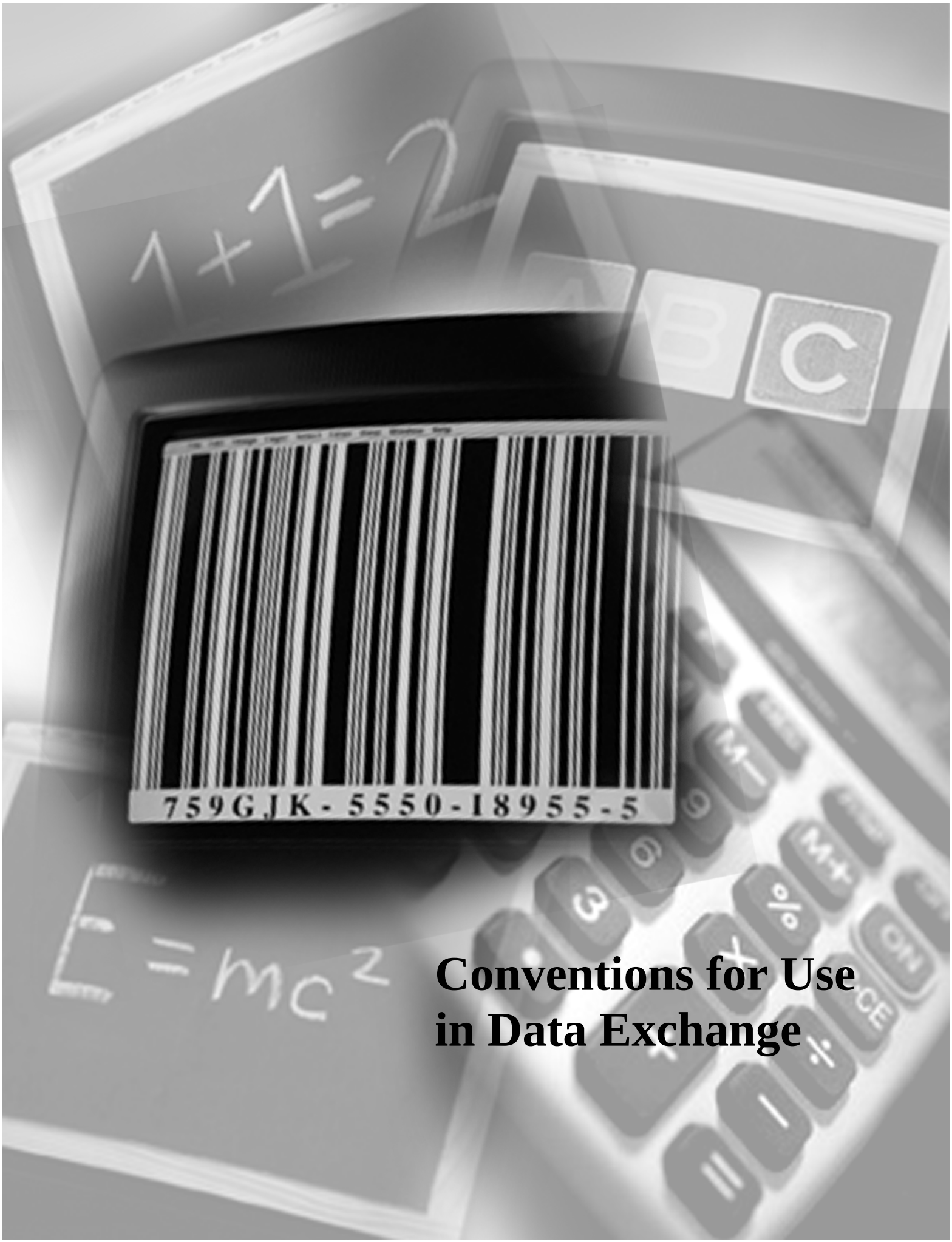
This calculation is especially important when the unit of analysis is method of instruction. For example, it is critical to know the extent, and therefore the cost, of underutilization of an interactive video network. These numbers serve to indicate either the additional volume that could be handled or the penalty being paid for low utilization.

Step 7. Sum the component costs to calculate the total costs associated with the method of delivery or the organizational unit.

Step 8. Record the number of students served and student credit hours generated as a result of the delivery method or organizational unit.

Step 9. Calculate costs per student and per credit hour by dividing the results of Step 7 by the data recorded in Step 8.

As a final note, it should be indicated that comparative data may be important — either data that compares costs of alternative delivery systems with costs of face-to-face instruction or costs of separate departments (off-campus instruction, for example) vis-à-vis the costs of their "regular," on-campus counterparts. The direct costs of instruction are addressed through the procedures described in Section II. The academic support and student service costs should be estimated, in gross totals, for the same set of activities listed in Table 1 and Step 3 above.



Conventions for Use in Data Exchange

IV. CONVENTIONS FOR USE IN DATA EXCHANGE

A. Introductory Comments

The procedures described in Sections II and III are written under the presumption of intra-institutional comparisons and uses. As a result, institutional practices concerning labels, numbering schemes, and subcategorizations could be utilized directly. The conversion to common data structures and categories is not necessary; ways can be found to use the data generally as they reside in the institution's accounting and other record-keeping systems. However, there are circumstances in which comparable data from multiple institutions are required for the task at hand. These circumstances include:

- The development of "benchmark" data to be used in determining the relative efficiency with which a particular course is being offered or with which a particular delivery mechanism is operating,
- The compilation of data from multiple sources for purposes of better understanding scale effects. How do costs **really** vary in relationship to numbers of students served?

These applications require that data be placed in a **common** framework in accordance with the diagrammatic representation of Alternative 2 in Section I. The costing procedures — Steps 1 through 9 — remain exactly as described in the previous two sections but:

- The data structures and categories utilized must be standardized. For example, the unique institutional course number that makes perfect sense within the institution must give way to an identifier that reflects discipline and course level in a standard way,
- Calculation procedures must be the same. This particularly means adoption of certain conventions that can be used consistently, conventions such as the assumption of a 50-year life for capital facilities.

In this section, standard data definitions and categories, along with a few calculations, are presented as the basis for interinstitutional exchange of information. The steps in the costing procedures remain exactly the same. The two-dimensional matrix — activities on one dimension and objects of expenditure on the other — remains in place. The only difference is that standard (rather than institutional) definitions of the categories and individual items must be utilized. In addition, there are areas in which **conventions** for calculations, rather than institutional choices, are required. The specific items for which standard or conventional definitions are presented in this section are:

1. The identification of the course for which costs are being calculated,
2. The credit value of the course,
3. The activity structure,
4. Objects of expenditures,
5. Conventions for calculating costs of capital items.

B. Standard Definitions

1. Course Identifier

Within an institution, courses typically are identified by department and a number that indicates the level of the course (freshman, senior, etc.) and, simultaneously, provides a unique designation for the course. For purposes of interinstitutional comparison and exchange, the most specific identifier feasible is one comprised of discipline (the equivalent of a departmental designator) and course level:

- Discipline

  Definition: a branch of knowledge or teaching. Disciplines should be designated by reference to the Classification of Instructional Programs (CIP) at the six-digit level. See Appendix A for a complete listing of the U.S. Department of Education's CIP. The institution's departmental codes should be "cross-walked" to the CIP code used in reporting to IPEDS.

- Course Level

  Definition: The intended level of complexity of the material associated with an instructional offering or the level of comprehension required of the students who undertake the instructional offering. The following categories (taken from NCHEMS *Data Element Dictionary,* 2nd ed., TR #51. Boulder, CO: 1973 with updates in 1975 and 1976) are recommended for those offerings that are part of a formal degree/diploma/certificate program:

  10 *Preparatory* — refers typically to instructional offerings or substitutes thereof (such as examinations) that may be part of the curricular requirements or preparation for degree work.

  20 *Lower Division* — refers to instructional offerings at a level of comprehension usually associated with freshman and sophomore students.

  30 *Upper Division* — refers to instructional offerings at a level of comprehension usually associated with junior and senior students.

  40 *Combined Upper Division and Graduate or Professional* — refers to those cases where no distinction is made between undergraduate and graduate courses.

  50 *Graduate I Courses* — this category represents instructional offerings at a level of comprehension usually associated with post baccalaureate students at the master's level or first year doctoral level.

60 *Graduate II Courses* — this category represents instructional offerings at a level of comprehension usually associated with post baccalaureate students at the second year doctoral level.

70 *Doctoral Dissertation Courses* — this category represents doctoral thesis instructional offerings.

The following categories are recommended for those offerings that are not part of a formal degree/diploma/certificate program:

91 *Basic* — refers to those instructional offerings that assume that the learner has no prior knowledge of, or experience with, what will be dealt with in the course or offering. In some instances, this level is referred to as the "apprentice" level.

92 *Intermediate* — refers to those instructional offerings that assume that the learner already possesses a basic level of knowledge, understanding, and skills associated with what will be dealt with in the course or offering. In some instances, this level is referred to as the "journeyman" level.

93 *Advanced* — refers to those instructional offerings that assume that the learner already possesses a significant level (beyond the intermediate level) of knowledge and/or skills associated with what will be dealt with in the course or offering. In some instances, this level is referred to as the "master" level.

2. Course Credit Hours

The ultimate objective is not just to calculate costs, but to calculate costs per unit of "production," usually measured in student credit hours. As a consequence, it is important to standardize the denominator in the cost/student credit hour calculation.

Definition: A student-credit hour is a unit of measure that represents one student engaged in an activity for which one hour of credit toward a degree or other award (diploma/certificate) is granted upon successful completion. Course-credit hours are calculated by multiplying the course's credit hour value by the number of students enrolled in the course.

Because not all institutions use semester credit hours as their unit of account, it is frequently necessary to present basic information that allows equivalencies to be established. Completion of the following table provides the necessary descriptive information. For those courses that need an alternative to the semester credit structure, refer to the paragraph below Table 5.

TABLE 5: Credit Hour Conversion

Credit Designation	Number of Credits	Type of Credit	Number Required for Completion
Degree/Certificate Credit			
Non-Degree/Certificate Credit			
Non-Credit			

Degree credit courses are those courses for which satisfactory completion is counted toward fulfillment of graduation requirements at the institution offering the course. This designation would hold even if some of the enrollees were not taking the course for credit. Non-degree credit courses are those for which students are awarded credit that does not count toward satisfaction of degree requirements (often associated with "0" level or developmental courses).

Type of credit is used to designate "semester credit," "quarter credit," or other indication of the metrics used by the institution. The possibilities here are numerous and can include competencies acquired, contact hours, course units, etc. To help interpret this number, information about number of (whatever) units required for a (specified) certificate or degree should also be provided in the last column of the format above. For example, if an institution assigns one course unit to a course, it is necessary to know that some specific number of units (say, 32) is required for a baccalaureate degree; or that, if an institution uses contact hours, a specified number is required for an associate's degree. Such data help the process of establishing equivalencies across different measures used by other institutions.

3. Activities

The list of activities utilized in the costing procedures is presented in Table 1, Section II.

The definitions associated with each of the entries are as follows:

1.0 INSTRUCTION

Definition — The Instruction program includes those activities carried out for the express purpose of eliciting some measure of "learning" (change in knowledge or skills) in a learner or group of learners. "Educational change" is defined to include, (1) the acquisition or improved understanding of some portion of a body of knowledge, (2) the adoption of new or different attitudes, and (3) the acquisition or increased mastery of a skill or set of skills.

1.1 *Curriculum Planning/Course Design* — Those activities associated with designing a course or sequence of courses. Included are tasks such as specifying learning outcomes and developing syllabi.

1.2 *Instructional Materials Acquisition/Development* — Those activities associated with both acquiring and organizing or developing those materials (printed, audio, video, computer programs, etc.) needed to implement the curriculum plan.

1.3 *Content Delivery* — Activities associated with conveying course content to the learner. Tasks within this activity include delivering lectures (conveying information face-to-face) and conveying this same information through use of print materials, audio/videotapes, software, etc.

1.4 *Tutoring/Mentoring* — Activities designed to help learners assimilate and understand information that they received. This can be accomplished either through group processes (small class discussion groups, laboratory section) or by means of one-on-one interaction whether face-to-face or through interactions mediated by e-mail, fax, phone, or other device.

1.5 *Assessment of Learning* — The design, development, and implementation of approaches to determining the extent to which individual learners actually acquired the knowledge and/or skill intended. Also includes assignment of grades.

4.0 ACADEMIC SUPPORT

Definition — The Academic Support program includes those activities carried out in direct support of one or more of the three primary programs (Instruction, Research, and Public Service). The activities that should be classified in this program include, (1) activities related to the preservation, maintenance, and display of both the stock of knowledge and educational materials (for example, library services and museums); (2) activities that directly contribute to the way in which instruction is delivered or research is conducted (such as educational media services, academic computing support, ancillary support); (3) activities directly related to the administration of academic programs; and (4) activities related to the professional development of academic personnel.

4.1 *Computing Support* — Those activities associated with ensuring reliable operation of academic computing systems, acquisition and maintenance of general purpose software necessary for academic functions and provision of user support services to students and faculty.

4.2 *Telecommunications Support* — Those activities undertaken to create, maintain, and operate the telecommunications infrastructure of an institution. Included are tasks associated with ensuring effective functioning of broadcast television, interactive video, local- and wide-area networks, etc.

4.3 *Library/Information Support Services* — Those activities undertaken to provide faculty and students with access to library materials and other information and data resources necessary to support activities. Included are the traditional library activities that directly support the collection, cataloging, storage, and distribution of printed materials. Also included are those activities associated with identifying, and arranging for access to, online information resources and databases.

4.4 *Assessment Support Services* — Those activities associated with providing institution-wide services in such areas as:

- aiding faculty in developing assessment instruments and techniques,
- acquiring commercially available assessment instruments,
- administering and scoring general purpose assessments,
- designing and administering student surveys,
- analyzing and interpreting the results of general purpose (not single course) assessments.

4.5 *Academic Logistical Support* — Acquiring and distributing course materials to students who are studying at sites remote from the campus.

4.6 *Academic Administration* — Those activities related to the management and governance of the institution's academic programs (excluding academic program advising) that are carried out by either faculty or administrative staff.

4.7 *Academic Personnel Development* — Those activities conducted to enhance the capacity of academic personnel to fulfill their assigned function. Included are teaching effectiveness centers, faculty internships, sabbaticals, etc.

5.0 STUDENT SERVICES

Definition: The Student Service program includes those activities carried out with the objective of contributing to the emotional and physical well-being of the students as well as to their intellectual, cultural, and social development outside the context of the institution's formal instruction program. The Student Service program attempts to achieve this objective by, (1) expanding the dimensions of the student's educational and social development by providing cultural, social, and athletic experiences; (2) providing those services and conveniences needed by students as members of an on-campus, resident student body; and (3) assisting students in dealing with personal problems and relationships as well as in their transition from student to member of the labor force.

5.1 *Academic Advising* — Those activities that involve providing assistance and advice to students about the courses they should take, describing course

requirements for particular programs, scheduling necessary courses, describing program standards, etc.

5.2 *Counseling and Career Guidance* — Activities associated with those formal placement, career guidance, and personal counseling services provided for the benefit of students.

5.9 STUDENT ACCESS SERVICES/STUDENT RECORDS

Definition: Included in this program are those activities carried out with the objective of obtaining a student body having those characteristics the institution desires (such as academic qualifications and capabilities, socioeconomic status, racial/ethnic background, athletic abilities). Also included are those activities carried out, (1) to identify prospective students, (2) to promote attendance at the institution, (3) to provide prospective students with incentives to attend the institution (including financial assistance), (4) to process the admissions applications of potential students, and (5) to maintain academic records on students once enrolled.

5.91 *Advertising and Marketing* — Tasks associated with presenting to potential student's information that is intended to persuade them to enroll in the institution/program.

5.92 *Recruitment* — Those activities related to the identification of potential students and to the active recruitment of students for admission to the institution. The focus of these activities is on influencing the decision of a particular student or target group either to apply for admission or to attend once admission has been granted.

5.93 *Admissions* — Those activities carried out in interviewing and evaluating potential students, processing applications for admission, and admitting students to the institution.

5.94 *Financial Aid* — Those activities carried out in order to conduct the student financial aid program of the institution (excludes actual student financial aid grants and stipends). The elements of this activity are:

5.941 Financial Aid Counseling and Evaluation — This category includes financial aid counseling with students and parents to provide information about educational costs, eligibility for aid programs, and the types of financial aid available. It also includes those activities related to the review and evaluation of an applicant's eligibility for financial aid, the determination of the award, and the notification of applicants.

5.942 Records Maintenance and Reporting — Includes those activities related to maintaining, updating, and storing financial aid records. This category also includes those activities related to reporting on the conduct

and impact of the institution's financial aid program to institutional planners, governmental agencies, and private donors.

5.943 Student Employment Services — Those activities that are part of the institution's financial aid program and that are intended to assist students, their spouses, and dependents in finding full- or part-time work, through employment opportunities both on- and off-campus. This category includes the activities associated with work/study programs but does not include those activities related to "job placement" for the institution's graduates.

5.95 *Student Records* — Those activities the institution carries out to maintain, handle, and update records for currently enrolled students as well as for those who were previously enrolled. Does not include the activities related to record keeping for those seeking admission to the institution.

6.0 INSTITUTIONAL SUPPORT

Definition: The Institutional Support program consists of those activities carried out to provide for both the day-to-day functioning as well as the long-range viability of the institution as an operating organization. The overall objective of the Institutional Support program is to provide for the institution's organizational effectiveness and continuity. It does this by, (a) providing for planning and executive direction; (b) providing for administrative and logistical services; (c) maintaining the quality of the physical environment; (d) enhancing relationships with the institution's constituencies; and (e) providing services and conveniences for the employees of the institution.

4. Objects of Expenditure

Categories of objects of expenditure are less standardized than the function/activities dimension. However, the following distinctions are almost universally made in institutional record systems:

- Compensation,
  - Salaries and Wages,
  - Benefits,
- Operating Supplies and Expenses,
- Capital Items.

While these major distinctions can be expected to be found in almost all record systems, subcategories within each of these major headings tend to vary widely depending on local needs and the vagaries of (usually haphazard) evolution of categorization schemes over relatively long periods of time.

The detailed list of objects of expenditure is listed in Table 6.

TABLE 6: Objects of Expenditure

1. **Compensation**
   - Executives/Managers
   - Other Professionals
   - Instruction/Research Professionals/Faculty
     - Tenure-Track Faculty
     - Non-Tenure-Track Faculty
     - Teaching/Graduate Assistants
   - Technicians
   - Clerical Staff
   - Trades Workers
   - Service Workers
2. **Operating Expenses**
   - Office and Instructional Supplies
   - Travel
   - Communications
     Voice/video/data connect time charges
     Satellite transponder time charges
   - Duplication of Materials
     Print
     Audio
     Video
   - Postage and Other Distribution Services
   - Contract Services
     Consulting
     Purchased services
   - Licenses — payments for the use of proprietary:
     Courseware
     Software
     Databases
   - Rent
   - Minor Capital Items
3. **Capital Items**
   - Facilities
   - Equipment
   - Telecommunication Infrastructure
   - Courseware
   - Professional Development
4. **Costs Borne by Others**
   - Other Institutions
   - State Agencies
   - Students
   - Other

The definitions for Table 6 are as follows:

1. COMPENSATION

Definition: The sum of salaries and wages and fringe benefits. Applies only to payments made to individual who are employees of the organization — not those paid as independent contractors.

- *Salaries and Wages* — Payments made to individuals who are employees of the organization in recompense for their services. This item excludes expenditures for College Work-Study and for employee fringe benefits.

- *Fringe Benefits* — Includes retirement plans, Social Security taxes, medical/dental plans, housing plans, unemployment compensation plans, group life insurance plans, workers' compensation plans, and other benefits in-kind with cash options.

For this category it is **necessary** to make distinctions among different categories of employees. These staff must be directly related to the course or the alternative unit of analysis for inclusion in the cost calculation. Those categories (in common use) in higher education are:

Executives/Managers — Those persons whose assignments require primary (and major) responsibility for management of the institution, or a customarily recognized department or subdivision thereof. Assignments require the performance of work directly related to management policies or general business operations of the institution, department, or subdivision, etc. It is assumed that assignments in this category customarily and regularly require the incumbent to exercise discretion and independent judgment and to direct the work of others. Report in this category all officers holding titles such as president, vice president, dean, director, or the equivalent, as well as officers subordinate to any of these administrators with such titles as associate dean, assistant dean, executive officer of academic departments (department heads, or the equivalent) if their principal activity is administrative.

Note: Supervisors of professional employees are included here, while supervisors of non-professional employees (technical, clerical, craft, and service/maintenance force) are classified within the specific categories of the personnel they supervise.

Other Professionals — Those persons employed for the primary purpose of performing academic support, student service, and institutional support activities, whose assignments would require either college graduation or experience of such kind and amount as to provide a comparable background. Include employees such as librarians, systems analysts, instructional courseware designers and developers, and communication network specialists.

Instruction/Research/Professionals/Faculty — Those persons whose specific assignments customarily are made for the purpose of conducting instruction,

research, or public service as a principal activity (or activities), and who hold academic-rank titles of professor, associate professor, assistant professor, instructor, lecturer, or the equivalent of any of these academic ranks. If their principal activity is instructional, report in this category deans, directors, or the equivalent, as well as associate deans, assistant deans, and executive officers of academic departments (chairpersons, heads, or the equivalent).

- *Tenure-Track Faculty*,
- *Non-Tenure-Track Faculty,*
- *Teaching/Graduate Assistants.*

Technicians — Those persons whose assignments require specialized knowledge or skills which may be acquired through experience or academic work, such as offered in many two-year technical institutes, junior colleges, or through equivalent on-the-job training. Include computer programmers (with less than a bachelor's degree) and operators, drafters, engineering aides, junior engineers, mathematical aides, licensed practical or vocational nurses, dieticians, photographers, radio operators, scientific assistants, technical illustrators, technicians (medical, dental, electronic, physical sciences), and similar occupational activity categories which are institutionally defined as technical assignments.

Clerical Staff — Those persons whose assignments typically are associated with clerical activities or are specifically of a secretarial nature. Include personnel who are responsible for internal and external communications, recording and retrieval of data (other than computer programmers) and/or information and other paperwork required in an office, such as bookkeepers, stenographers, clerk-typists, office-machine operators, statistical clerks, payroll clerks, etc. Include also sales clerks such as those employed full-time in the bookstore and library clerks who are not recognized as librarians.

Trades Workers — Those persons, whose assignments typically require special Handbook skills and a thorough and comprehensive knowledge of the processes involved in the work, acquired through on-the-job training and experience or through apprenticeship or other formal training programs. Include mechanics and repairers, electricians, stationary engineers, skilled machinists, upholsterers, carpenters, compositors, and typesetters.

Service Workers — Those persons whose assignments require limited degrees of previously acquired skills and knowledge and in which workers perform duties which result in or contribute to the comfort, convenience, and hygiene of personnel and the student body or which contribute to the upkeep and care of buildings, facilities, or grounds of the institutional property. Include chauffeurs, laundry and dry cleaning operatives, cafeteria and restaurant workers, truck drivers, bus drivers, garage laborers, custodial personnel, gardeners and groundskeepers, refuse collectors, construction laborers, and security personnel.

2. OPERATING EXPENSES

This category includes expenditures for:

- Services provided by individuals/entities other than the organization's employees,
- Goods that have an expected useful life or less than one year (paper, etc.),
- Goods that have an expected useful life of greater than one year but a purchase price of less than $1,000. If more than $1,000, they should be treated as a capital item (equipment, etc.).

Included within this category are:

Office and Instructional Supplies — Include expenses directly attributable to the course. In many cases, a per-student estimate can be calculated easily and is an acceptable approach.

Travel — Again, only expenses directly related to the course should be included Typical in this category are expenses associated with faculty traveling to an off-campus site to teach a class. For ease of calculation, it is appropriate to estimate:

travel costs = costs/trip x number of trips required.

Communications — Include:

- voice/video/data connect time charges,
- satellite transponder time charges.

These costs are usually determined on the basis of cost per hour of connect time or of transponder time. Again, for analytic purposes, it is not necessary to obtain communication costs numbers by compilation of accounting data. It is appropriate to use an estimate of these costs as:

communication costs = cost/hour x number of hours.

Duplication of Materials — Many alternative forms of delivery rely on use of materials—print, audio, video, CD-ROMs, etc.— specifically designed for the course. This cost component includes the cost of reproducing the materials for student use. Costs of developing the materials in the first instance are not included here (they are included as a capital item). Calculation of the cost in this area is appropriately done by estimating cost per unit and multiplying by number of units.

Postage and Other Distribution Services — Include here the estimated costs of mailing or otherwise distributing course materials identified above. Again, the costs included are only those directly attributable to the course; other postage costs are appropriately considered an indirect cost.

Contract Services — This category includes costs of consultants and purchase of services under contract. This category excludes purchases of services of part-time faculty members, a cost treated as part of personnel compensation.

Licenses — Included in this category are fees paid for the use of proprietary courseware, software, databases. For inclusion in this category, expenditures must be made solely for purposes of supporting the course in question; for example, software designed and utilized expressly for teaching a basic accounting course, calculus, etc. In some instances, license fees are established on a per-student basis. In this case, the cost estimate is simply the product of cost per student/user and number of students. In other instances, site licenses are granted without reference to number of users. In this case, costs are determined by calculating the per-student costs (including students in other sections of the course for which cost estimates are being developed) and multiplying by number of students.

Rent — This category includes costs of using space in facilities not owned by the organization providing the instruction. Typical would be rents associated with delivering a course at a high school or other off-campus site. The calculation is as follows:

> cost = annual cost per square foot x number of square feet x
> (hours of use divided by total hours per year of availability).

Minor Capital Items — Items having a useful life in excess of one year but having an acquisition cost of less than $1,000 (e.g. calculators, fax machines, etc.).

3. CAPITAL ITEMS

Included in this category are expenditures for those items which:

- Have a useful life of greater than one year and an acquisition cost of greater than $1,000,
- Become the property of the organization (are owned and not rented/leased/licensed).

The category includes expenditures for:

Facilities — Historically, facilities costs have not been calculated as an element in higher education cost studies. However, since many alternative forms of delivery require either the construction/use of special purpose facilities or payment of a direct expenditure for rent of off-campus facilities, a level playing field requires inclusion of capital items in the cost equation. The calculation can take alternative forms:

$$\left[\begin{array}{c}\text{Cost per square foot} \\ \text{to construct space}\end{array} \div 50\right] \times \begin{array}{c}\text{Square feet of} \\ \text{space used}\end{array} \times \left[\text{hours used} \div \begin{array}{c}\text{hours of} \\ \text{capacity}\end{array}\right]$$

OR

$$\left[\begin{array}{c}\text{Total} \\ \underline{\text{replacement value}} \\ \text{Net assignable sq. ft.}\end{array} \div 50\right] \times \begin{array}{c}\text{Square feet of} \\ \text{space used}\end{array} \times \left[\text{hours used} \div \begin{array}{c}\text{hours of} \\ \text{capacity}\end{array}\right]$$

In this calculation, hours used equal number of hours/week times the number of weeks the class meets. With regard to this calculation, it is suggested that:

- the convention of 50 years of useful building life be adopted by all users,
- the conventions of 35 hours per week of room use and 48 weeks per year be established.

Equipment — As noted earlier in this document, it is most useful to consider costs of equipment in aggregate, rather than per unit, terms. For example, to calculate the costs of equipping:

- a send-site interactive video facility,
- a receive-site interactive video facility,
- a computer lab (perhaps of various standard sizes used on the campus).

At this point, the calculation becomes:

[cost of the facility ÷ years of useful life] x [hours used ÷ hours of capacity].

With regard to this calculation, it is suggested that the following conventions be utilized:

- useful life of five years for video facilities and three years for computer facilities,
- hours of capacity are defined as 80 hours per week for computer facilities, 35 hours per week for video facilities, and 48 weeks per year.

Hours of use for computer facilities should be estimated on the basis of number of hours (total for the courses) in which a class physically meets in such a facility (recognizing that this number may well be zero) plus the estimated number of hours a typical student would use the facility outside of formal class.

Telecommunication Infrastructure — Included in this category are transmission, relay, and receive equipment used to enable students to participate in the course. Include costs for items, such as, transmission lines, routers, multi-point control unites, switches, satellite dishes, phone bridges, repeaters, and other equipment for which the institution owns or leases and uses are part of the course interaction.

For some items, the equipment may be considered an indirect cost, if costs can not be specifically assigned to the course.

Courseware — In the case of software/courseware, costs should only be included if:

- the material is expressly for the course for which cost calculations are being made. Thus, costs associated with acquiring general purpose software — e-mail, word processing, spreadsheets, etc .— would not be included, even if they are used regularly by students in the class.
- the expenditure covers a multi-year period. If costs are limited to year-to-year expenditures for licensing, the costs should be reflected under licenses in the Supplies and Services category.

In addition, it must be recognized that these particular assets can be acquired in multiple ways:

- purchased,
- leased,
- locally developed.

In instances where courseware/software is locally developed, an overall development cost should be calculated. This is only true, however, if the material was developed as part of a "project" that received a specific allocation of personnel, technical support, etc. If the material was developed without explicit recognition — no release time for faculty, nor assignment of time of graduate students, technicians, etc. — the developmental costs should be ignored.

Where costs are identifiable, through purchase or local development, they should be assigned in accordance with the following algorithm:

[acquisition cost ÷ yrs. of useful life] x [no. of students in class ÷ no. of annual users].

For purposes of these calculations, the convention of a useful life of four years should be assumed.

Professional Development — Expenditures specifically identifiable as supporting the development of knowledge or skills of faculty and staff (e.g., expenditures for teaching/learning centers, sabbaticals, computer training, etc.).

4. COSTS BORNE BY OTHERS

In many instances, some of the costs associated with delivering a course are borne by parties other than the organization providing the instruction. For example:

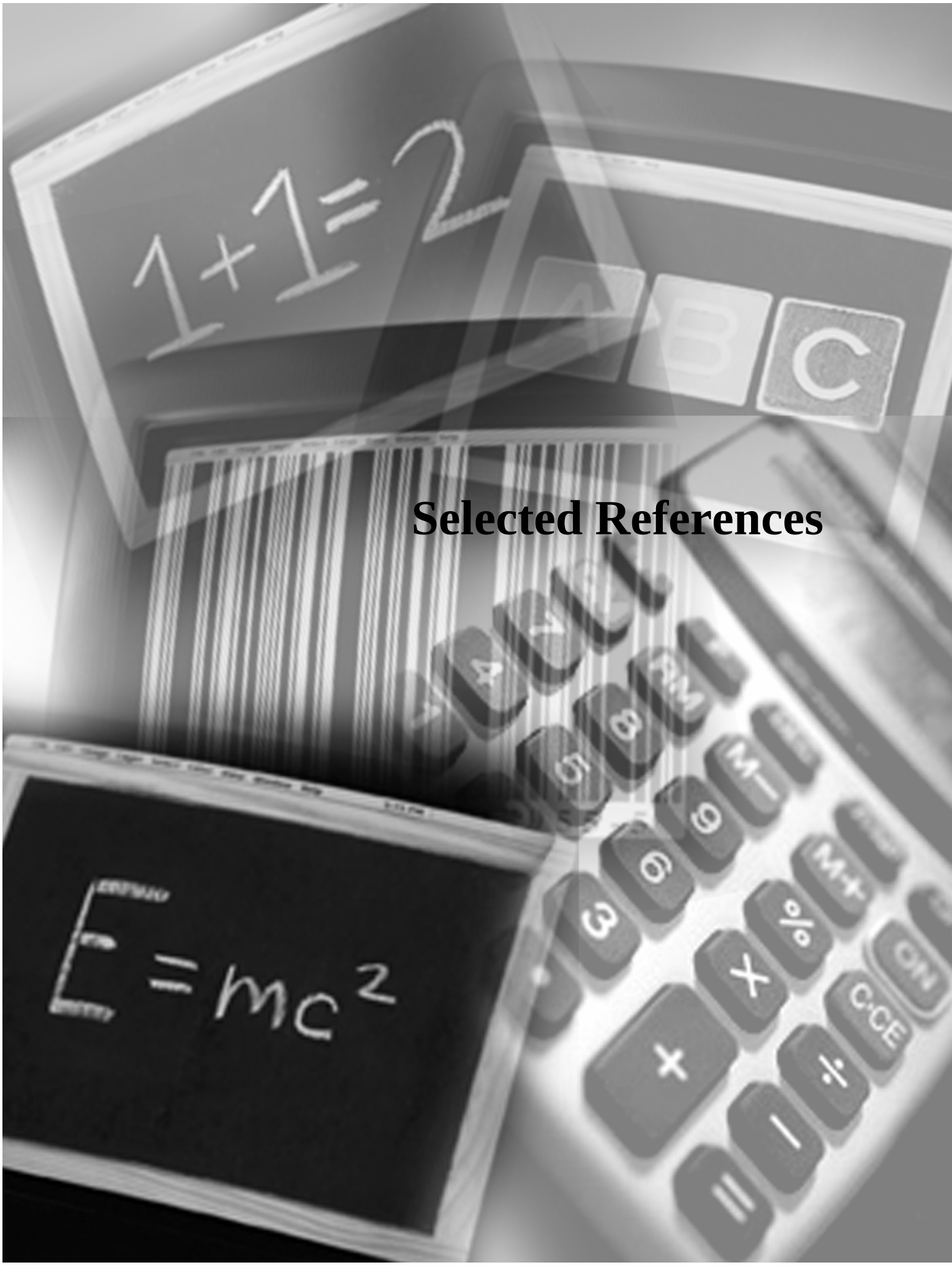
- A statewide agency may cover all communications expenditures without charging costs back to the provider.

- A "receive-site" organization may provide space and equipment free of charge.
- A vendor may provide courseware at no cost (or at a substantially reduced cost) in return for the provider serving as a beta test site for the product.
- Students may have to pay for their own computers and ISP access.

In some instances this arrangement is complicated by quid-pro-quo arrangements—e.g., a receive site provides space free in cases in which the sending institution pays for equipping the room. In such instances, it is suggested that:

- The sending institution calculates the amortized cost of equipment and includes this figure in its costs,
- The rented (or amortized) cost of the "free" space be calculated as suggested above and treated as a cost borne by others.

These "foregone" costs should not be included in the summary of the costs of delivering the course. However, it is recommended that the true costs of these free or reduced rate components be calculated according to the procedures identified above and recorded separately. This will serve two purposes. First, it will provide decisionmakers within the institution an indication of their exposure — the additional costs they would have to incur if the ground rules changed. Second, it will aid comparisons in instances where the comparison provider is not receiving the benefits of reduced rates.



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APPENDIX A

CLASSIFICATION OF INSTRUCTIONAL PROGRAMS

Mogan, Robert, L., Hunt, Stephen, E., and Carpenter, Judith M. (1990 Edition). Classification of Instructional Programs. Washington, D.C.: U.S. Department of Education. <http://nces.ed.gov/pubs91/91396.pdf.>

CLASSIFICATION OF INSTRUCTIONAL PROGRAMS

CIP CODE	CIP TITLE
01.0000	Agribusiness and Agricultural Production
01.0101	Agricultural Business and Mgmt., General
01.0102	Agricultural Business/Agribusiness Oper.
01.0103	Agricultural Economics
01.0104	Farm and Ranch Management
01.0199	Agricultural Business & Management, Oth.
01.0201	Agricultural Mechanization, General
01.0204	Agricultural Power Machinery Operator
01.0299	Agricultural Mechanization, Other
01.0301	Ag. Prod. Workers and Managers, Gen.
01.0302	Ag. Animal Husbandry & Prod. Mgmt.
01.0303	Aquaculture Operations and Prod. Mgmt.
01.0304	Crop Production Operations & Management
01.0399	Ag. Prod. Workers and Managers, Other
01.0401	Ag. & Food Products Process. Op. & Mgmt.
01.0501	Ag. Supplies Retailing & Wholesaling
01.0505	Animal Trainer
01.0507	Eques./Equine Stds., Horse Mgmt. & Trgn.
01.0599	Ag. Supplies and Related Svcs, Other
01.0601	Horticulture Svcs. Ops. and Mgmt., Gen.
01.0603	Ornamental Horticulture Ops. and Mgmt.
01.0604	Greenhouse Operations and Management
01.0605	Landscaping Operations and Management
01.0606	Nursery Operations and Management
01.0607	Turf Management
01.0699	Horticulture Svcs. Ops. and Mgmt., Oth.
01.0701	International Agriculture
01.9999	Agricultural Business & Production, Oth.
02.0000	Agriculture Sciences
02.0101	Agriculture/Agricultural Sciences, Gen.
02.0102	Agricultural Extension
02.0201	Animal Sciences, General
02.0202	Agricultural Animal Breeding & Genetics
02.0203	Agricultural Animal Health
02.0204	Agricultural Animal Nutrition
02.0205	Agricultural Animal Physiology
02.0206	Dairy Science
02.0209	Poultry Science
02.0299	Animal Sciences, Other
02.0301	Food Sciences and Tech.
02.0401	Plant Sciences, General
02.0402	Agronomy and Crop Science
02.0403	Horticulture Science
02.0405	Plant Breeding and Genetics
02.0406	Agricultural Plant Pathology
02.0407	Agricultural Plant Physiology
02.0408	Plant Protection (Pest Management)
02.0409	Range Science and Management
02.0499	Plant Sciences, Other
02.0501	Soil Sciences
02.9999	Agriculture/Agricultural Sciences, Other
03.0000	Conservation & Renewable Nat. Resrs
03.0101	Natural Resources Conservation, General
03.0102	Environmental Science/Studies
03.0201	Natural Resources Management and Policy
03.0203	Nat. Resrcs. Law Enforce. & Protect. Svc
03.0299	Nat. Resrcs. Mgmt. & Protectv Svcs, Oth.
03.0301	Fishing and Fisheries Sciences and Mgmt.
03.0401	Forest Harvesting and Production Tech.
03.0404	Forest Products Tech./Technician
03.0405	Logging/Timber Harvesting
03.0499	Forest Production and Processing, Other
03.0501	Forestry, General
03.0502	Forestry Sciences
03.0506	Forest Management
03.0509	Wood Science and Pulp/Paper Tech.
03.0599	Forestry and Related Sciences, Other
03.0601	Wildlife and Wildlands Management
03.9999	Conservation & Renewable Nat. Resrs, Oth
04.0000	Architecture and Related Programs
04.0201	Architecture
04.0301	City/Urban, Community & Reg. Planning
04.0401	Architectural Environmental Design
04.0501	Interior Architecture
04.0601	Landscape Architecture
04.0701	Architectural Urban Design and Planning
04.9999	Architecture and Related Programs, Other
05.0000	Area, Ethnic and Cultural Studies
05.0101	African Studies
05.0102	American Studies/Civilization
05.0103	Asian Studies
05.0104	East Asian Studies
05.0105	Eastern European Area Studies
05.0106	European Studies
05.0107	Latin American Studies
05.0108	Middle Eastern Studies
05.0109	Pacific Area Studies
05.0110	Russian and Slavic Area Studies
05.0111	Scandinavian Area Studies
05.0112	South Asian Studies
05.0113	Southeast Asian Studies
05.0114	Western European Studies
05.0115	Canadian Studies
05.0199	Area Studies, Other
05.0201	Afro-American (Black) Studies
05.0202	American Indian/Native American Studies
05.0203	Hispanic-American Studies
05.0204	Islamic Studies
05.0205	Jewish/Judaic Studies
05.0206	Asian-American Studies
05.0207	Women's Studies
05.0299	Ethnic and Cultural Studies, Other

05.9999 Area, Ethnic and Cultural Studies, Other
08.0000 Marketing Opns/Market. & Distrib.
08.0101 Apparel & Accessories Market. Opns, Gen.
08.0102 Fashion Merchandising
08.0199 Apparel & Accessories Market. Opns, Oth.
08.0204 Business Services Marketing Operations
08.0299 Bus. & Personal Ser. Market. Opns, Oth
08.0301 Entrepreneurship
08.0401 Financial Services Marketing Operations
08.0503 Floristry Marketing Operations
08.0601 Food Products Retail and Wholesale Opns.
08.0701 Auctioneering
08.0704 General Buying Operations
08.0705 General Retailing Operations
08.0706 General Selling Skills and Sales Opns.
08.0708 General Marketing Operations
08.0709 General Distribution Operations
08.0799 Gen. Retail & Whlsale Opns. & Skills,Oth
08.0809 Home Products Marketing Operations
08.0810 Office Products Marketing Operations
08.0899 Home & Office Products Mrkting Opns, Oth
08.0901 Hospitality & Rec. Marketing Opns, Gen
08.0902 Hotel/Motel Serv. Marketing Operation
08.0903 Recreation Products/Serv. Marketing Opns
08.0906 Food Sales Operations
08.0999 Hospitality & Recrtn. Market. Opns, Oth
08.1001 Insurance Marketing Operations
08.1104 Tourism Promotion Operations
08.1105 Travel Services Marketing Operations
08.1199 Tourism & Travel Serv. Market. Opns,Oth
08.1203 Vehicle Parts & Accessories Market. Opns
08.1208 Vehicle Marketing Operations
08.1299 Vehicle & Petrol. Prods. Market. Ops, Ot
08.9999 Marketing Opns/Market. & Distrib.,Oth
09.0000 Communications
09.0101 Communications, General
09.0201 Advertising
09.0401 Journalism
09.0402 Broadcast Journalism
09.0403 Mass Communications
09.0499 Journalism and Mass Communication, Other
09.0501 Public Relations & Organizational Comm.
09.0701 Radio and Television Broadcasting
09.9999 Communications, Other
10.0000 Communications Technol./Technicians
10.0101 Educational/Instructional Media Tech.
10.0103 Photographic Tech./Technician
10.0104 Radio and Television Broadcasting Tech.
10.0199 Communications Technol./Technicians, Oth
11.0000 Computer and Information Sciences
11.0101 Computer and Information Sciences, Gen.
11.0201 Computer Programming
11.0301 Data Processing Tech./Technician
11.0401 Information Sciences and Systems
11.0501 Computer Systems Analysis
11.0701 Computer Science
11.9999 Computer and Information Sciences, Other
12.0000 Personal & Miscellaneous Services
12.0203 Card Dealer
12.0299 Gaming & Sports Officiating Serv., Oth.
12.0301 Funeral Services and Mortuary Science
12.0401 Cosmetic Services, General
12.0402 Barber/Hairstylist
12.0403 Cosmetologist
12.0404 Electrolysis Technician
12.0405 Massage
12.0406 Make-Up Artist
12.0499 Cosmetic Services, Other
12.0501 Baker/Pastry Chef
12.0502 Bartender/Mixologist
12.0503 Culinary Arts/Chef Training
12.0504 Food & Beverage/Restaurant Opns. Manager
12.0505 Kitchen Personnel/Cook & Asst. Trng.
12.0506 Meatcutter
12.0507 Waiter/Waitress and Dining Room Manager
12.0599 Culinary Arts & Related Services, Other
12.9999 Personal & Miscellaneous Services, Other
13.0000 Education
13.0101 Education, General
13.0201 Bilingual/Bicultural Education
13.0301 Curriculum and Instruction
13.0401 Education Admin. & Supervision, Gen.
13.0402 Administration of Special Education
13.0403 Adult and Continuing Education Admin.
13.0404 Educational Supervision
13.0405 Elementary, Middle & Secondary Ed. Admin
13.0406 Higher Education Administration
13.0407 Community & Junior College Admin.
13.0499 Education Admin. & Supervision, Oth.
13.0501 Educational/Instructional Media Design
13.0601 Educational Evaluation and Research
13.0603 Educational Statistics & Research Method
13.0604 Educ. Assessment, Testing & Measurement
13.0699 Educ. Eval., Research & Statistics, Oth.
13.0701 International and Comparative Education
13.0802 Educational Psychology
13.0901 Social/Philosophical Foundations of Educ
13.1001 Special Education, General
13.1003 Education of the Deaf & Hearing Impaired
13.1004 Education of the Gifted and Talented
13.1005 Education of the Emotionally Handicapped
13.1006 Education of the Mentally Handicapped
13.1007 Education of the Multiple Handicapped
13.1008 Education of the Physically Handicapped
13.1009 Educ. of Blind & Visually Handicapped
13.1011 Educ. of the Specific Learning Disabled
13.1012 Education of the Speech Impaired
13.1013 Education of the Autistic
13.1099 Special Education, Other
13.1101 Counselor Educ. Counseling & Guid. Svc.
13.1102 College/Postsec. Student Counsel/Personn
13.1201 Adult and Continuing Teacher Education

13.1202 Elementary Teacher Education
13.1203 Jr High/Intermed/Middle Sch Teach Educ
13.1204 Pre-Elem/Erly Childhd/KG. Teach Educ
13.1205 Secondary Teacher Education
13.1206 Teacher Education, Multiple Levels
13.1299 General Teacher Education, Other
13.1301 Agricultural Teacher Educ (Vocational)
13.1302 Art Teacher Education
13.1303 Business Teacher Education (Vocational)
13.1304 Driver and Safety Teacher Education
13.1305 English Teacher Education
13.1306 Foreign Languages Teacher Education
13.1307 Health Teacher Education
13.1308 Home Economics Teacher Educ (Vocational)
13.1309 Technology/Industrial Arts Teacher Educ
13.1310 Mkt. Op./Mkt. & Distrib. Teacher Educ
13.1311 Mathematics Teacher Education
13.1312 Music Teacher Education
13.1314 Physical Education Teaching and Coaching
13.1315 Reading Teacher Education
13.1316 Science Teacher Education, General
13.1317 Social Science Teacher Education
13.1318 Social Studies Teacher Education
13.1319 Technical Teacher Education (Vocational)
13.1320 Trade & Industrial Teacher Educ. (Voc)
13.1321 Computer Teacher Education
13.1322 Biology Teacher Education
13.1323 Chemistry Teacher Education
13.1324 Drama and Dance Teacher Education
13.1325 French Language Teacher Education
13.1326 German Language Teacher Education
13.1327 Health Occupations Teacher Educ. (Voc)
13.1328 History Teacher Education
13.1329 Physics Teacher Education
13.1330 Spanish Language Teacher Education
13.1331 Speech Teacher Education
13.1399 Teacher Ed., Spec Acad & Voc Prog, Oth
13.1401 Teaching ESL/Foreign Language
13.1501 Teacher Assistant/Aide
13.9999 Education, Other
14.0000 Engineering
14.0101 Engineering, General
14.0201 Aerospace, Aeronautical and Astronautic
14.0301 Agricultural Engineering
14.0401 Architectural Engineering
14.0501 Bioengineering & Biomedical Engineering
14.0601 Ceramic Sciences and Engineering
14.0701 Chemical Engineering
14.0801 Civil Engineering, General
14.0802 Geotechnical Engineering
14.0803 Structural Engineering
14.0804 Transportation and Highway Engineering
14.0805 Water Resources Engineering
14.0899 Civil Engineering, Other
14.0901 Computer Engineering
14.1001 Electrical, Electronics & Communication
14.1101 Engineering Mechanics
14.1201 Engineering Physics
14.1301 Engineering Science
14.1401 Environmental/Environmental Health Engin
14.1501 Geological Engineering
14.1601 Geophysical Engineering
14.1701 Industrial/Manufacturing Engineering
14.1801 Material Engineering
14.1901 Mechanical Engineering
14.2001 Metallurgical Engineering
14.2101 Mining and Mineral Engineering
14.2201 Naval Architecture & Marine Engineering
14.2301 Nuclear Engineering
14.2401 Ocean Engineering
14.2501 Petroleum Engineering
14.2701 Systems Engineering
14.2801 Textile Sciences and Engineering
14.2901 Engineering Design
14.3001 Engineering/Industrial Management
14.3101 Materials Science
14.3201 Polymer/Plastics Engineering
14.9999 Engineering, Other
15.0000 Engineering-Related Technol./Techn
15.0101 Architectural Engineering Techno/Tech
15.0201 Civil Engineering/Civil Tech./Technician
15.0301 Computer Engineering Tech./Technician
15.0303 Elec., Electronic & Comm. Engin. Tech.
15.0304 Laser and Optical Tech./Technician
15.0399 Electrical & Electronic Engin.-Rel. Tech
15.0401 Biomedical Engineering-Related Tech.
15.0402 Computer Main. Tech./Technician
15.0403 Electromechanical Tech./Technician
15.0404 Instrumentation Tech./Technician
15.0405 Robotics Tech./Technician
15.0499 Electromechanical Instrum. & Maint. Tech
15.0501 Heating, Air Condition. & Refrig. Tech.
15.0503 Energy Management & Systems Tech./Techn.
15.0506 Water Quality/Wastewater Treatment Tech.
15.0507 Environmental & Pollution Control Tech.
15.0599 Environmental Control Tech, Oth.
15.0603 Industrial/Manufacturing Tech/Technician
15.0607 Plastics Tech./Technician
15.0611 Metallurgical Tech./Technician
15.0699 Industrial Product. Technol./Techn, Oth.
15.0701 Occupational Safety & Health Tech./Techn
15.0702 Quality Control Tech./Technician
15.0799 Quality Control & Safety Technol./Tech.
15.0801 Aeronautical & Aerospace Engineering Tec
15.0803 Automotive Engineering Tech./Technician
15.0805 Mechanical Engineering/Mechanical Tech.
15.0899 Mechanical Engineering-Related Tech, Oth
15.0901 Mining Tech./Technician
15.0903 Petroleum Tech./Technician
15.0999 Mining & Petroleum Technol./Tech, Other
15.1001 Construction/Building Tech./Technician
15.1101 Engineering-Related Tech/Technician, Gen

15.1102 Surveying
15.1103 Hydraulic Tech./Technician
15.9999 Engineering-Related Technol./Techn, Oth.
16.0000 Foreign Languages and Literatures
16.0101 Foreign Languages and Literatures, Gen.
16.0102 Linguistics
16.0103 Foreign Language Interpretation\Translat
16.0301 Chinese Language and Literature
16.0302 Japanese Language and Literature
16.0399 East/Southeast Asian Lang. & Lit., Oth.
16.0402 Russian Language and Literature
16.0403 Slavic Lang. & Lit. (Other Than Russian)
16.0499 East Europe Languages & Literatures, Oth
16.0501 German Language and Literature
16.0502 Scandinavian Languages and Literatures
16.0599 Germanic Languages and Literatures, Oth
16.0703 South Asian Languages and Literatures
16.0901 French Language and Literature
16.0902 Italian Language and Literature
16.0904 Portuguese Language and Literature
16.0905 Spanish Language and Literature
16.0999 Romance Languages and Literatures, Other
16.1101 Arabic Language and Literature
16.1102 Hebrew Language and Literature
16.1199 Mid Eastern Languages & Literatures, Oth
16.1201 Classics & Classical Languages and Lit
16.1202 Greek Lang. & Lit. (Ancient/Medieval)
16.1203 Latin Lang. & Lit. (Ancient/Medieval)
16.1299 Classical & Ancient Near Eastern Lang.
16.9999 Foreign Languages and Literatures, Other
19.0000 Home Economics
19.0101 Home Economics, General
19.0201 Business Home Economics
19.0202 Home Economics Communications
19.0301 Family and Community Studies
19.0401 Family Resource Management Studies
19.0402 Consumer Economics and Science
19.0499 Family/Consumer Resource Management, Oth
19.0501 Foods and Nutrition Studies, General
19.0502 Foods and Nutrition Science
19.0503 Dietetics/Human Nutritional Services
19.0505 Food Systems Administration
19.0599 Foods and Nutrition Studies, Other
19.0601 Housing Studies, General
19.0603 Interior Environments
19.0699 Housing Studies, Other
19.0701 Individual/Family Devel. Studies, Gen.
19.0703 Family and Marriage Counseling
19.0704 Family Life and Relations Studies
19.0705 Gerontological Services
19.0706 Child Growth, Care & Development Studies
19.0799 Individual/Family Devel. Studies, Oth.
19.0901 Clothing/Apparel and Textile Studies
19.9999 Home Economics, Other
20.0000 Vocational Home Economics
20.0201 Child Care/Guidance Workers & Manager, G
20.0202 Child Care Provider/Assistant
20.0203 Child Care Services Manager
20.0299 Child Care/Guidance Workers & Manager, O
20.0301 Clothing, Apparel & Textile Workers & Ma
20.0303 Commercial Garment and Apparel Worker
20.0305 Custom Tailor
20.0306 Fashion and Fabric Consultant
20.0309 Drycleaner and Launderer (Commercial)
20.0399 Clothing/Apparel/Textile Workers & Mange
20.0401 Institutional Food Workers & Admin, Gen
20.0404 Dietician Assistant
20.0405 Food Caterer
20.0409 Institutional Food Services Admin.
20.0499 Institutional Food Workers & Admin, Oth
20.0501 Home Furnishings and Equipment Installer
20.0502 Window Treatment Maker and Installer
20.0599 Home Furnishings and Equipment Installer
20.0601 Custodial, Housekeeping and Home Service
20.0602 Elder Care Provider/Companion
20.0604 Custodian/Caretaker
20.0605 Executive Housekeeper
20.0606 Homemaker's Aide
20.0699 Custodial, Housekeeping and Home Service
20.9999 Vocational Home Economics, Other
22.0000 Law and Legal Studies
22.0101 Law (LL.B., J.D.)
22.0102 Pre-Law Studies
22.0103 Paralegal/Legal Assistant
22.0104 Juridical Science/Legal Specialization
22.0199 Law and Legal Studies, Other
23.0000 English Language and Literature/Letters
23.0101 English Language and Literature, General
23.0301 Comparative Literature
23.0401 English Composition
23.0501 English Creative Writing
23.0701 American Literature (United States)
23.0801 English Literature (British & Commonweal
23.1001 Speech and Rhetorical Studies
23.1101 English Technical and Business Writing
23.9999 English Language and Literature/Letters,
24.0000 Lib. Art&Sci., Gen. Studies&Human.
24.0101 Liberal Arts & Sciences/Liberal Studies
24.0102 General Studies
24.0103 Humanities/Humanistic Studies
24.0199 Lib. Art&Sci., Gen. Studies&Human., Oth
25.0000 Library Science
25.0101 Library Science/Librarianship
25.0301 Library Assistant
25.9999 Library Science, Other
26.0000 Biological & Life Sciences
26.0101 Biology, General
26.0202 Biochemistry
26.0203 Biophysics
26.0301 Botany, General
26.0305 Plant Pathology
26.0307 Plant Physiology

26.0399 Botany, Other
26.0401 Cell Biology
26.0402 Molecular Biology
26.0499 Cell and Molecular Biology, Other
26.0501 Microbiology/Bacteriology
26.0601 Anatomy
26.0603 Ecology
26.0607 Marine/Aquatic Biology
26.0608 Neuroscience
26.0609 Nutritional Sciences
26.0610 Parasitology
26.0611 Radiation Biology/Radiobiology
26.0612 Toxicology
26.0613 Genetics, Plant and Animal
26.0614 Biometrics
26.0615 Biostatistics
26.0616 Biotechnology Research
26.0617 Evolutionary Biology
26.0618 Biological Immunology
26.0619 Virology
26.0699 Misc. Biological Specializations, Oth.
26.0701 Zoology, General
26.0702 Entomology
26.0704 Pathology, Human and Animal
26.0705 Pharmacology, Human and Animal
26.0706 Physiology, Human and Animal
26.0799 Zoology, Other
26.9999 Biological Sciences/Life Sciences, Other
27.0000 Mathematics
27.0101 Mathematics
27.0301 Applied Mathematics, General
27.0302 Operations Research
27.0399 Applied Mathematics, Other
27.0501 Mathematical Statistics
27.9999 Mathematics, Other
29.0000 Military Technologies
29.0101 Military Technologies
30.0000 Multi/Interdisciplinary Studies
30.0101 Biological and Physical Sciences
30.0501 Peace and Conflict Studies
30.0601 Systems Science and Theory
30.0801 Mathematics and Computer Science
30.1001 Biopsychology
30.1101 Gerontology
30.1201 Historic Preservation, Conservation and
30.1301 Medieval and Renaissance Studies
30.1401 Museology/Museum Studies
30.1501 Science, Tech. and Society
30.9999 Multi/Interdisciplinary Studies, Other
31.0000 Parks, Recreation, Leisure and Fitness
31.0101 Parks, Recreation and Leisure Studies
31.0301 Parks, Rec. & Leisure Facilities Mgmt.
31.0501 Health and Physical Education, General
31.0502 Adapted Phys. Education/Therapeutic Rec.
31.0503 Athletic Training and Sports Medicine
31.0504 Sport and Fitness Administration/Mgmt.
31.0505 Exercise Sciences/Physiology & Movement
31.0506 Socio-Psychological Sports Studies
31.0599 Health & Physical Education/Fitness, Oth
31.9999 Parks, Recreation, Leisure and Fitness S
38.0000 Philosophy and Religion
38.0101 Philosophy
38.0201 Religion/Religious Studies
38.9999 Philosophy and Religion
39.0000 Theological Studies & Rel. Vocations
39.0101 Biblical & Oth Theological Lang. & Lit.
39.0201 Bible/Biblical Studies
39.0301 Missions/Missionary Studies and Misology
39.0401 Religious Education
39.0501 Religious/Sacred Music
39.0601 Theology/Theological Studies
39.0602 Divinity/Ministry (B.D., M.Div.)
39.0603 Rabbinical & Talmudic Stu. (M.H.L./Rav)
39.0604 Pre-Theological/Pre-Ministerial Studies
39.0606 39.0606
39.0699 Theological and Ministerial Studies, Oth
39.0701 Pastoral Counseling & Specialized Minist
39.9999 Theological Studies & Rel. Vocations, Ot
40.0000 Physical Sciences
40.0101 Physical Sciences, General
40.0201 Astronomy
40.0301 Astrophysics
40.0401 Atmospheric Sciences and Meteorology
40.0501 Chemistry, General
40.0502 Analytical Chemistry
40.0503 Inorganic Chemistry
40.0504 Organic Chemistry
40.0505 Medicinal/Pharmaceutical Chemistry
40.0506 Physical and Theoretical Chemistry
40.0507 Polymer Chemistry
40.0599 Chemistry, Other
40.0601 Geology
40.0602 Geochemistry
40.0603 Geophysics and Seismology
40.0699 Geological and Related Sciences, Other
40.0701 Metallurgy
40.0702 Oceanography
40.0703 Earth and Planetary Sciences
40.0799 Miscellaneous Physical Sciences, Other
40.0801 Physics, General
40.0802 Chemical and Atomic/Molecular Physics
40.0804 Elementary Particle Physics
40.0805 Plasma and High-Temperature Physics
40.0806 Nuclear Physics
40.0807 Optics
40.0808 Solid State and Low-Temperature Physics
40.0809 Acoustics
40.0810 Theoretical and Mathematical Physics
40.0899 Physics, Other
40.9999 Physical Sciences, Other
41.0000 Science Technol./Technicians
41.0101 Biological Tech./Technician

41.0204 Industrial Radiologic Tech./Technician
41.0205 Nuclear/Nuclear Power Tech./Technician
41.0299 Nuclear & Industrial Radiologic Tech.,Ot
41.0301 Chemical Tech./Technician
41.0399 Physical Science Technol./Technicians, O
41.9999 Science Technol./Technicians, Other
42.0000 Psychology
42.0101 Psychology, General
42.0201 Clinical Psychology
42.0301 Cognitive Psychology & Psycholinguistics
42.0401 Community Psychology
42.0601 Counseling Psychology
42.0701 Developmental and Child Psychology
42.0801 Experimental Psychology
42.0901 Industrial and Organizational Psychology
42.1101 Physiological Psychology/Psychobiology
42.1601 Social Psychology
42.1701 School Psychology
42.9999 Psychology, Other
43.0000 Protective Services
43.0102 Corrections/Correctional Administration
43.0103 Criminal Justice/Law Enforcement Admin.
43.0104 Criminal Justice Studies
43.0106 Forensic Tech./Technician
43.0107 Law Enforcement/Police Science
43.0109 Security and Loss Prevention Services
43.0199 Criminal Justice and Corrections, Other
43.0201 Fire Protection and Safety Tech./Technic
43.0202 Fire Services Administration
43.0203 Fire Science/Firefighting
43.0299 Fire Protection, Other
43.9999 Protective Services, Other
44.0000 Public Administration and Services
44.0201 Community Organization, Resources & Serv
44.0401 Public Administration
44.0501 Public Policy Analysis
44.0701 Social Work
44.9999 Public Administration and Services, Oth.
45.0000 Social Sciences and History
45.0101 Social Sciences, General
45.0201 Anthropology
45.0301 Archeology
45.0401 Criminology
45.0501 Demography/Population Studies
45.0601 Economics, General
45.0602 Applied and Resource Economics
45.0603 Econometrics and Quantitative Economics
45.0604 Development Econ. & International Dev.
45.0605 International Economics
45.0699 Economics, Other
45.0701 Geography
45.0702 Cartography
45.0801 History, General
45.0802 American (United States) History
45.0803 European History
45.0804 History & Philosophy of Science and Tech
45.0805 Public/Applied History & Archival Admin.
45.0899 History, Other
45.0901 International Relations and Affairs
45.1001 Political Science, General
45.1002 American Government and Politics
45.1099 Political Science and Government, Other
45.1101 Sociology
45.1201 Urban Affairs/Studies
45.9999 Social Sciences and History, Other
46.0000 Construction Trades
46.0101 Mason and Tile Setter
46.0201 Carpenter
46.0301 Elec. & Power Trans. Installer, Gen.
46.0302 Electrician
46.0303 Lineworker
46.0399 Elec. & Power Trans. Installer, Oth.
46.0401 Building/Property Main. and Manager
46.0403 Construction/Building Inspector
46.0408 Painter and Wall Coverer
46.0499 Const. & Bldg. Finishers & Managers, Oth
46.0501 Plumber and Pipefitter
46.9999 Construction Trades, Other
47.0000 Mechanics and Repairers
47.0101 Electrical and Electronics Equipment Ins
47.0102 Business Machine Repairer
47.0103 Communication Sys. Installer & Repairer
47.0104 Computer Installer and Repairer
47.0105 Indus. Electronics Installer & Repairer
47.0106 Major Appliance Installer and Repairer
47.0199 Electrical and Electronics Equipment Ins
47.0201 Heating, Air Conditioning and Refrigerat
47.0302 Heavy Equipment Main. and Repairer
47.0303 Industrial Machinery Main. and Repairer
47.0399 Indus. Equip. Main. and Repairers, Oth.
47.0401 Instrument Calibration and Repairer
47.0402 Gunsmith
47.0403 Locksmith and Safe Repairer
47.0404 Musical Instrument Repairer
47.0408 Watch, Clock and Jewelry Repairer
47.0499 Miscellaneous Mechanics & Repairers, Oth
47.0501 Stationary Energy Sources Installer/Oper
47.0603 Auto/Automotive Body Repairer
47.0604 Auto/Automotive Mechanic/Technician
47.0605 Diesel Engine Mechanic and Repairer
47.0606 Small Engine Mechanic and Repairer
47.0607 Aircraft Mechanic/Technician, Airframe
47.0608 Aircraft Mechanic/Technician, Powerplant
47.0609 Aviation Systems and Avionics Main. Tech
47.0611 Motorcycle Mechanic and Repairer
47.0699 Vehicle & Mobile Equip. Mechanics & Repa
47.9999 Mechanics and Repairers, Other
48.0000 Precision Production Trades
48.0101 Drafting, General
48.0102 Architectural Drafting
48.0103 Civil/Structural Drafting
48.0104 Electrical/Electronics Drafting

48.0105 Mechanical Drafting
48.0199 Drafting, Other
48.0201 Graphic & Printing Equip. Operator, Gen.
48.0205 Mechanical Typesetter and Composer
48.0206 Lithographer and Platemaker
48.0208 Printing Press Operator
48.0211 Computer Typography & Composition Equip.
48.0212 Desktop Publishing Equipment Operator
48.0299 Graphic & Printing Equip. Operator, Oth.
48.0303 Upholsterer
48.0304 Shoe, Boot and Leather Repairer
48.0399 Leatherworkers and Upholsterers, Other
48.0501 Machinist/Machine Technologist
48.0503 Machine Shop Assistant
48.0506 Sheet Metal Worker
48.0507 Tool and Die Maker/Technologist
48.0508 Welder/Welding Technologist
48.0599 Precision Metal Workers, Other
48.0701 Woodworkers, General
48.0702 Furniture Designer and Maker
48.0703 Cabinet Maker and Millworker
48.0799 Woodworkers, Other
48.9999 Precision Production Trades, Other
49.0000 Transportation and Materials Moving
49.0101 Aviation and Airway Science
49.0102 Aircraft Pilot and Navigator (Profession
49.0104 Aviation Management
49.0105 Air Traffic Controller
49.0106 Flight Attendant
49.0107 Aircraft Pilot (Private)
49.0199 Air Transportation Workers, Other
49.0202 Construction Equipment Operator
49.0205 Truck, Bus & Oth. Commercial Vehicle Op.
49.0299 Vehicle and Equipment Operators, Other
49.0304 Diver (Professional)
49.0306 Marine Main. and Ship Repairer
49.0309 Marine Science/Merchant Marine Officer
49.0399 Water Transportation Workers, Other
49.9999 Transportation and Materials Moving Work
50.0000 Visual and Performing Arts
50.0101 Visual and Performing Arts
50.0201 Crafts, Folk Art and Artisanry
50.0301 Dance
50.0401 Design and Visual Communications
50.0402 Graphic Design, Commercial Art and Illus
50.0404 Industrial Design
50.0406 Commercial Photography
50.0407 Fashion Design and Illustration
50.0408 Interior Design
50.0499 Design and Applied Arts, Other
50.0501 Drama/Theater Arts, General
50.0502 Technical Theater/Theater Design & Stage
50.0503 Acting and Directing
50.0504 Playwriting and Screenwriting
50.0505 Drama/Theater Lit., History & Critcism
50.0599 Dramatic/Theater Arts & Stagecraft, Oth.
50.0601 Film/Cinema Studies
50.0602 Film-Video Making/Cinematography & Prod.
50.0605 Photography
50.0699 Film/Video and Photographic Arts, Other
50.0701 Art, General
50.0702 Fine/Studio Arts
50.0703 Art History, Criticism and Conservation
50.0704 Arts Management
50.0705 Drawing
50.0706 Intermedia
50.0708 Painting
50.0709 Sculpture
50.0710 Printmaking
50.0711 Ceramics Arts and Ceramics
50.0712 Fiber, Textile and Weaving Arts
50.0713 Metal and Jewelry Arts
50.0799 Fine Arts and Art Studies, Other
50.0901 Music, General
50.0902 Music History and Literature
50.0903 Music - General Performance
50.0904 Music Theory and Composition
50.0905 Musicology and Ethnomusicology
50.0906 Music Conducting
50.0907 Music - Piano and Organ Performance
50.0908 Music - Voice and Choral/Opera Perform.
50.0909 Music Business Management and Merchandis
50.0999 Music, Other
50.9999 Visual and Performing Arts, Other
51.0000 Health Professions & Rel. Sciences
51.0101 Chiropractic (D.C., D.C.M.)
51.0201 Communication Disorders, General
51.0202 Audiology/Hearing Sciences
51.0203 Speech-Language Pathology
51.0204 Speech-Language Pathology and Audiology
51.0205 Sign Language Interpreter
51.0299 Communication Disorders Sci & Serv, Oth
51.0301 Community Health Liaison
51.0401 Dentistry (D.D.S., D.M.D.)
51.0501 Dental Clinical Sciences/Graduate Dentis
51.0601 Dental Assistant
51.0602 Dental Hygienist
51.0603 Dental Laboratory Technician
51.0699 Dental Services, Other
51.0701 Health System/Health Services Admin.
51.0702 Hospital/Health Facilities Admin.
51.0703 Health Unit Coordinator/Ward Clerk
51.0704 Health Unit Manager/Ward Supervisor
51.0705 Medical Office Management
51.0706 Medical Records Administration
51.0707 Medical Records Tech./Technician
51.0708 Medical Transcription
51.0799 Health & Medical Admin. Services, Oth.
51.0801 Medical Assistant
51.0802 Medical Laboratory Assistant
51.0803 Occupational Therapy Assistant
51.0804 Ophthalmic Medical Assistant

51.0805 Pharmacy Technician/Assistant
51.0806 Physical Therapy Assistant
51.0807 Physician Assistant
51.0808 Veterinarian Assistant/Animal Health Tec
51.0899 Health and Medical Assistants, Other
51.0901 Cardiovascular Tech./Technician
51.0902 Electrocardiograph Tech./Technician
51.0903 Electroencephalograph Tech./Technician
51.0904 Emergency Medical Tech./Technician
51.0905 Nuclear Medical Tech./Technician
51.0906 Perfusion Tech./Technician
51.0907 Medical Radiologic Tech./Technician
51.0908 Respiratory Therapy Technician
51.0909 Surgical/Operating Room Technician
51.0910 Diagnostic Medical Sonography
51.0999 Health & Med. Diagnostic & Treat Svc, Ot
51.1001 Blood Bank Tech./Technician
51.1002 Cytotechnologist
51.1003 Hematology Tech./Technician
51.1004 Medical Laboratory Technician
51.1005 Medical Technology
51.1006 Optometric/Ophthalmic Laboratory Tech.
51.1099 Health & Medical Laboratory Tech., Oth.
51.1101 Pre-Dentistry Studies
51.1102 Pre-Medicine Studies
51.1103 Pre-Pharmacy Studies
51.1104 Pre-Veterinary Studies
51.1199 Health & Med. Preparatory Programs, Oth
51.1201 Medicine (M.D.)
51.1301 Medical Anatomy
51.1302 Medical Biochemistry
51.1304 Medical Physics/Biophysics
51.1305 Medical Cell Biology
51.1306 Medical Genetics
51.1307 Medical Immunology
51.1308 Medical Microbiology
51.1309 Medical Molecular Biology
51.1310 Medical Neurobiology
51.1311 Medical Nutrition
51.1312 Medical Pathology
51.1313 Medical Physiology
51.1314 Medical Toxicology
51.1399 Basic Medical Sciences, Other
51.1401 Medical Clinical Sciences (M.S., Ph.D.)
51.1501 Alcohol/Drug Abuse Counseling
51.1502 Psychiatric/Mental Health Services Tech.
51.1503 Clinical and Medical Social Work
51.1599 Mental Health Services, Other
51.1601 Nursing (R.N. Training)
51.1602 Nursing Administration (Post-R.N.)
51.1603 Nursing, Adult Health (Post-R.N.)
51.1604 Nursing Anesthetist (Post-R.N.)
51.1605 Nursing, Family Practice (Post-R.N.)
51.1606 Nursing, Maternal/Child Health (Post-R.N
51.1607 Nursing Midwifery (Post-R.N.)
51.1608 Nursing Science (Post-R.N.)
51.1609 Nursing, Pediatric (Post-R.N.)
51.1610 Nursing, Psych./Mental Health (Post-R.N.
51.1611 Nursing, Public Health (Post-R.N.)
51.1612 Nursing, Surgical (Post-R.N.)
51.1613 Practical Nurse (L.P.N. Training)
51.1614 Nurse Assistant/Aide
51.1615 Home Health Aide
51.1699 Nursing, Other
51.1701 Optometry (O.D.)
51.1801 Opticianry/Dispensing Optician
51.1802 Optical Technician/Assistant
51.1803 Ophthalmic Medical Technologist
51.1899 Ophthalmic/Optometric Services, Other
51.1901 Osteopathic Medicine (D.O.)
51.2001 Pharmacy (B. Pharm., Pharm.D.)
51.2002 Pharmacy Administration & Pharmaceutics
51.2003 Medical Pharmacology & Pharmaceutical Sc
51.2099 Pharmacy, Other
51.2101 Podiatry (D.P.M., D.P., Pod.D.)
51.2201 Public Health, General
51.2202 Environmental Health
51.2203 Epidemiology
51.2204 Health and Medical Biostatistics
51.2205 Health Physics/Radiologic Health
51.2206 Occupational Health & Industrial Hygiene
51.2207 Public Health Education and Promotion
51.2299 Public Health, Other
51.2301 Art Therapy
51.2302 Dance Therapy
51.2303 Hypnotherapy
51.2304 Movement Therapy
51.2305 Music Therapy
51.2306 Occupational Therapy
51.2307 Orthotics/Prosthetics
51.2308 Physical Therapy
51.2309 Recreational Therapy
51.2310 Vocational Rehabilitation Counseling
51.2399 Rehabilitation/Therapeutic Services, Oth
51.2401 Veterinary Medicine (D.V.M.)
51.2501 Veterinary Clinical Sciences (M.S., Ph.D
51.2601 Health Aide
51.2701 Acupuncture and Oriental Medicine
51.2702 Medical Dietician
51.2703 Medical Illustrating
51.2704 Naturopathic Medicine
51.2705 Psychoanalysis
51.9999 Health Professions & Rel. Sciences, Oth.
52.0000 Business Management & Admin. Serv.
52.0101 Business, General
52.0201 Business Administration & Mgmt., Gen.
52.0202 Purchasing, Procurement & Contracts Mgmt
52.0203 Logistics and Materials Management
52.0204 Office Supervision and Management
52.0205 Operations Management and Supervision
52.0206 Non-Profit and Public Management
52.0299 Business Administration & Mgmt., Oth.

52.0301 Accounting
52.0302 Accounting Technician
52.0399 Accounting, Other
52.0401 Administrative Assistant/Secretarial Sci
52.0402 Executive Assistant/Secretary
52.0403 Legal Administrative Assistant/Secretary
52.0404 Medical Administrative Asst./Secretary
52.0405 Court Reporter
52.0406 Receptionist
52.0407 Information Processing/Data Entry Tech.
52.0408 General Office/Clerical & Typing Serv.
52.0499 Administrative & Secretarial Serv., Oth.
52.0501 Business Communications
52.0601 Business/Managerial Economics
52.0701 Enterprise Management & Operation, Gen.
52.0702 Franchise Operation
52.0799 Enterprise Management & Operation, Oth.
52.0801 Finance, General
52.0802 Actuarial Science
52.0803 Banking and Financial Support Services
52.0804 Financial Planning
52.0805 Insurance and Risk Management
52.0806 International Finance
52.0807 Investments and Securities
52.0808 Public Finance
52.0899 Financial Management and Services, Other
52.0901 Hospitality/Administration Management
52.0902 Hotel/Motel and Restaurant Management
52.0903 Travel-Tourism Management
52.0999 Hospitality Services Management, Other
52.1001 Human Resources Management
52.1002 Labor/Personnel Relations and Studies
52.1003 Organizational Behavior Studies
52.1099 Human Resources Management, Other
52.1101 International Business
52.1201 Mgmt. Info. Systems & Bus. Data Process
52.1202 Business Computer Programming/Programmer
52.1203 Business Systems Analysis and Design
52.1204 Business Systems Networking and Telecomm
52.1205 Business Computer Facilities Operator
52.1299 Business Information and Data Processing
52.1301 Management Science
52.1302 Business Statistics
52.1399 Bus. Quantitative Methods & Mgmt.,Oth.
52.1401 Business Marketing/Marketing Management
52.1402 Marketing Research
52.1403 International Business Marketing
52.1499 Marketing Management and Research, Other
52.1501 Real Estate
52.1601 Taxation
52.9999 Business Management & Admin. Serv., Oth.
95.0000 Undesignated Field/Imputed
99.0000 Award Level Total

APPENDIX B

DEFINITIONS OF ACTIVITIES

Collier, Douglas J. (1978). Program Classification Structure. 2nd Edition. Boulder, CO: National Center for Higher Education Management Systems (NCHEMS).

DEFINITIONS OF ACTIVITIES

1.0 The Instructional Function

A. Program Definition

Definition: The Instruction program includes those activities carried out for the express purpose of eliciting some measure of "learning" (change in knowledge or skills) in a learner or group of learners. "Educational change" is defined to include (1) the acquisition or improved understanding of some portion of a body of knowledge; (2) the adoption of new or different attitudes, and (3) the acquisition or increased mastery of a skill or set of skills.

B. Definitions of Activities

1. *Curriculum Planning/Course Design*—Those activities associated with designing a course or sequence of courses. Included are tasks such as specifying learning outcomes and developing syllabi.

2. *Instructional Material Acquisition/Development*—Those activities associated with either acquiring and organizing or developing those materials (printed, audio, video, computer programs, etc.) needed to implement the curriculum plan.

3. *Content Delivery*—Activities associated with conveying course content to the learner. Tasks within this activity include delivering lectures (conveying information face-to-face) and conveying this same information through use of print materials, audio/videotapes, software, etc.

4. *Tutoring/Mentoring*—Activities designed to help learners assimilate and understand information that they received. This can be accomplished either through group processes (small class discussion groups, laboratory section) or by means of one-on-one interaction whether face-to-face or through interactions mediated by e-mail, fax, phone, or other device.

5. *Assessment of Learning*—The design, development, and implementation of approaches to determining the extent to which individual learners actually acquired the knowledge and/or skill intended. Also includes assignment of grades.

4.0 THE ACADEMIC SUPPORT FUNCTION AND ASSOCIATED ACTIVITIES

A. Academic Support

Definition: The Academic Support program includes those activities carried out in direct support of one or more of the three primary programs (Instruction, Research, Public Service). The activities that should be classified in this program include (1) activities related to the preservation, maintenance, and display of both the stock of knowledge and educational materials (for example, library services and museums),

(2) activities that directly contribute to the way in which instruction is delivered or research is conducted (such as educational media services, academic computing support, ancillary support), (3) activities directly related to the administration of academic programs, and (4) activities related to the professional development of academic personnel.

B. Related Activities

1. *Computing Support*—Those activities associated with ensuring reliable operation of academic computing systems, acquisition and maintenance of general purpose software necessary for academic functions and provision of user support services to students and faculty.

2. *Telecommunications Support*—Those activities undertaken to create, maintain, and operate the telecommunications infrastructure of an institution. Included are tasks associated with ensuring effective functioning of broadcast television, interactive video, local- and wide-area networks, etc.

3. *Library/Information Support Services*—Those activities undertaken to provide faculty and students with access to library materials and other information and data resources necessary to support activities. Included are the traditional library activities that directly support the collection, cataloging, storage, and distribution of printed materials. Also included are those activities associated with identifying, and arranging for access to, online information resources and databases.

4. *Assessment Support Services*—Those activities associated with providing institution-wide services in such areas as:

    - aiding faculty in developing assessment instruments and techniques
    - acquiring commercially available assessment instruments
    - administering and scoring general purpose assessments
    - designing and administering student surveys
    - analyzing and interpreting the results of general purpose (not single course) assessments

5. *Academic Logistical Support*—Acquiring and distributing course materials to students who are studying at sites remote from the campus.

6. *Academic Administration*—Those activities related to the management and governance of the institution's academic programs (excluding academic program advising) that are carried out by either faculty or administrative staff.

7. *Academic Personnel Development*—Those activities conducted to enhance the capacity of academic personnel to fulfill their assigned function. Included are teaching effectiveness centers, faculty internships, sabbaticals, etc.

5.0 THE STUDENT SERVICES PROGRAM

A. Student Services

Definition: The Student Service program includes those activities carried out with the objective of contributing to the emotional and physical well-being of the students as well as to their intellectual, cultural, and social development outside the context of the institution's formal instruction program. The Student Service program attempts to achieve this objective by (1) expanding the dimensions of the student's educational and social development by providing cultural, social, and athletic experiences; (2) providing those services and conveniences needed by students as members of an on-campus, resident student body; and (3) assisting students in dealing with personal problems and relationships as well as in their transition from student to member of the labor force.

B. Related Activities

1. *Academic Advising*—Those activities that involve providing assistance and advice to students about the courses they should take, describing course requirements for particular programs, scheduling necessary courses, describing program standards, etc.

2. *Counseling and Career Guidance*—Activities associated with those formal placement, career guidance, and personal counseling services provided for the benefit of students.

5.9 STUDENT ACCESS SERVICES/STUDENT RECORDS

A. Student Access Program

Definition: Included in this program are those activities carried out with the objective of obtaining a student body having those characteristics the institution desires (such as academic qualifications and capabilities, socioeconomic status, racial/ethnic background, athletic abilities). Also included are those activities carried out (1) to identify prospective students, (2) to promote attendance at the institution, (3) to provide prospective students with incentives to attend the institution (including financial assistance), (4) to process the admissions applications of potential students, and (5) to maintain academic records on students once enrolled.

B. Related Activities

Major activities within this programmatic area include:

(1) *Advertising and Marketing*—Tasks associated with presenting to potential students information that is intended to persuade them to enroll in the institution/program.

(2) *Recruitment*—Those activities related to the identification of potential students and to the active recruitment of students for admission to the institution. The focus of these activities is on influencing the decision of a particular student or target group either to apply for admission or to attend once admission has been granted.

(3) *Admissions*—Those activities carried out in interviewing and evaluating potential students, processing applications for admission, and admitting students to the institution.

(4) *Financial Aid*—Those activities carried out in order to conduct the student financial aid program of the institution (excludes actual student financial aid grants and stipends). The elements of this activity are:

201 *Financial Aid Counseling and Evaluation*—This category includes financial aid counseling with students and parents to provide information about educational costs, eligibility for aid programs, and the types of financial aid available. It also includes those activities related to the review and evaluation of an applicant's eligibility for financial aid, the determination of the award, and the notification of applicants.

473 *Records Maintenance and Reporting*—Includes those activities related to maintaining, updating, and storing financial aid records. This category also includes those activities related to reporting on the conduct and impact of the institution's financial aid program to institutional planners, governmental agencies, and private donors.

537 *Student Employment Services*—Those activities that are part of the institution's financial aid program and that are intended to assist students, their spouses, and dependents in finding full- or part-time work, through employment opportunities both on- and off-campus. This category includes the activities associated with work/study programs but does not include those activities related to "job placement" for the institution's graduates.

(5) *Student Records*—Those activities the institution carries out to maintain, handle, and update records for currently enrolled students as well as for those who were previously enrolled. Does not include the activities related to record-keeping for those seeking admission to the institution.

6.0 THE INSTITUTIONAL SUPPORT PROGRAM

Institutional Support

Definition: The Institutional Support program consists of those activities carried out to provide for both the day-to-day functioning as well as the long-range viability of the institution as an operating organization. The overall objective of the Institutional Support program is to provide for the institution's organizational effectiveness and continuity. It does this by (a) providing for planning and executive direction; (b) providing for administrative and logistical services; (c) maintaining the quality of the physical environment; (d) enhancing relationships with the institution's constituencies; and (e) providing services and conveniences for the employees of the institution.

APPENDIX C

DEFINITIONS OF OBJECTS OF EXPENDITURE

Compilation of various works from the National Center for Higher Education Management Systems (NCHEMS), 1970-2000. Boulder, CO.

DEFINITIONS OF OBJECTS OF EXPENDITURE

A. Compensation

The sum of salaries and wages and fringe benefits. Applies only to payments made to individual who are **employees** of the organization—not those paid as independent contractors.

1. *Salaries and Wages*—Payments made to individuals who are employees of the organization in recompense for their services. This item excludes expenditures for College Work Study and for employee fringe benefits.

2. *Fringe Benefits*—Includes retirement plans, social security taxes, medical/dental plans, housing plans, unemployment compensation plans, group life insurance plans, workers' compensation plans, and other benefits in-kind with cash options.

For this category it is **necessary** to make distinctions among different categories of employees. Those categories in common use in higher education are:

1. *Executive Management*—Those persons whose assignments require primary (and major) responsibility for management of the institution, or a customarily recognized department or subdivision thereof. Assignments require the performance of work directly related to management policies or general business operations of the institution, department, or subdivision, etc. It is assumed that assignments in this category customarily and regularly require the incumbent to exercise discretion and independent judgment and to direct the work of others. Report in this category all officers holding titles such as president, vice president, dean, director, or the equivalent, as well as officers subordinate to any of these administrators with such titles as associate dean, assistant dean, executive officer of academic departments (department heads, or the equivalent) if their principal activity is administrative.

   Note: Supervisors of professional employees are included here, while supervisors of non-professional employees (technical, clerical, craft, and service/maintenance force) are classified within the specific categories **of** the personnel they supervise.

2. *Instruction/Research/Public Service Professionals (Faculty)*—Those persons whose specific assignments customarily are made for the purpose of conducting instruction, research, or public service as a principal activity (or activities), and who hold academic-rank titles of professor, associate professor, assistant professor, instructor, lecturer, or the equivalent of any of these academic ranks. If their principal activity is instructional, report in this category deans, directors, or the equivalent, as well as associate deans, assistant deans, and executive officers of academic departments (chairpersons, heads, or the equivalent).

3. *Other Professionals*—Those persons employed for the primary purpose of performing academic support, student service, and institutional support activities, whose assignments would require either college graduation or experience of such kind and

amount as to provide a comparable background. Include employees such as librarians, accountants, systems analysts, computer programmers, and coaches.

4. *Technicians*—Those persons whose assignments require specialized knowledge or skills which may be acquired through experience or academic work, such as offered in many 2-year technical institutes, junior colleges, or through equivalent on-the-job training. Include computer programmers (with less than a bachelor's degree) and operators, drafters, engineering aides, junior engineers, mathematical aides, licensed practical or vocational nurses, dieticians, photographers, radio operators, scientific assistants, technical illustrators, technicians (medical, dental, electronic, physical sciences), and similar occupational activity categories which are institutionally defined as technical assignments.

5. *Clerical Staff*—Those persons whose assignments typically are associated with clerical activities or are specifically of a secretarial nature. Include personnel who are responsible for internal and external communications, recording and retrieval of data (other than computer programmers) and/or information and other paperwork required in an office, such as bookkeepers, stenographers, clerk-typists, office-machine operators, statistical clerks, payroll clerks, etc. Include also sales clerks such as those employed full-time in the bookstore and library clerks who are not recognized as librarians.

6. *Trades Workers*—Those persons whose assignments typically require special manual skills and a thorough and comprehensive knowledge of the processes involved in the work, acquired through on-the-job training and experience or through apprenticeship or other formal training programs. Include mechanics and repairers, electricians, stationary engineers, skilled machinists, upholsterers, carpenters, compositors, and typesetters.

7. *Service/Maintenance Workers*—Those persons whose assignments require limited degrees of previously acquired skills and knowledge and in which workers perform duties which result in or contribute to the comfort, convenience, and hygiene of personnel and the student body or which contribute to the upkeep and care of buildings, facilities or grounds of the institutional property. Include chauffeurs, laundry, and dry cleaning operatives, cafeteria and restaurant workers, truck drivers, bus drivers, garage laborers, custodial personnel, gardeners, and groundskeepers, refuse collectors, construction laborers, and security personnel.

B. Supplies and Service

This category includes expenditures for:

- Services provided by individuals/entities other than the organization's employees.
- Goods that have an expected useful life or less than one year (paper, etc.)
- Goods that have an expected useful life of greater than one year but a purchase price of less than $1,000.

Included within this category are:

1. Office and Instructional Supplies

2. Travel

3. Communications

    - voice/video/data connect time charges
    - satellite transponder time charges

4. Duplication of Materials

    - print
    - audio
    - video

5. Postage and Other Distribution Services

6. Contract Services

    - consulting
    - purchased services

7. Licenses—payments for the use of proprietary:

    - courseware
    - software
    - databases

8. Rent

9. Minor Capital Items

C. Capital Items

Included in this category are expenditures for those items which:

1. Have a useful life of greater than one year and an acquisition cost of greater than $1,000.

2. Become the property of the organization (are owned and not rented/leased/licensed).

The category includes expenditures for:

1. Facilities

2. Equipment

3. Telecommunication Infrastructure

4. Courseware–content and Software

5. Professional Development

Since the life of such items is greater than one year, one of the necessary steps in the costing procedures is calculating the single year—as opposed to life cycle—costs associated with utilization of these assets in the delivery of instruction.

D. Costs Borne by Others

1. In many instances, some of the costs associated with delivering a course are borne by parties other than the organization providing the instruction, for example:Other Institutions

2. State Agencies

3. Students

4. Other

APPENDIX D

MATERIALS RELATED TO ACTIVITY BASED COSTING

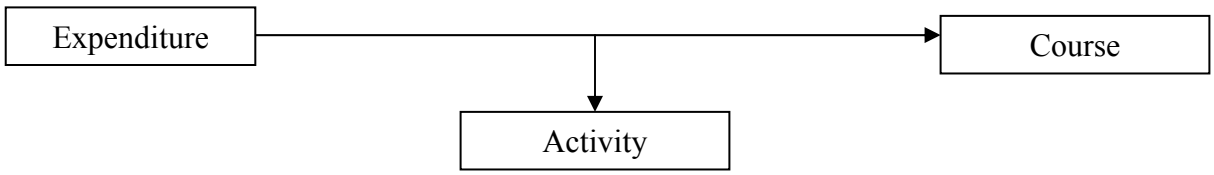
This material was provided by Robert Wallhaus as part of his evaluation of the TCM Phase II Pilot Tests

ASSIGNING EXPENDITURES TO ACTIVITIES AND COURSES

A central step in the Technology Costing Methodology (TCM) is the assignment of costs associated with various objects of expenditure to elements of the activity structure (i.e., Step 5). Essentially, this involves filling in Table 3 of the *TCM Handbook* for those cells that are "material." This is undoubtedly the most critical and difficult step in the TCM.

Before course- and enrollment-related costs are calculated, the costs of activities must be allocated to courses. This can be a one-step or multiple-step process. The following describes some of the different assignment and allocation processes that are involved based upon the interviews with campuses utilizing the TCM. In all of these examples, it is assumed that costs are annualized.

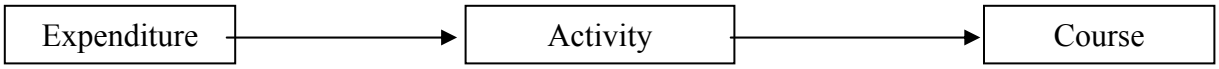
EXPENDITURES ASSIGNED DIRECTLY TO A COURSE



Example: Interactive courseware is leased from a commercial vendor.

No activity analysis is needed in this case, but it is important to assign the expenditures from Table 1:Costing Activity Structure (i.e., 2. Operating-Licenses, Courseware) to the course-related instruction (i.e., Instruction 1.2-Instructional Acquisition/Development). However, if the courseware is shared across multiple courses, a "cost-driver" (for example, number of courses using the courseware) needs to be used to allocate the lease costs to each course.

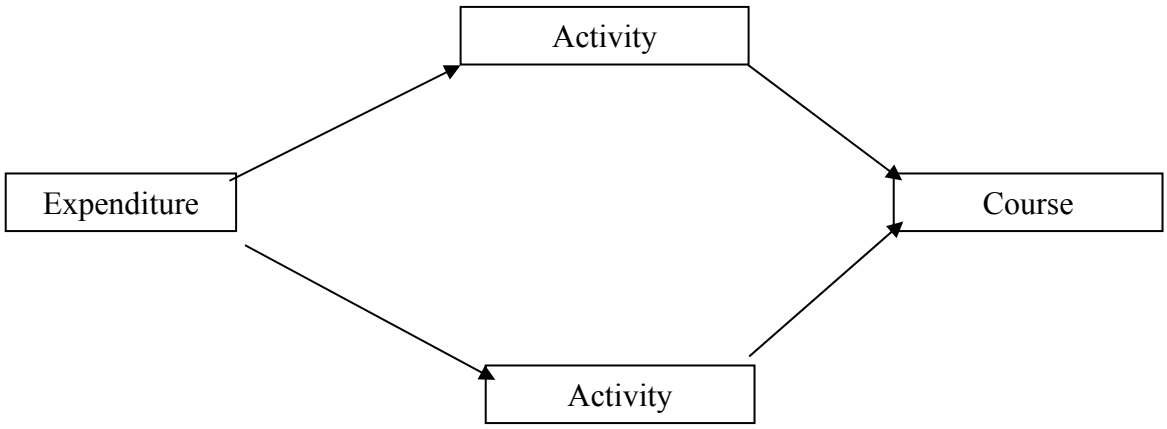
EXPENDITURE ASSIGNED TO AN ACTIVITY, THEN TO A SINGLE COURSE



Example: A faculty member delivers a single course.

A proportion of a faculty member's compensation (i.e., 1. Compensation-Faculty) is assigned to enrollment-related instruction (Instruction 1.3-Content Delivery). Then, the expenditures related to this activity, along with the expenditures related to other activities involved in developing and delivering the course, are assigned to the course.

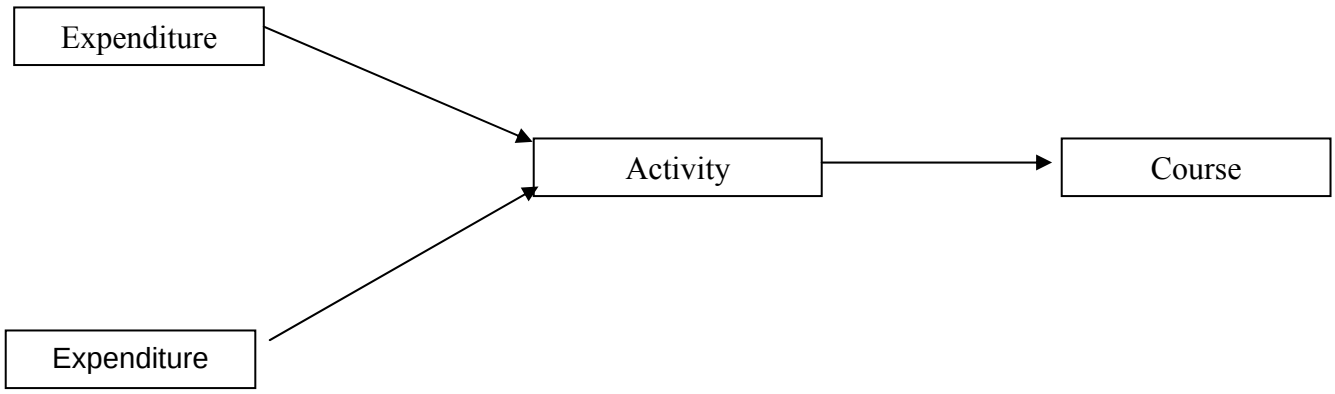
EXPENDITURE ASSIGNED TO MULTIPLE ACTIVITIES, THEN TO A SINGLE COURSE



Example: A faculty member designs and delivers a single course.

The proportion of a faculty member's compensation (i.e., 1. Compensation-Faculty) spent designing the course is assigned to course-related instruction (Instruction 1.1-Curriculum Planning/Course Design). The proportion spent delivering the course is assigned to enrollment-related instruction (Instruction 1.3-Content Delivery). Then, the expenditures related to each of these activities are assigned to the course, along with the expenditures related to other activities involved in developing and delivering the course.

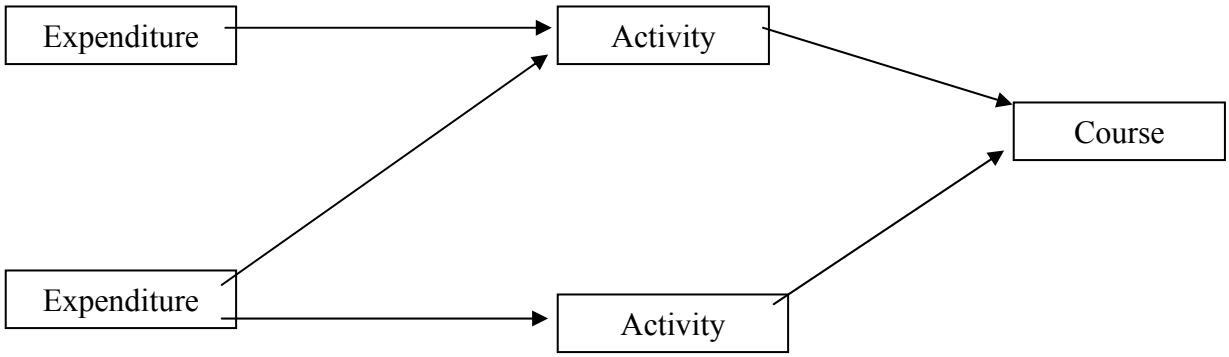
MULTIPLE EXPENDITURES ASSIGNED TO AN ACTIVITY AND THEN TO A SINGLE COURSE



Example: A faculty member collaborates with a member of the media staff in the design of a web-based course.

The proportion of a faculty member's compensation (i.e., 1. Compensation-Faculty) and the proportion of the media center staff compensation (i.e., 1. Compensation-Other Professionals), based upon time spent designing the course, is assigned to course-related instruction (Instruction 1.1-Curriculum Planning/Course Design). Then, the expenditures related to this activity along with the expenditures related to other activities involved in developing and delivering the course are assigned to the course.

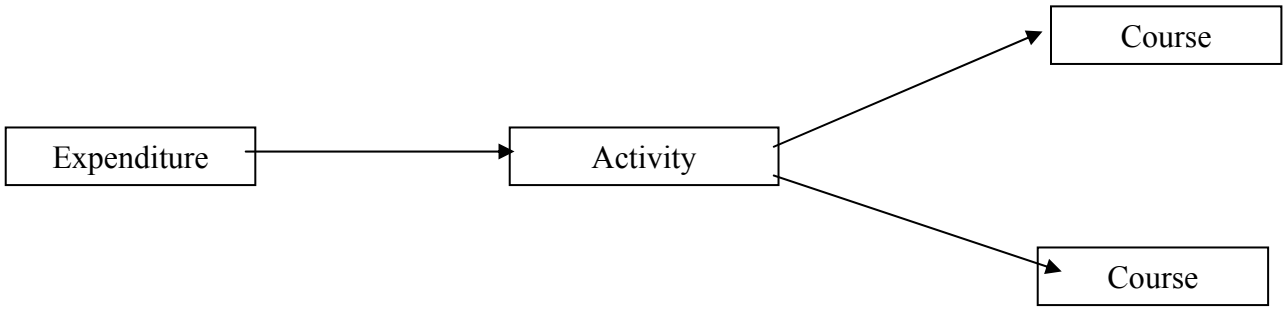
MULTIPLE EXPENDITURES ASSIGNED TO MULTIPLE ACTIVITIES AND THEN ASSIGNED TO A SINGLE COURSE



Example: A faculty member uses courseware acquired (leased) by his academic unit in developing a course which he then delivers/facilitates.

A proportion of the lease cost of the courseware is assigned to course-related instruction (Instruction 1.2-Instructional Acquisition/Development). Since the courseware is shared with other faculty and courses within the academic unit, a "cost-driver," such as number of courses sharing the courseware, must be used to allocate the appropriate proportion of the total lease costs. The proportion of the faculty member's time spent in course development is also assigned to course-related instruction (Instruction 1.2-Instructional Acquisition/Development). The proportion of the faculty member's time spent in delivering/facilitating the course (i.e., 1. Compensation-Faculty) is assigned to enrollment-related instruction (i.e., Instruction 1.3-Content Delivery). Then, the expenditures related to each of these activities along with the expenditures related to other activities involved in developing and delivering the course are assigned to the course.

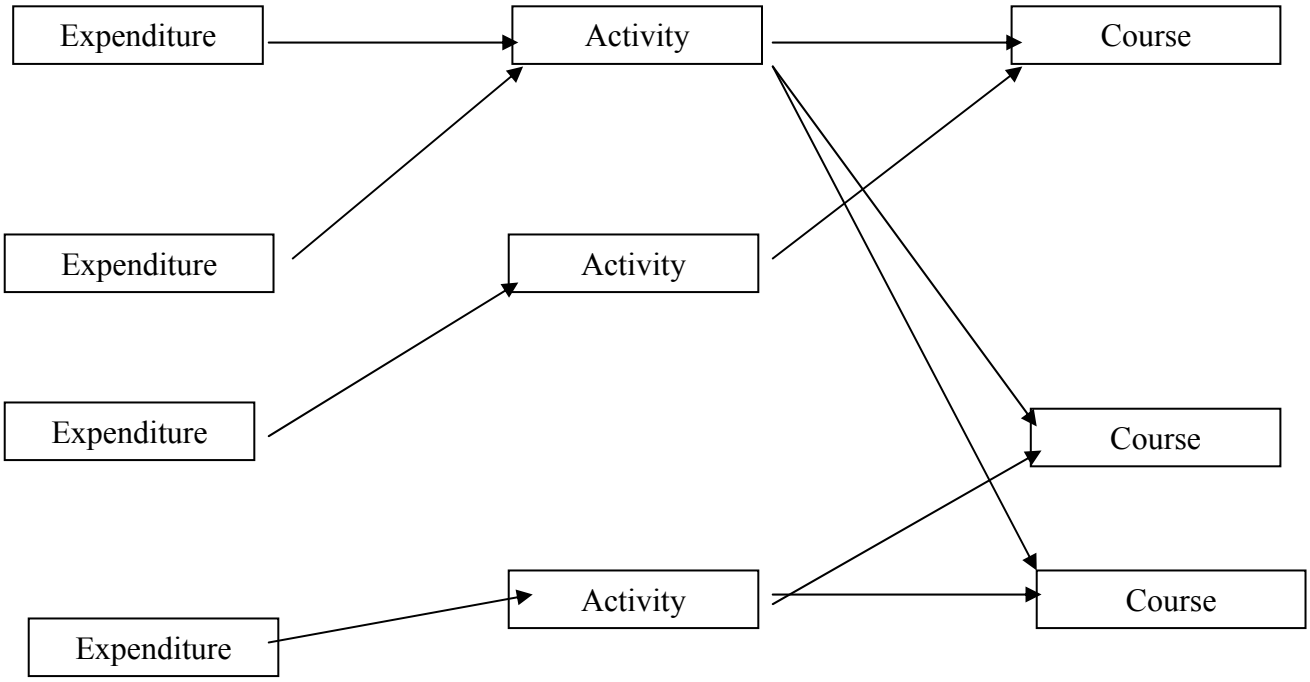
EXPENDITURE ASSOCIATED WITH A SINGLE ACTIVITY ALLOCATED TO MULTIPLE COURSES



Example: A course management system is acquired for use in multiple courses.

The annualized cost of the course management system (i.e., 3. Capital Items, Courseware) is assigned to course-related instruction (i.e., Instruction 1.2-Instructional Acquisition/Development) and then allocated proportionately (based upon course enrollments) to courses in which it is used.

MULTIPLE EXPENDITURES ASSIGNED TO MULTIPLE ACTIVITIES AND THEN ASSIGNED TO MULTIPLE COURSES



Example: Multiple faculty members use interactive voice-video classrooms to deliver their courses.

Expenditures associated with equipping and operating the classrooms (i.e., 3. Capital Items-Facilities and Equipment, annualized; and 2. Operating Expenses-Voice/video connect time charges) are assigned to Academic Support 4.2-Telecommunications Support. Academic Support-Telecommunications Support is then allocated across courses using course enrollments as the cost driver. The proportion of each faculty member's compensation (i.e., 1. Compensation-Faculty) spent on his or her course(s) is assigned to enrollment-related instruction (Instruction 1.3-Content Delivery) and then allocated to the appropriate course(s).