November/December 1998
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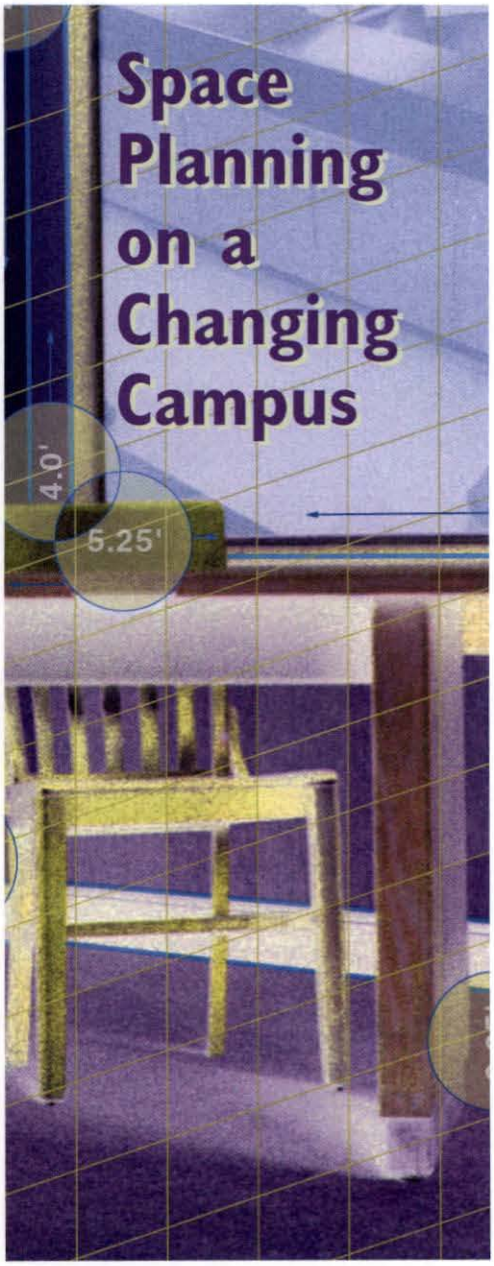
Facilities Manager

The official publication of APPA: The Association of Higher Education Facilities Officers

Space Planning on a Changing Campus

Truth Can Be Stranger Than Fiction



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From the Editor

Steve Glazner

Our last issue focusing on space planning and management was in April 1996. Articles included Gail Biddison and Tom Hier's discussion of performance and productivity, Ira Fink's belief that space counting is not space management, Michel de Jocas' guidelines for selecting the right space planning software, and two articles by Brenda Albright on accountability and results and communicating your space needs to your administration and others. We were pleased with the expertise provided by our excellent authors.

Space planning was, and remains, an extremely popular and important topic to which educational facilities professionals should stay abreast. For this issue of *Facilities Manager,* we have assembled another impressive ensemble of authors who are experts in their fields and have something new to tell us about space planning and management.

Gail Biddison and Tom Hier return to discuss ways to generate revenue from existing and new campus space, and they include a look at housing and classrooms as examples.

Ira Fink also returns in this issue and provides not only an excellent history of space planning in higher education, but also a proposal that we've been calculating space needs based on the wrong criteria all along. Part 2 of his article will appear in the January/February issue.

Harvey Kaiser and Eva Klein have worked on many facilities and space planning projects both individually and together. Here they offer a summary of recent trends within the context of several states' initiatives. Dan Paulien discusses the changing campus classroom and how space management needs to adapt to increased computer use and technology.

Scott Shader and Antony Vaughn describe several of the University of Missouri's Internet-based innovations for storing, maintaining, and updating drawings of buildings and other campus space, as well as communicating to the building occupants any changes that are being made. Beth Worthington shares her concept of place-making as a meaningful component of space planning. Finally, we are pleased to include an article by Sharon Morioka on the popular and comprehensive space planning workshop offered by the Society for College and University Planning.

Space planning and management continues to be a tricky subject for facilities managers. Becoming more educated on the current trends, concepts, and opinions is critical for keeping up with this ever-shifting facilities management responsibility. In addition to the authors and articles listed above, APPA's *Facilities Management* manual provides a good introduction and overview to space planning and management. The twice yearly Institute for Facilities Management also addresses the topic as part of the core curriculum on planning, design, and construction. Search for more information on APPANet at http://www.appa.org.

APPA Mourns the Loss of Long-Time Supporter

Lee Newman

APPA is saddend to announce the death of Lee Newman from Ceramic Cooling Tower. Lee died October 15 from a massive heart attack.

Lee was a long-time supporter of APPA, exhibiting at the international conference for more than 25 years. He was well-known among the members of APPA and actively supported both the international and regional associations.

In 1995, Lee Newman was presented the President's Award by then-President Charlie Jenkins for his faithful support of both APPA and CAPPA annual meetings.

Memorial services were held on Tuesday, October 20 in Ft. Worth, Texas. Condolences should be sent to: Joan Newman, 4308 Tamworth, Ft. Worth, TX 76116.

APPANet Woes

As many Internet users already know, APPA's Internet services experienced problems beginning in September due to hardware difficulties. Staff e-mail is up and running, and the website is online; however, we are still continuing to work on fully restoring all services as quickly as possible. While APPA mailing lists still remain offline, members should remember to make use of their regionally-hosted mailing lists as online resources. Information on subscribing to your chapter's listserv is available at **http://www.appa.org/links/lists.htm.**

Also, should you need assistance or materials, do not hesistate to contact the APPA headquarters by e-mail, phone, or fax. Any materials you may need can be requested through APPA's fax-on-demand service by dialing 800-701-UFAX (select the first option to receive a current listing of available documents). We apologize for any inconvenience caused by this service interruption, and we thank you for your patience!

It's Been Fun!

APPA staff and members bid adieu in September to Tina Myers, who has left her role as APPA's director of member services to spend quality time with newly-arrived daughter Sarah Ann. Tina had been with APPA for 8½ years, during which she was active in many APPA initiatives and was instrumental in getting APPA's office networked. Starting as office manager and moving on to hold the positions of director of administrative services and director of member services, Tina was also staff liaison to the ERAPPA region and the K-12 Task Force.

Although filling Tina's shoes will be difficult, the lengthy process of interviewing and hiring a new director of member services has begun. In the meantime, all questions regarding member services should be directed to Maxine Mauldin, member services manager. She can be reached by e-mailing **mmauldin@appa.org.**

Hot Off the Presses

The second edition of *Custodial Staffing Guidelines for Educational Facilities* is now available to help you assess the right mix of custodial services for your facilities. This thoroughly revised and expanded edition of the original *Custodial Staffing Guidelines* is designed to help you gain control of your needs by organizing them into five succinctly defined "levels of cleanliness."

Custodial Staffing Guidelines covers:

- Data from comparable facilities takes the guesswork out of determining the right custodial mix.
- Helpful space inventory information shows you how to determine appropriate staffing based on facilities square footage.
- Case studies illustrating how principles are put into practice—see what works and what doesn't!
- Information on how and when contracting can be used to meet your custodial needs.
- Find out where your institution is on the cleanliness scale, and find out where you should be and how to get there.
- Learn how to train and manage your custodial team for optimum results.
- Learn what you should be paying for custodial services and how to back up your budget with data.
- Take advantage of cyclical changes in your staffing requirements to utilize your budget and time effectively.

Meeting your institution's custodial needs is a difficult challenge. Make sure you have the right tools to get the job done. Order your copy today! Copies are available from APPA for $75 members/$95 nonmembers. To order contact APPA at 703-684-1446 ext. 235, or obtain an order form from APPA's fax-on-demand service at 800-701-UFAX, document no. 44.

Strategically Planning on APPANet

One of the highlights of *Facilities Manager* magazine's 1997 year was James and Susan Cole's six-part Strategically Planning series, which emphasized the issues that impact facilities organizations and creative means of resolving those issues. Now the articles have been compiled and published on APPANet as an useful resource for members. Visit **www.appa.org** and click on the Bookstore icon. James is a 1996 recipient of APPA's President's Award for assisting the APPA Board of Directors in the development of its strategic plan. James Cole is the principal consultant to management, and Susan Cole is president, of CommTech Transformations, Inc., based in Fort Collins, Colorado.

Early Bird Registrations

The next Institute for Facilities Management will be held January 17-22, 1999 in scenic, snowy Reno, Nevada. The September Institute sold out in record time so don't delay! Course, faculty, hotel, and registration information are now available on APPANet. Click on the Education icon and follow links to the Institute. Register before December 18 and save $100!

Launching Alliances

by E. Lander Medlin

Since my appointment as APPA's Executive Vice President, I have shared my views on our future and my reflections on this past year's accomplishments and the coming year's opportunities. Now, I will chronicle the meaningful strategic alliances APPA's Board of Directors has formally embraced with several associations, organizations, and agencies. These strategic alliances have been established for the long-term benefit of the membership. By forging ahead with each of these strategic alliances, we are poised to: a) provide depth and breadth to the profession's four core competencies (1. General Administration & Finance; 2. Operations & Maintenance; 3. Planning, Design, & Construction; and 4. Energy & Utilities); b) improve the facilities management profession as an industry; c) further leverage our scarce resources; and d) increase our understanding and appreciation of the critical factors influencing both higher education and the profession. These factors include: information technology, resource scarcity, public scrutiny and accountability, governmental intervention, and environmental deterioration.

The **Professional Grounds Management Society** (PGMS) can be bookmarked as our first alliance partner. This is an extremely important relationship to build since grounds maintenance is reflective of a major responsibility area under the Operations & Maintenance core competency. We signed a formal agreement in the spring of 1997 (which was described in that year's May/June issue of *Facilities Manager*). The alliance agreement outlines our mission to cooperatively work together to improve the quality of landscaping and grounds design, maintenance, and operations performed by member professionals. Our goals are broad sweeping and reinforce our commitment to: 1) continue communication at the national level and foster these channels of communication at the regional and local level; 2) promote the use of sound environmental and ethical practices; and 3) collaborate and cooperate in outreach programs to increase awareness and further recognize grounds management, specifically, and the facilities management profession, in general.

Regarding this relationship, John Gillan, my counterpart and executive director of PGMS, stated, "Though we have worked together on an informal basis for several years, the partnering agreement between our two organizations has definitely galvanized our thinking and activity toward benefiting our two memberships." What does this alliance mean for you? As grounds management is considered a core management responsibility for most facilities managers, member rates are provided for any and all PGMS publications, programs, and services, which are many, varied, and highly professional. Other areas of opportunity focus on educational programs at both the annual meeting and several regional meetings. We are incorporating their facilitators in our Speakers' Bureau/PETS program (partnerships in education training series); plus work has begun on the development of a Grounds Staffing Guidelines publication. This is measurable progress.

Our next strategic alliance partner, signed in the fall of 1997, is the **Construction Specifications Institute** (CSI). CSI provides a wealth of technical information in building design and construction through a well-known uniform system of organizing construction specifications and information. We are committed to cooperatively work together to advance the technology and quality of building construction and management in North America. It is in this vein that we fleshed out the following goals: 1) to foster a strong, continuing alliance to better serve the construction and facilities management community; 2) to provide a rich and clear exchange of information; 3) to leverage our respective strengths to develop unique programs, programs, and services; 4) to provide each of our members with quick and economical access to each others' products and services; and 5) to build a strong bond of trust between and among these two communities of professionals.

Noble as these goals sound, much has already been accomplished to forge a strong partnership with CSI. We have already engaged in exchanging speakers to deliver sessions at our respective annual meetings; new products and services are offered either free or at corresponding member discount prices in our publications catalog and on the Internet; CSI speakers have agreed to be part of our Speakers' Bureau/PETS program and are already teaching electives at our newly redesigned Institute for Facilities Management. We envision ample opportunities for the development of

Lander Medlin is APPA's executive vice president. She can be contacted at lander@appa.org.

joint publications and educational programs that would mutually benefit both organizations' members, especially since this area of responsibility also reflects one of the four core competencies of the facilities management profession (Planning, Design & Construction). CSI was featured in our 1998 March/April issue of *Facilities Manager* focused on planning, design, and construction and will be so again this coming year. They have much to offer within their detailed specifications manuals titled *Manu-Spec, Spec-Data, Uniformat,* etc.

We have invested much time and energy in an alliance with the **Department of Energy's Rebuild America Program** (DOE/RBA) and it is serving to be an invaluable relationship. As you may recall, we agreed to work together to establish a program to provide educational workshops and other tools to aid educational institutions in addressing two critical and costly facilities issues: deferred maintenance and energy expenditures. APPA and DOE/RBA initiated a series of activities called the Opportunity Assessment to help the nation's schools understand the new options available to them. Those options consist and are designed to: 1) take advantage of deregulation by helping institutions negotiate for the lowest possible rates; 2) help institutions reduce consumption through retrofits, upgrades, and accurate monitoring; and, 3) show institutions how to turn these cost savings into funding for deferred maintenance and capital renewal.

We have moved beyond this initial, onetime contractual effort to an alliance that outlines our desire to work together to: 1) continue to encourage energy efficient, cost effective educational facilities; 2) aid in the reduction of the multi-billion-dollar backlog of accumulated deferred maintenance and facilities renewal and replacement needs on our college and university campuses; 3) work toward the establishment of more energy efficient design guidelines for renovation and new construction; and 4) increase the awareness of these problems by senior institutional officers.

The **Association of College and University Housing Officers-International** (ACUHO-I) represents the fourth strategic alliance, which was formalized this summer 1998 at our respective annual meetings. At many of your institutions, the housing professional represents the first line of defense for building maintenance, operations, construction, and energy consumption in the residence halls (which more often than not is reflective of one-third of the institution's square footage to be maintained). We consider ACUHO-I to be a sister organization where a similar need exists for the body of knowledge resident in the facilities management profession. It behooves us to better educate and inform and, correspondingly be educated and informed, by these professionals concerning this major programmatic area of responsibility. In many cases, these individuals are entry level staff who need facilities management training in order to manage their buildings and educate students about their living environment.

Our goals for this strategic alliance outline the need to: 1) commit to enhanced communication between the two international organizations and their corresponding regional and local chapters; 2) provide an exchange of information via both print and electronic media; 3) focus on the development of specific preconference workshops and targeted publications for the housing professional; 4) provide reciprocal member fees and rates for our programs, products, and services; and 5) ultimately build a stronger relationship amongst and between our members, leaders, and institution's organizations. Gary Thompson, the assistant director for facilities for University Housing at North Carolina State University, sums up the need and desire for this alliance by saying: "The management of our facilities to meet the standards and expectations of our resident population, our own department, and our college/university administration is a tremendous responsibility. Our goal should be to place well-trained and prepared staff in positions to best meet this challenge. Taking advantage of all that APPA offers can be a very effective way to meet that goal."

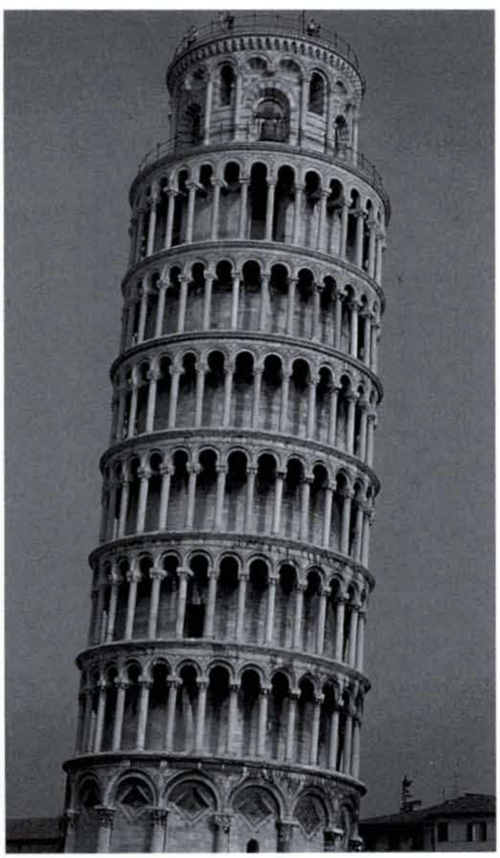
Finally, I am also pleased to report that a strategic alliance has been formed and signed as of this past annual meeting in San Jose with the **Construction Market Data Group** (CMD Group), which represents a group of companies spanning the building construction industry in such areas as publishing in both print and electronic media, data and information collection and dissemination, and construction estimation. In our industry, the most well-known of their group of companies is R.S. Means, which is considered "the source" for building construction and repair estimation guidelines. Although a for-profit entity, much of CMD's information, services, and technology will be considered shared resources made available for the asking. As the strategic alliance agreement states, we strive to work jointly to improve the efficiency and quality of information, services, and technologies of our respective industries. Therefore, it is mutually beneficial for APPA and the CMD Group to enter into this strategic alliance. Our relationship grew out of a desire to positively impact the way construction and facilities managers do business. We have much to offer each other and both firmly believe the overriding, overarching goal is to improve the facilities profession.

Specifically, our mission is to align our organizations to advance the information, services, and technologies of the construction and facilities management industries to better meet the needs of our stakeholders. Our goals encompass: 1) the development of a rich and clear exchange of information regarding construction and facilities management processes and practices, the requisite skills and experiences of our organizations; 2) the economical access to existing products, services and programs, thereby leveraging our skills and resources to provide better information and services to better serve our stakeholders; and 3) to create a strong alliance that capitalizes on and promotes existing and emerging technologies that serve the construction and facilities management industries. We are already exchanging industry news and editorial content in our corresponding publications, providing discounted services, offering pre-conference workshops and educational programs, and establishing a task force to jointly develop technical trades staffing and costing guidelines. CMD Group presently offers a free print copy of *Architects First Source* (a product selection and specification solution) to all APPA members (to obtain your copy, just call 800-395-1988). Details concerning CMD Express, an online construction project information tool can be found by exploring our hyperlink between APPA's website and that of the CMD Group.

I have merely highlighted the mission and goals for each strategic alliance and touched on some of the measurable progress made by each of these alliances. For additional details concerning the specific objectives and initiatives for each of these strategic alliance agreements, please visit APPA's website. I will update you as other formalized partnership agreements unfold.

It is my desire to keep you better informed about the alliances and partnerships APPA is engaged for your mutual benefit and interest. It is also my hope that as you become more aware of these relationships, you will take advantage of what each has to offer and engage me or any APPA staff member in a dialogue about how we can better serve your needs through these relationships.

Frankly, by forging such alliances, we have the opportunity to create real synergy: where the whole becomes greater than the sum of its parts. It is through this synergy with the various members of the facilities management profession that we will indeed make a difference throughout the educational facilities community well into the 21st century.



Movers and Shakers

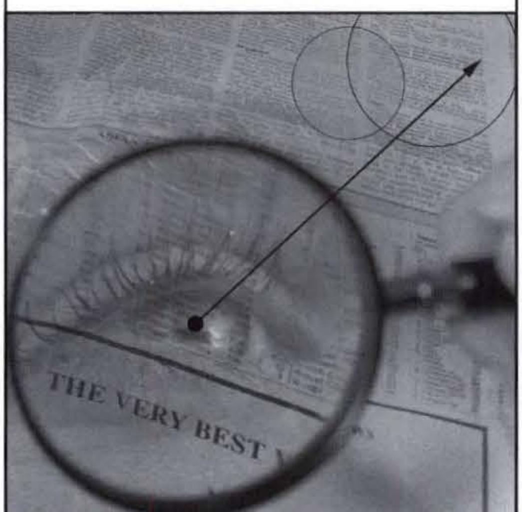
by H. Val Peterson

Out in the community, in both business and government, the folks who make things happen, those who set trends and are not satisfied with maintaining the status quo, are called movers and shakers. I'm not sure where the term originated, but it seems obvious that those who qualify to be called such are people on the "move" who are willing to "shake" things up in order to accomplish needed initiatives or changes. A mover is one that sets something in motion such as a plan, a good idea, a concept, or a project. A shaker is one that incites, promotes, or directs action. Movers and shakers are good in both areas.

The opposite of these movers and shakers might be referred to as "loafers and quakers" (The term "quakers" refers to the tremulous variety, not the religious kind.) This group is made up of individuals that rarely accomplish much of lasting value because they are not willing to lead out for fear of failure, or they are too lazy, or they just don't care. They are merely caretakers of their responsibility.

Robert Byrne has said, "There are two kinds of people, those who finish what they start and so on...." Movers and shakers obviously stay more focused. In the workplace, however, there are two types of people:

- Those who follow trends and those who set them.
- Those who say "no" and those who ask "how."
- Those who focus on problems and those who envision possibilities.
- Those who make mistakes and those who learn from them.
- Those who fix blame and those who fix problems.
- Those who fear change and those who thrive on it.
- Those who tear down and those who build up.
- Those who quit at the end of the day and those who never stop.



- Those who make it up as they go and those who know where they're headed.
- Those who roll with the punches and those who deliver the punch.
- Those who strive and those who achieve.

Which type are you?

There are movers and shakers in the field of facilities management too. You have, no doubt, met some of them. Perhaps you are one. These movers and shakers are the ones who set things in motion and make things happen. They lead out with new and innovative ways of getting the job done. They are not bound by convention and they look for better ways for doing old tasks. They embrace technology and use it extensively within an organization. They move beyond customer service into what has been called customer astonishment.

Facilities management movers and shakers don't just complain about deferred maintenance problems, they find the means to get them funded. They burst the shackles of sluggish institutional bureaucracy, restrictive governing board policies and prohibitive state laws and get them changed. They don't shrug their shoulders and wring their hands over employee salaries that are not competitive, but find creative ways to increase them. They don't make excuses for poor performance and lack of service because of inadequate operating budgets, but rather find ways to get the job done anyway. They don't tell customers "we don't do that," but find the wherewithal to respond to customer needs. Sometimes leaders stage revolutions to get the job done.

Jerry Garcia of The Grateful Dead once said, "Somebody has to do something, and it's just incredibly pathetic that it has to be us." If you and your own facilities management organization want to be known as an organization of movers and shakers, it can happen, but to do so means it has to be us—you and your team. You can't wait for someone else or for some other unit or department to do it—it has to be us. If you want to be known for leading out, for raising the bar, for setting the benchmark, for doing things right, and for doing the right things, then you must be willing to do some moving and some shaking. And there are always plenty of things to work on.

So how about it? Are you willing to be a mover and a shaker?

Val Peterson is director of facilities management at Arizona State University, Tempe, Arizona, and a past APPA President. He can be reached at valpeterson@asu.edu.

SPACE STANDARDS: SOME RECENT LESSONS

By Harvey H. Kaiser and Eva Klein

Space standards are a ubiquitous and often misunderstood component of space planning and management. Recent initiatives to review space standards in current use by statewide coordinating agencies for public higher education offer insights into the concept of standards for space planning and management. One of those initiatives was a study conducted in 1997 by the authors of this article for the University of North Carolina (UNC) General Administration. This national survey of space standards was an element in the development of capital budget process guidelines for the 16 UNC constituent institutions. The survey was extremely informative about use (and misuse) and understandings (and misunderstandings) of space standards.

This article incorporates data, findings, and conclusions developed for the UNC study, along with our other recent experiences in higher education.

Harvey Kaiser is president of Harvey H. Kaiser & Associates, Syracuse, New York. Eva Klein is president of Eva Klein & Associates, Ltd., Great Falls, Virginia.
The authors acknowledge the use of the material prepared for the University of North Carolina General Administration under the direction of Jeffrey R. Davies, associate vice president for finance, in the development of this article.

Increasing Interest in Space Standards

The subject of space planning and utilization standards is receiving increasing attention in higher education as a tool for improving capital planning, budgeting, and management. Several states are in the process of reviewing space planning and utilization standards. Some systems recently have conducted extensive internal or consultant studies.

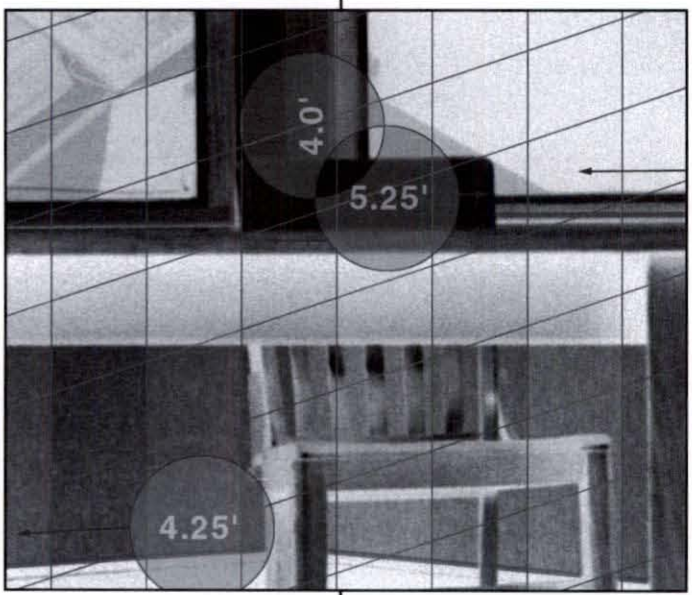
There are several sources of impetus for this heightened interest. Generally, much of it derives from increasing demands for accountability. In some cases, the direct focus is the introduction of more rigorous tests of capital budget requests to statewide coordinating agencies, prior to submission to sources responsible for authorizing capital appropriations. Another factor is legislative concern about requests for new construction and the recent trend to encourage increased space utilization and/or major repair and rehabilitation, as alternatives to new construction. In some states, outdated space standards that have received little or no application in recent years are being reexamined to respond to legislators' interest. Finally, in some states, recognition of the impact of technology is driving renewed interest in space standards, particularly for classrooms, class labs, and libraries.

Defining Space Standards

One finding in the UNC survey was the varied interpretation of the term space standards. To some states, the procedures that include certain space and utilization criteria used for the completion of an inventory of facilities suffice for standards. In other states, standards are specific planning criteria to be used solely in the preparation of capital budget project requests. Elsewhere, there are two companion policies that distinguish between space planning standards and space programming standards.

Even the titles of space standards documents suggest the variety of guidelines in use. They use such varied and seemingly interchangeable phrases as: key guidelines for space management, program standards, space planning standards, space utilization planning criteria, space generation procedures, quantitative space analysis, space projections methodology, facilities standards and guidelines, facilities qualification and prioritization process, and many others.

Space standards policy documents range from one or a few pages of space and utilization criteria to documents of more than 50 pages that explain the background, use, and detailed design guideline criteria for all HEGIS (Higher Education General Information Survey) room use codes. Some documents separate space planning criteria from program design standards.



Use of HEGIS Room Use Codes or Other Categorizations

HEGIS room use codes define categories of space. Therefore, in some policy documents, space allowances are defined for HEGIS rooms use codes, such as 110 classrooms, or 310 offices.

In some state policies, the HEGIS categories are further disaggregated into sub-categories to reflect distinctions for levels of programs (undergraduate, masters/professional, and doctorate), intensity of use (high, medium, or low), and FTE students, as an economy of scale factor. In such policies, there would be a series of space allowances within the 110 classroom code that differ for levels or programs.

In contrast, some states aggregate several HEGIS codes to create broader categories, such as "teaching space" or "instructional space." For example, in the Texas model mentioned below, several HEGIS codes—110 classrooms, 210 class laboratories, 220 special laboratories, 230 self-study laboratories, physical education (500s) and assembly (600s)—are combined together into a measure called "teaching space" and accorded a base allowance of 45 ASF, which then is modified for two more intensive categories of programs.

Categories of Space Standards in Use

The purposes of space standards can be threefold, ranging from macro to micro planning:

- Strategic and capital budget planning
- Utilization reviews of existing space
- Design programming for new construction or renovation

The most understandable and usable are those policies in which the guidelines distinguish between space planning standards for strategic and capital budget planning and space programming standards for facilities programming. Space utilization standards are intended to measure the efficiency of existing space use for classrooms and class laboratories. For these two categories (HEGIS 110 classrooms and HEGIS 210 class laboratories), the utilization standards are incorporated with planning standards, in projections of space needs.

Space Planning Standards

Space planning standards (or guidelines) are criteria, usually expressed as an assignable square feet (ASF) allowance, used for analysis of campus capital needs. The point is to compare existing space to hypothetical projections of space required, based on the standards. Comparisons of actual to predicted space, by facility type, result in calculated surpluses or deficits, and usually are applied as a factor in the evaluation of a campus capital budget request. Reliable calculations can only be done if the system or institution maintains a detailed and current space inventory. For 110 classrooms and 210 class laboratories, utilization standards must be used with the planning standards, to predict space and calculate surpluses/deficits.

The level of detail can vary in these standards. For example, the Texas Higher Education Coordinating Board (THECB) *Space Projection Model* is designed as a tool to assess net E&G space, as an aggregated category. Standards in use in New York (CUNY and SUNY), Tennessee, and South Carolina are more detailed examples of space criteria for room types, but that also are applied to calculate surpluses/deficits as measures of overall campus facilities needs. Models often are designed to include only E&G space types because, in most states, taxpayer- supported funding often is limited largely to E&G facilities. The categories most typically covered by policies on planning standards are:

- Instructional/teaching (classrooms and class labs)
- Offices
- Library/Study Space
- Research
- Support space

Space Utilization Standards

Space utilization standards for classrooms and classroom measure laboratories the number of hours per week a room is in use (*weekly room use hours*) and the average percentage of seats occupied during any given hour (*student station occupancy ratio*).

Utilization standards, sometimes referred to as productivity factors, are calculated to assess how effectively 110 or 210 instructional space is being used. This productivity measure may be called a "room utilization rate" (RUR). The formula, shown below, compares "actual use" (expressed in actual Student Clock/Contact Hours) to "potential use" (with potential Student Clock/Contact Hours expressed as a combination of the number of student stations, the weekly room hours, and the station occupancy rate):

$$\text{RUR} = \frac{\text{Total Weekly Student Contact Hours}}{\text{\# of Student Stations x Weekly Room Hours x Station Occupancy Rate}}$$

Use of a Space Factor in Planning

The two space utilization factors, combined with the ASF allowance of the planning standard, creates a "space factor," which then is multiplied by the Student Clock Hours of instruction to generate campus predicted space.

$$\text{Space Factor \#1} = \frac{\text{Assignable Square Feet per Student Station}}{\text{Average Weekly Room Hours x Station Occupancy Rate}}$$

$$\text{Space Factor \#2} = \frac{\text{Assignable Square Feet}}{\text{Weekly Student Contact Hours X Station Occupancy Rate}}$$

$$\text{Space Factor \#3} = \frac{\text{Assignable Square Feet per Student Station}}{\text{Student Clock Hours}}$$

For example, Space Factor #1 is calculated and then multiplied by the Student Clock Hours of Instruction, to generate a predicted/needed square footage of classroom or class laboratory space.

Space Programming Standards

Space programming standards, sometimes called design standards or design guidelines, are quite specific planning formulas by which one designs the exact sizes of individual rooms usually in the context of capital project planning. The completeness of detail on room sizes, characteristics, and equipment form a set of programming standards that can be applied directly in the design of a facility. Programming standards in use in New York (SUNY) and the California (UC and CSU) are in formats separate from those systems' planning standards and are administered by different staffs.

An inappropriate application would be use of the planning/utilization standards as a programming standard. For example, a system may establish an ASF station size of 16 ASF for purposes of overall planning for the quantity of campus classrooms. However, it would be inappropriate to apply this standard as a programming standard, to specify that each classroom should be built to exactly 16 ASF per student station.

In their varied applications, planning standards suggest considerable flexibility because they are one factor in supporting capital budgeting, while programming standards are intentionally more rigid, because they are used to actually plan a building project.

Common Aspects of Space Standards

Common Industry Sources

Throughout higher education, a few standard industry sources are the basis or genesis of observed space standards. Most commonly, governing agencies and/or university systems adopted or adapted space standards are based on:

- H.D. Bareither's and J.L. Schillinger's *University and Space Planning* (1968)
- *Higher Education Facilities Planning and Management Manuals,* published by WICHE (1971)
- *Space Planning Guidelines for Institutions of Higher Education,* (1985) published by CEFPI.

Planning for study facilities (libraries) typically is based on *Standards for College Libraries,* published by the Association of Research Libraries (1986). Consistency for space inventory data collection is found in general use of the *Postsecondary Education Facilities Classification and Inventory Manual* (1992), published by the National Center for Education Statistics.

Common Units of Measurement

To quantify user volume, student and faculty/staff full-time equivalents (FTEs, FTSEs, FTEFs, and FTENs) or Student Clock Hours or Contact Hours (SCH) are the most consistent basis of measurement and expression for space standards. However, there are differences in the way governing agencies and university systems establish enrollment and employee counts including:

- Method of definition of full-time equivalent enrollments (by number of credit hours)
- Enrollment time period (fall semester, annual average, etc.)
- Inclusion or exclusion of non-E&G-funded courses (off-campus, continuing education, etc.)
- Period of day (daytime versus evening)
- Definitions of FTE faculty/staff and categories of postdoctoral, fellows, etc.

- Levels of instruction (Lower Division, Upper Division, Graduate I, Graduate II)
- Classification of instructional programs by disciplines or complexity of use

For other elements, standard units of measure used include:

- Stations (classrooms or labs)
- Weekly room hours (WRH) and room occupancy ratios (ROR) or Station Occupancy Ratios (SOR) for utilization measures
- Library volumes
- Stacks
- Reading stations

Variations in Space Standards and Uses

Variations in approaches to the development and application of space standards are explained, in part, by traditional system practices for review and approval of capital budget requests. More important factors are the level of demand for capital funding, availability of funds for capital expenditures, and competition for funds.

Those states with substantial capital expenditure experience (e.g., New York, California, Ohio, and Texas), or those states anticipating large enrollment growths (e.g., Virginia, Florida, and Georgia), place a higher emphasis on space standards as a component of their capital budget review process. Their approaches to space guidelines incorporate techniques to assist in the evaluation of capital budget requests. These techniques include the use of variables to differentiate between space needs based on:

- Institutional size (by enrollments)
- Upper and lower divisions (e.g., undergraduate 1 and 2, graduate1 and 2)
- Program complexity, and
- Carnegie classifications.

A trend that is developing among various state facilities offices, like Texas, limit guidelines to only E&G space, while others have established standards to cover the entire list of HEGIS room use categories. In some cases, standards are available for reference but are not essential components of the capital budget review process. This, for example, had been the case in North Carolina, as the Board of Governors had not previously used the standards in capital budget preparation. Current reviews in several states are directed towards alternatives for data collection and analysis that will affect the content and use of their standards for capital review purposes.

Sample Means and Ranges for a Sample of State Systems

Table 1 presents highlights of planning standard policies from the survey that was done for UNC.

Flexible Interpretation of Standards

Typically, policy documents urge flexibility in application of space standards. This flexibility in application of standards is illustrated by introductions to guideline documents for capital planning and programming of several statewide agencies. For example:

- The Maryland Department of State Planning states that *"These guidelines are to be used as an aid in identifying the types and amounts of non-residential facilities that may be required by a campus to meet its future needs."*
- The California Postsecondary Commission defines space and utilization standards in broader terms as *"formulas used by planners and policy-makers at the State, central office, and campus levels to determine the sizes of various types of facilities, and the number of hours per week that classrooms and teaching laboratories are expected to be in use."*
- The Texas Higher Education Coordinating Board stresses its flexibility with the statement that *"This model does not*

Table 1: Summary of ASF Ranges and Means for Selected HEGIS Room Codes from Survey Conducted for UNC

Code	Description	Range	Mean
110	Classroom	14 to 22	16.6
210	Class Laboratory*	15 to 244	75.7
310	Office Space**	125 to 190	143
410	Study Facilities/Reading Room***		25% of FTE Students at 25 ASF per FTE Student
420/430	Study Facilities/Stack and Open Stack	0.025 to 0.15	0.078

Notes: *Many policies vary lab ASF allowances by discipline.

**All FTE faculty, staff, and student employees, may or may not include conference and support space

***Reading space is a typical standard, not a mean.

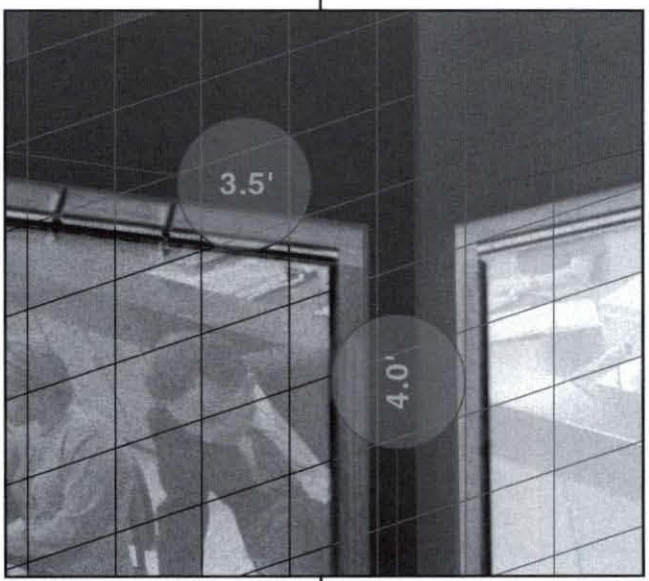
Source: *Other States Survey*, Eva Klein & Associates, Ltd. and Harvey H. Kaiser, Fall 1997 *paint an absolute, black and white picture on facilities. It provides a fair evaluation of the many shades of gray among the state's diverse institutions."*

- The Virginia Council on Higher Education guidelines introduces considerations of impacts of technologies with the caveat that *"guidelines—-will not always fit each institution's individual situation of all the possibilities of technology."*

Careful interpretation of these guidelines by a statewide coordinating agency allows subjective factors to enter into the final analysis of capital project requests. For example, in New York (CUNY and SUNY) and South Carolina all three purposes (planning, utilization, and programming) are served and applied in the prioritization of capital budget requests. In comparison, Maryland, California, Texas, and Virginia stress the flexibility in the use of criteria for capital budgeting that is limited to educational and general facilities.

A conclusion from the UNC survey is that standards should be:

- considered as flexible guidelines
- used as a minimum expectation, not a "hurdle rate"
- not applied to the design of specific facilities
- used as guidelines in estimating whether sufficient space has been provided
- intended as guidelines more than as absolute standards



Facility Condition as a Factor

Space standards used for planning and/or utilization analysis omit treatment of the condition of facilities as a component of the capital planning and space management process. A broad interpretation of "condition" includes two parts—the literal physical condition of a space and the suitability or functionality of the space for a designated activity. The lack of a qualitative "condition factor" is a limitation in space planning standards, which are purely quantitative. Thus, they do not directly address questions of the suitability of space to meet assigned functions and utilization targets due to physical deterioration, obsolescence, environmental conditions, or inappropriateness. Nor do typical quantitative space standards address technology and telecommunications requirements.

Supplementary criteria to the surplus/deficit calculations in the capital budget prioritization process appear in the UC System, SUNY, and Texas capital budget models that use conditions as a component of analysis. While this approach to introducing criteria for condition is useful in the evaluation of an individual project, it is impossible to introduce condition factors directly into surplus/deficit calculations, as they are quantitative. Other approaches are required.

A frequently available source for facilities condition is data collected in some systems/governing agencies space inventories based on an HEGIS taxonomy of six factors that range from "satisfactory" to "termination." Designed to establish a comparative level of conditions, this methodology is weakened by the cursory nature of inspections and lack of consistent condition inspection guidelines. A better alternative is a facilities condition assessment that identifies facilities deficiencies based on a consistently applied methodology, and conducted by appropriate professional personnel. Several systems/governing agencies require regular one-to-three year cycles of inspections and submission of results as part of capital budget requests. In North Carolina, for example, the state requires inspections of all state agency facilities, including UNC campuses, in three-year cycles. The North Carolina Office of State Construction conducts these Facility Condition Assessment Program reviews.

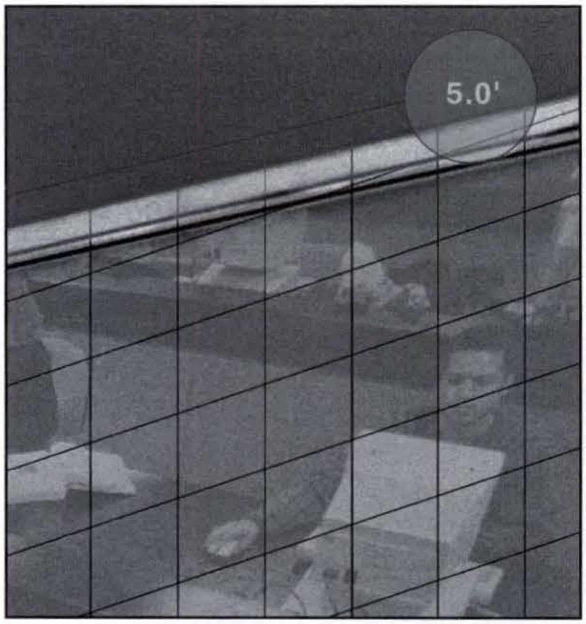
Emerging Standards for Technology Facilities

The survey conducted for UNC did not focus specifically on newly developing standards for technology-intensive instructional space. In fact, that research revealed the fact that very few systems or states have yet developed established models or standards for new kinds of technology-able instructional space. This is a new area of endeavor, however, in which a number of institutions have created new configurations that may lead to new conceptual standards. This discussion of technology-intensive classrooms is based on recent, informal research on facilities at the University of Missouri-St. Louis, Rensselaer Polytechnic Institute, Johns Hopkins University, the Sage Colleges, and Syracuse University, among others.

Various uses of technologies include introduction of laptop computers or Internet connections into the traditional classroom/lecture hall setting, creation of new classroom/class lab configurations, open access computer labs, and distance learning transmitting and receiving facilities. Each configuration has special requirements for individual student stations and support spaces and services, in addition to lighting, ventilation, and communications media. There is, at present, no "standard" for these special requirements, nor for the ASF allowances that should be planned.

Consequently, there are two concerns about the impact of technologies on planning and programming standards. First, good models are needed for both building new facilities and modifications to existing classroom square footage. Second, there is an emerging question of classification of these kinds of rooms—either as new forms of 110 space with different space allowances than has been typical in the past, or as 210/220/230 space with space allowances geared to "laboratory" configurations.

A sample of recent informal experience in examining these new kinds of teaching space is presented in Table 2.



Summary

Lessons learned from the national survey of public higher education systems in 1997 and consulting engagements include the following points:

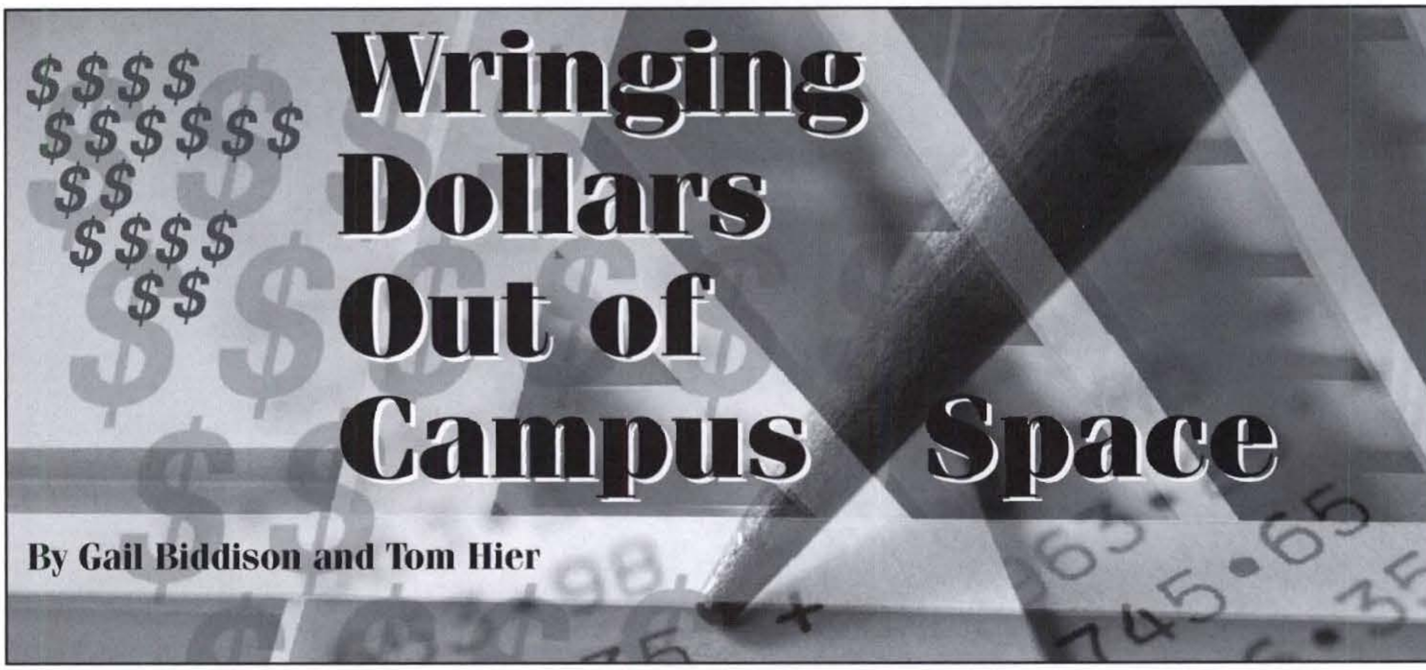
Three types of standards—space *planning* standards, space *utilization* standards, and space *programming*—are applied for appropriate (and different) purposes.

- **Space planning standards** are guidelines for assessing or projecting current and future needs based on specific assumptions of program, enrollment, employment, and/or research growth during a given planning period. Usually expressed as an ASF allowance, planning criteria permit an analysis to develop predicted space needs for each category of space. These figures, in turn, are used in comparison with inventoried space statistics, to calculate hypothetical ASF surpluses or deficits of in the selected categories. For 110 classrooms and 210 class laboratories, the space planning standard is used with the two space utilization standard factors, often combined into a space factor, to predict needed space and compare it with actual.
- **Space utilization standards** are guidelines for comparative analysis of the efficiency or productivity of space use. Utilization standards for classrooms and class laboratories measure the number of hours per week a room is in use (weekly room use hours) and the average percentage of seats occupied during any given hour (student station occupancy percentage). As noted above, the utilization standard is used in conjunction with the planning standard to assess adequacy of current space or project future needs.
- **Space programming (or design) standards** are adopted criteria used as architectural planning or cost estimation guides.

Space standards are useful in planning and assessment and design. However, differences in institutional mission, program diversity, or specific strategic plans should be considered in conjunction with standards. Also, space standards are quantitative tools and cannot incorporate measures for qualitative factors of space condition—physical condition or original systems, adequacy, and appropriateness or functionality—also must be considered in evaluations of capital needs, but usually will have to be done in a separate methodology.

Table 2: Examples of ASF Allowances for Technology-Intensive Space

Function	Room Use		Room Use Code
	Type	Area(ASF)	
Traditional Teaching Space	Classroom	18-28	110
	Lecture Hall	18-25	110
	Collaborative/Seminar	20-28	110
Computer - Instructional	Classrooms/Class labs	35-45	220
Distance Learning	Classroom/studio	Varies	110
Studio/Laboratory	Classroom/studio	35-50	220
Support Space	Open Laboratory Service	Varies	225
	Media production	Varies	530
	Media Production Service	Varies	535



Wringing Dollars Out of Campus Space

By Gail Biddison and Tom Hier

Demands for greater efficiency and cost controls on the part of higher education, escalating for years, have now reached the level of the United States Congress. Reacting to the fact that tuition costs have increased three times faster than inflation (the price of attending a four-year public institution increased 234 percent in the last 15 years, while median household incomes increased only 82 percent), both the House and the Senate this summer passed legislation directed at forcing colleges and universities to exercise greater financial accountability and control.

One of the largest assets on any college or university balance sheet is its facilities. All told, higher education owns and operates more than 4 billion square feet of space which have a replacement value of more than $500 billion. This substantial asset also represents significant costs–to paraphrase the old adage that "time is money," *space* is money. So clearly, given the size of the facilities portfolio, efficiencies in this area are one of the keys to institutional cost savings.

One thing is certain: *significant change is not optional*. If higher education doesn't take aggressive action on its own to control costs, controls will be imposed upon it. But in the facilities arena, what kinds of initiatives are most likely to yield major, meaningful efficiencies and cost savings that can be measured at the institutional bottom line? What do you need to do to achieve them?

For the purpose of finding ways to wring dollars out of campus space, it is useful to divide campus space into two categories, *non-revenue generating* and *revenue generating*.

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Non-revenue space has no direct source of revenue to support its operation. Classroom facilities are one example. Funds to maintain and operate classrooms typically come from tuition or other general revenue sources. Revenue-generating spaces, as the term suggests, are associated with identifiable revenue streams. A good example is campus housing, paid for by room fees.

This article uses these two types of space to illustrate the potential cost savings that can result from good space management practices.

Classrooms

The Background

While classrooms typically represent a small portion of total campus square footage, operational costs are substantial. Often functioning as 24-hour spaces, classrooms place a high demand on utilities and require daily maintenance.

Perhaps the most significant threat from a cost standpoint is the introduction of technology into the classroom. Very simply, technology eats money. It is expensive to purchase and even more costly to support and maintain. On many campuses, the "classroom technology plan" has consisted of little more than finding ways to wire buildings for access to the Internet, sporadically installing computing workstations at instructor podia, and cobbling together funds to purchase computers for a few computer labs scattered across campus. Equipment standardization, a hierarchical plan for distributing technology around campus, and technical support and training are more often a hoped-for glimmer in the eye of an information officer than a reality. This *ad hoc* approach to classrooms leads to the frustration of many; more importantly, it can be expensive and consumes resources inefficiently.

The Politics

The "politics of space" is another complicating factor. At some institutions, classrooms are among the most contentious real estate on campus. "Owners" of classroom space are many, and the incentives and desires to share are few. Reminiscent of kindergarten, favorite words of those who control classrooms are often "mine" and "no." This leads to highly underutilized spaces, inequitable distribution of classroom technology resources, and ultimately higher than necessary capital and operating costs for instructional space.

The Cost Impact

So what is the cost impact? To understand this, a shift in thinking may be helpful. The tendency is to think of classrooms as "free goods"—they're just there. Widely accessible, part of the basic infrastructure of running a university, and paid for, so why worry about the cost? But, of course, they're not free. Classrooms consume resources (people, dollars, technology) just as any other physical investment on campus. With this frame of reference—classrooms as one claimant on an institution's scarce resources—the importance of understanding the cost impact becomes clearer.

Measuring the cost of classrooms is a tricky business, and an evolving field in the world of higher education management. Classrooms do not produce revenues that can be measured, so the focus must be on the cost side—that is, finding ways to reduce the cost of space. This leads indirectly to assessing the productivity of classroom space, since productivity improvements ultimately result in lower costs per square foot.

Measuring Classroom Productivity

One standard way to measure classroom productivity is to look at room utilization, the percentage of time a classroom is occupied in a representative week. While there is no definitive room utilization standard, conventional wisdom suggests that utilization targets of 66 percent or better are reasonable. (That is, on average, an institution's classroom should be occupied 30 to 33 hours in a normal 45 to 50 hour week.)

Classroom utilization analysis is an emerging discipline, and there is not yet a wide body of empirical utilization statistics. Our research, however, has turned up utilization rates as low as 20 percent; utilization greater than 50 percent has been rare. (Public institutions are often held more strictly to utilization standards than private institutions and, as a group, tend to have better utilization.)

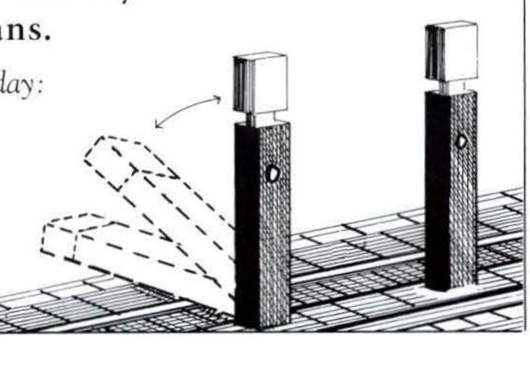
The cost of poor utilization is substantial, as an example illustrates. A campus that schedules roughly 4,000 hours of course time (between 1,300 and 1,800 courses) in an average week and with an average room utilization of 45 percent will require a minimum of 237 rooms to accommodate all of its courses. At 60 percent utilization, the number of rooms required is 178. The difference—almost 60 rooms—is substantial in cost savings and potential benefits to the institution.

Cost Savings and Benefits

Cost savings are realized in two ways:

- First, if the institution were contemplating the construction of new classroom space, greater utilization of existing space would reduce or obviate the new for new construction.

  Savings: are the costs associated with new construction. Sixty rooms at an average of 600 square feet per room is 36,000 square feet of classroom space. At a conservative cost of $120 per square foot for new



construction, an institution saves $4.3 million of its resources for other uses.

- Second, if the institution had no additional needs for classroom space, it could declare these 60 rooms as "excess space" that could be dedicated to other uses.

  Savings: as above, the cost of constructing new space is reduced (in this case, for other parts of the campus that are the beneficiaries of the excess classroom space). Additionally, while operating costs are not necessarily reduced (as long as the space is kept in service), they can be reallocated to other campus budgets, in sync with space reallocation, so that responsibility for operating overhead is better matched to the consumers of space. To do otherwise distorts the true cost of campus operations. In this example, if operating costs were $7 per square foot, classrooms would bear an annual burden of $252,000 for space that it did not really require.

Table 1 summarizes the potential cost savings that attend reductions in the classroom inventory.

The Power of Objective Quantitative Data

Examples like the one in Table 1, although admittedly simplified, not only illustrate the potential for wringing cost savings out of classrooms, they yield quantitative, objective data that provide a real picture of costs associated with policy decisions. In the example, the campus debate is *instantly* reframed. Instead of adhering to the common wisdom that "students don't like early morning classes and faculty won't teach on Friday," campus administrators must ask the question, "Is a 45 percent room utilization really okay when we can pick up 36,000 square feet of space for other uses just by scheduling courses a bit more intensively in less popular times?" In short, this approach to classrooms permits the institution to make informed choices about resource allocation, and can lead to significant cost savings over time.

Revenue Space—Housing

The Background

In the arena of cost savings, student housing stands out for three reasons: 1) its connection to the mission of the institution makes it more than just a "bottom line" to be improved, 2) it is potentially both a huge asset and a significant liability, and 3) it offers the potential for significant operational cost savings and efficiencies.

Link with mission. While a significant producer of revenues, housing is often closely linked to the educational mission of the university. Accordingly, maximizing revenues and minimizing costs is usually not a primary goal for a housing system.

Asset and liability. Much housing was constructed in the 1960s and 1970s and as such, for a number of years has been generating substantial revenues. It has been tempting for many institutions to divert some portion these revenues to other university needs in times of budget crunches, and many have done so. This has resulted in either underfunding or no funding at all of reserves to perform ongoing maintenance and repairs on the housing stock. The result of this practice is that many housing facilities are in deplorable condition, as run-down as some inner city neighborhoods.

This lack of attention to housing maintenance in the past has turned this asset into a liability. Repair costs for deferred maintenance alone for a 3,000-bed system can easily reach $50 million and higher. And before too long, these

Table 1
Savings from Increased Room Utilization

ROOM UTILIZATION	CLASSROOM INVENTORY		BENEFITS FROM INCREASING ROOM UTILIZATION			
	No of Rooms	Square Feet	Rooms Saved	Reduction in Sq. Fl.	Value of New Construction Avoided	Reduction in Operaring Cost Buurden
45%	237	142,200	-	-	-	-
50%	213	127,800	24	14,400	$1.7 million	$100,00
55%	194	116,400	43	25,800	$3.1 million	$180,000
60%	178	106,800	59	35,400	$4.3 million	$250,000

Assumptions

Nimber of classroom hours to be accommodated:4,000

Average square feet per classroom: 600

Average cost of new construction: $120

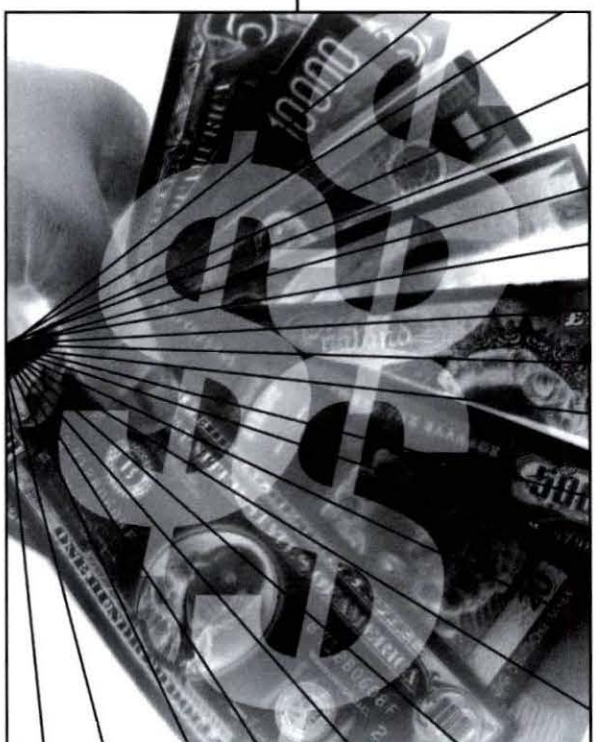
Operating cost per square feet: $7

Room Utilization Defined

The percentage of time a classroom is used in a representative week.

investments will have to be made, if only to stave off the substantial liability issues that are associated with crumbling and unsafe housing. This will impose substantial new debt burdens and, ultimately rent increases, on the housing system.

Operating efficiencies. The advent of private sector student housing providers (in both development and management) has forced institutions to look more carefully at their own means of creating and managing student housing. In the process, opportunities for reducing operating costs, improving customer service and generating new ancillary sources of revenues are being uncovered on campuses. While this work is only beginning, early signs are hopeful that with equal attention to the business and program sides of the housing equation, operational efficiencies should be realizable without great sacrifices to the mission aspect of housing.



Options for Savings

Cost savings in the housing area may be viewed from two perspectives, active and passive. The active ways have received considerable attention in the last several years, and have received a boost from the entry of the private sector into the student housing market.

Active Cost Saving Measures

Developers have been building market-style housing in nearby neighborhoods *off-campus* for years; only in the last three to five have they been actively seeking to enter into partnerships with universities to build *on-campus* housing. While the focus has heretofore been on new housing, discussions are now beginning between developers and universities about ways to involve the private sector in the renovation of existing housing, a much more difficult and complex issue. Unlike bookstores and food service facilities where relatively small capital investments will suffice, the capital investments in housing can be substantial and would require many years to amortize.

Another relatively new "active" housing area where universities seek cost savings, or efficiencies, is in the area of housing management. The University of Pennsylvania last year awarded the management of not only its housing, but all campus facilities, to Trammel Crow. George Mason University in Northern Virginia has entered into its second three-year housing management contract with Century Management.

Passive Cost Saving Measures

The second avenue for cost savings is in what may be called "passive" areas. These are less obvious, but yield cost savings equally as dramatic.

There has been an assumption, often implicit or subliminal, that housing reinvestment carried with it the need to make major changes to the configuration of housing, i.e., to gut and reconfigure old-fashioned "dorms" as suites or apartments. Having performed market research with thousands of college students, we find some interesting counters to this assumption.

We have found that the primary determinant of housing "mix" is the composition of on-campus student populations. For example, a small, private residential college with the goal to house all freshmen, 50 percent of sophomores, and 20 to 30 percent each of juniors and seniors should have double bedrooms, singles, suites, and perhaps apartments. A large, public institution with the goal of housing 90 to 95 percent of freshmen, 25 percent of sophomores, and very small percentages of juniors and seniors would be adequately served with a very high proportion of dormitory-style buildings.

Also, administrators and staff often are more negative about the double bedrooms and community bathrooms than are students, particularly freshmen. After freshman year, tolerance for this type of living typically drops off dramatically, but freshman typically both tolerate it and like the collegiality it engenders.

These findings and trends bode well for reaping *passive* cost savings from student housing. Rather than engaging in costly, wholesale reconfiguration from dorms to suites and apartments that is a trend today, campuses can reduce the amount of investment required by better understanding student interests in and tolerances for different unit configurations—including dormitories—and tailoring their renovation programs accordingly. The savings that can be realized by avoiding major reconfiguration can be substantial.

A compelling statistic is that *moderate* reconfiguration (addition of common space, more community baths, etc.) can be expected to result in the loss of about one-third of the original beds in a residence hall, while more *substantial* reconfiguration to create suites or apartments results in the loss of half or even more of the original bed count. Since every bed lost represents lost revenue as well as the potential for new capital investment to create replacement housing, the differential financial impact between moderate and substantial reconfiguration can be eye-opening. A simple example illustrates the point.

- A dormitory-style residence hall with 200 beds that is moderately reconfigured would end up with 132 beds; if substantially reconfigured to suites/apartments, the resulting bed count would be 100 or fewer beds, a differential of 32 beds.
- *Lost revenue:* At a per bed room rate of $2,500 per year, the *incremental* revenue loss associated with substantial reconfiguration is $80,000. If the renovation is to be debt financed, the amount of debt the project can support is reduced by about $1.2 million. If only *moderate* reconfiguration were undertaken and the 32 beds preserved, the $1.2 million could fund a number of amenities that would substantially increase the appeal of the residence hall.
- *Replacement cost:* Assuming the institution wanted to maintain the same overall bed count after all renovations, the cost of replacing the additional 32 beds lost after *substantial* reconfiguration, conservatively estimated at $30,000 per bed, would be about $1 million, or about $70,000 in annual debt service. The incremental revenue drop from the loss of 32 beds has reduced the ability to support debt for the renovation project; at the same time, the replacement of 32 additional beds has increased the amount of debt service that needs to be funded in new construction, resulting in a double hit to the project and the housing system.

Realizing Cost Savings: Implications for Managers

As we noted earlier, change (and significant change) is no longer optional for higher education. The combination of the threat of government intervention and regulation, the pressures of the commercial marketplace, and student demographics, to name just a few, are all drivers of this change. The need to realize cost savings is one significant aspect of this change.

Another significant change is in university organizational structures, with newly created positions for "executive vice presidents" and "chief operating officers," and new offices of "university services" being among the most observable developments. The creation of these offices signals the recognition that the universities which will thrive in the 21st century are those that accept the proposition that university administrators must move from a "caretaker" to a "manager" mentality. Uncovering innovative methods for measuring and controlling costs will be an important part of this new management philosophy.

This philosophy could bring with it new management models that may require fewer staff in middle management, but a staff with higher skill levels and more entrepreneurial spirits who will be more highly compensated. Those with an entrepreneurial bent will be in a position to make substantial contributions in "wringing dollars" to achieve cost savings that will make their institutions viable.

For enterprising facilities managers, two factors will be paramount in empowering them to generate cost savings and effect changes in space management—quantitative data and a champion for change.

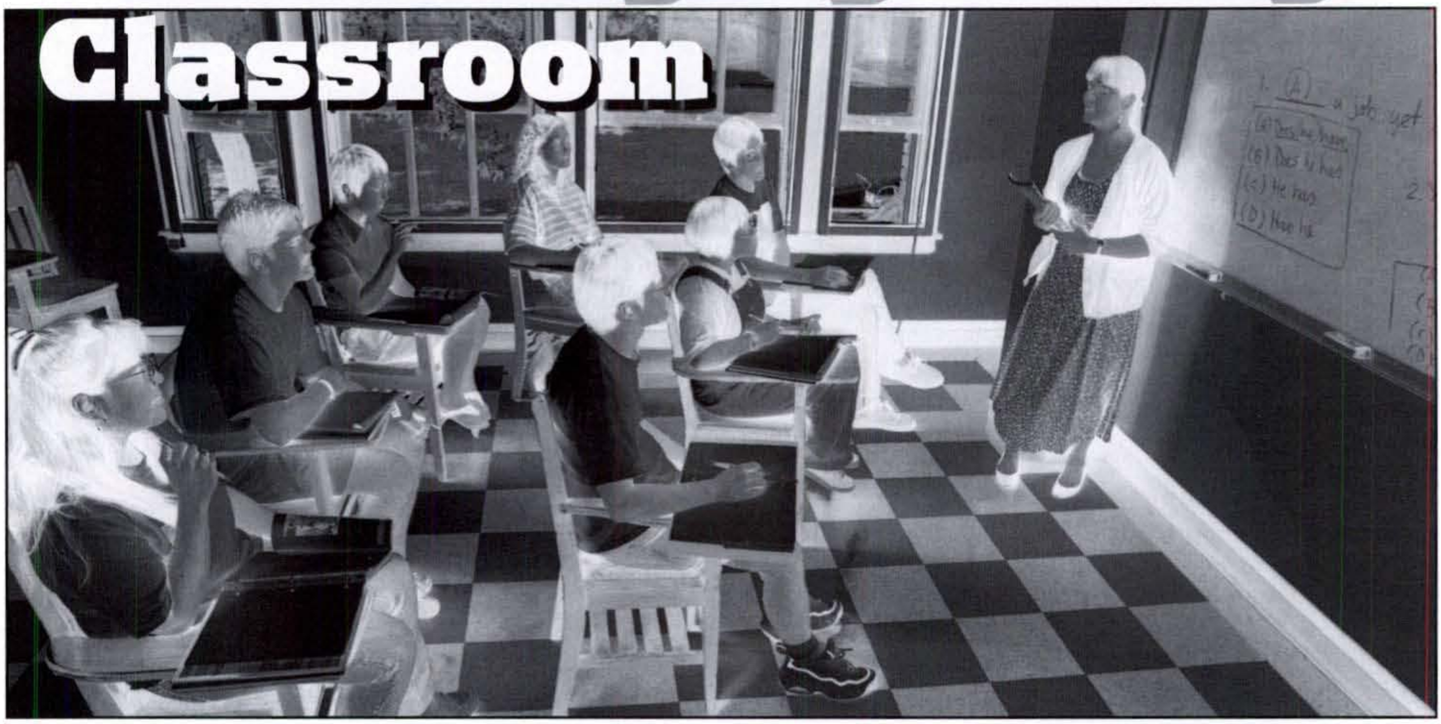
Quantitative Data

As the classroom example demonstrated, quantitative data, coupled with compelling analysis, is critical to shaping campus debate about issues of space management and ownership. It is the key to obtaining senior level/decision maker attention to an issue and getting the decision to make a change. The provost of one of the premier educational institutions in the country was prepared to make a major decision affecting space allocation "by fiat," if necessary, because the data presented about space utilization was "so compelling."

A Champion for Change

Every space management issue that involves substantial policy modifications to reap cost savings requires at least one champion, and ideally more than one. If no one "owns" the issue, then it is likely to die. Someone needs to be the keeper of the flame—managing the data collection and analysis, assembling the right parties to develop consensus, and generally coordinating the effort for change. It is also helpful to have an institutional champion who either has the ear of senior decision makers, or is one, and who can ultimately bring the issue up for resolution.

The Changing College Classroom



by Daniel K. Paulien

Classrooms are the most studied and measured type of space on a college campus. Many states and governing boards have utilization criteria for classrooms and most also have a target figure for the amount of space per student needed in a classroom.

Classroom use is the criterion most often scrutinized by legislative or executive branch officials. Many of them are surprised that colleges and universities conclude reasonable classroom use is often around 30 hours per week and are of the opinion that classrooms should be used at least 40 hours per week. The complexities of the scheduling process at colleges and universities, and the fact that rooms are scheduled on an hour by hour basis, is often lost on those individuals who feel colleges and universities should have higher classroom utilization.

At research universities, classrooms usually make up less than 10 percent of the educational and general space available (even after housing and other auxiliary spaces, student unions and athletic facilities have been removed from consideration). At community colleges, classrooms might comprise 25 percent of the space.

When I was coordinator of facilities planning and research for the Colorado Commission on Higher Education in the early 1970s, classroom analysis was the most cut and dried of the different facilities planning analyses we did. Classrooms were expected to be used 30 hours per week, 60 percent of the seats were expected to be occupied (the Commission subsequently raised that utilization criterion to 67 percent of the seats occupied) when courses are scheduled. A figure of 15 square feet per student station, as an overall average, was viewed as adequate and no deviations were expected.

Today, 15 square feet is usually not nearly enough as an overall campus average for classroom needs. Significant changes have happened in the way classrooms are furnished and how they are used.

In the 1960s and 1970s, almost all classrooms were furnished with tablet armchairs. Many of the buildings built in the 1950s and 1960s had these tablet armchairs fixed to the floor so that the seating would be in straight rows and students would find it easy to get to their seats. Exceptions to tablet armchairs were rare. Classrooms for accounting were outfitted with tables and chairs. Most other programs in business were expected to use tablet armchairs. Some senior courses and graduate courses were held in seminar rooms where students met around a single table. Large lecture halls had fixed auditorium seating, with small folding tablets attached, essentially producing tablet armchairs for the auditoriums. In some cases, students were issued a clipboard for those rooms where there were no tablet armchairs.

Business programs were one of the first to break from the mold. They wanted case rooms where students had a table in front of them and the chairs were either loose or swing out attached chairs. Most of these rooms were set up with raked

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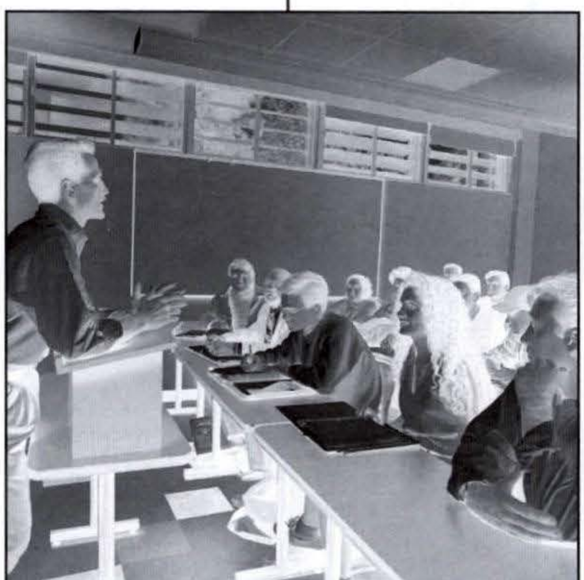
seating and they were designed so that the instructor could get close to the first row of students. Most case rooms took more space than the standard tablet armchair classroom.

When I taught communication classes in the old Wisconsin State University System in the late 1960s, I always had groups of students select a topic and then present it as one of their class assignments. This meant five or six students had to take their tablet armchairs to the front of the room, turn them around, and then the one who was presenting would go to the teachers' podium. It would have been much easier if there had been side chairs that the students could have used for that purpose, but only tablet armchairs were available to my departments.

By the 1980s, faculty in the humanities began to question whether tablet armchairs, in particular fixed tablet armchairs, were the most appropriate furniture for teaching their classes. They now wanted students to grade each others papers. There were occasions when groups of students within a class were asked to develop a group project, with each of them having an individual piece of that project. Tablet armchairs were not a very effective way to conduct these types of activity.



Around the same time, lecturers in the sciences also began to question whether steeply raked large auditoriums were the most effective way for them to conduct large classes. Experiments were made with rooms that had far fewer rows and a less steep rake, and rooms where the seats were arranged in a V-shape or chevron shape, in many cases, with an aisle in the middle so the instructor could communicate better with more of the students. The style of interaction, first popularized by Phil Donahue on his television show, had significant impact in the way academic auditoriums were designed.

All of these changes were resulting in more space per student than the most efficient rectangular set-ups with fixed seating or small movable tablet armchairs that were the norm.

The personal computer was invented in the mid-1970s. As it became more widely used in higher education in the 1980s, the desire to have computers at every seat became an important educational component for certain types of course material. In the 1990s, with the greater use of laptop or notebook sized computers, the desire for data ports at every seat is a very strong trend. Having enough space for the computer, as well as a text book and notebook, results in the need for more table space per student. Students who were previously put 22" apart, now need in some cases 30" width per student in a row.

The type of class taught in a classroom was expanded to include lecture demonstration methods. The United States Military Academy at West Point has a classroom with a helicopter in the room, along with tablet armchair seating. The United States Air Force Academy in Colorado Springs has classrooms with sections of rockets, so that students can have hands-on demonstrations of the engineering principles involved with these sophisticated engines. These items clearly require more space per student. Nursing programs, agriculture programs, and earth sciences programs often want to have demonstration materials available in the classroom, resulting in storage requirements.

Now in the 1990s, the concept of active learning, with students working more intensively on their projects within the classroom setting, and the desire to have learner directed instruction rather than teacher directed instruction, results in even more dramatic changes in the look of the classroom. In some instances now, it is more desirable for students to sit at round tables so that they can face each other and work directly in groups on their projects.

The desire to have a lecture area attached to a laboratory has become more widespread. The University of Arizona, in a science building constructed in the late 1980s, included such lecture areas within many of the undergraduate teaching labs in their Chemistry/Biological Sciences Building.

As more non-traditional adult students have become part of higher education, the need for furniture that is easier to sit in and get up from has become a consideration. The author has heard stories of students who were embarrassed by their difficulty getting in and out of small tablet armchairs with large desk fronts and relatively narrow amounts of space from the desk front to the back of the chair, so that they have dropped out of school rather than face the embarrassment of the difficulty of getting in and out of those chairs. This has resulted in a number of community colleges moving totally to a table and chairs concept. This, again, requires more space per student than the traditional tablet armchair.

Other items have impacted the space per station. The increased use of multimedia has required there to be concern about the sight lines from the front row to the screen, and the viewing angles resulting in some cases in narrower rooms than might have been designed without concern for the viewing of the media materials.

The Americans with Disabilities Act requiring an appropriate number of stations to be available to individuals with disabilities has resulted in some additional space per student.

Those rooms that serve as computer classrooms with a full desktop computer at every station clearly need significantly more space per student; in most cases, at least double the amount that would have been provided for tablet armchairs.

The use of distance learning, with transmit and receive classrooms, usually requires more space per student to provide appropriate sight lines and viewing distances. In some cases, these types of rooms are fairly traditional classrooms or auditoriums, but in most cases they are now being set up with the ability to conduct active learning along with the transmission.

For those institutions using TV to reach multiple sites, where the room serves as a classroom as well as a control room, additional space is needed for the equipment that punches up the different sites and operates the cameras. In many cases, this can now be done by the instructor using a touch screen. Some institutions have experimented with the instructor being in a separate small control room with even the on-site class being a true distance learning experience. Those institutions which like that approach believe the instructor then is more likely to have even interaction with each group of students, rather than favoring those students who otherwise would be directly in the room with the instructor.

Some institutions are now moving to even more high-tech based facilities, which are being referred to as learning environments. The University of Colorado at Boulder has a program known by the acronym ATLAS (Alliance for Technology Learning and Society), which is both a program that is bringing together high tech computer and multimedia technology with programs as disparate as engineering, music, and theater. The technology rich learning environments will all required substantially more space than traditional tablet armchair classrooms.

All of this results in the need for review agencies to begin to look at classrooms the way they have traditionally analyzed teaching laboratory needs. Rather than using one space factor for all classrooms, specific numbers are needed for each type of room. This is the method traditionally used for teaching laboratories where a laboratory for biology would be expected to have quite different space needs than a laboratory for aeronautical engineering or a laboratory for auto mechanics.

It seems that there are now at least six classroom types that are used regularly on many campuses: lecture hall, tablet armchair room, tables and chairs room, seminar room, computer classroom, and active learning room.

The lecture hall remains the most space efficient, but whereas in the past figures as low as 10 square feet per student station were used for lecture halls, now it is not unusual to have lecture hall spaces running as high as 20 square feet per student when wider spaces are needed, and tabletop work spaces that include data ports for student computer hook-ups. The more traditional lecture hall, with the fold-up tablet armchairs, which are still used in those cases where many of the uses may be for lectures or films or other presentations where a more comfortable movie theater type environment is desirable, may still work at 12-15 square feet per student. Again, the need for appropriate distances and viewing angles for multimedia and space for the equipment, either in terms of a booth or rear projection, or a variety of pieces of equipment that are directly accessible to the instructor in the front of the room, will all add to the space needed.

The traditional tablet armchair room is now fairly unpopular. Because, in many cases, campuses went to full-sized desks rather than the smaller paddle shaped tablet armchairs that were in wide use in the 1960s and 1970s, the amount of space needed per tablet armchair has also increased. Those governing boards, which had cookbook type criteria that allowed one to determine the acceptable amounts of space for different capacities of rooms, find those often not working because the type of furniture being bought now is larger than was anticipated by the individuals who developed those criteria. Whereas in the past it was not unusual to assume many tablet armchair rooms with as little as 12 square feet per student, now in many cases 15-18 square feet is the figure utilized.

Table and chair rooms have always been more space intensive. Some institutions have experimented with narrower 18" deep tables, and in some cases, with specific room dimensions have been able to make these work with as little as 18 square feet per student. More traditional planning targets for tables and chairs are 20-24 square feet, with some instances requiring as much as 27 square feet per student.

Seminar rooms usually require between 20 and 22 square feet per student with students sitting at a single large table.

Computer classrooms normally need between 30 and 40 assignable square feet per student. If those rooms are set up with one computer for two students, the lower end of the range is workable. As campuses move toward more use of data ports rather than desktop computers, these also will be workable at the lower end of the range.

Active learning rooms, with students sitting at circular, oval, hexagonal, or octagonal tables will usually require about 25 square feet per student.

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Service space for classrooms used to be minimal, with an occasional storage room, a projection room for a large auditorium, and perhaps a prep room for a science demonstration auditorium. Now, much more service space is needed to accommodate the technology, like the need for servers to support the local area networks handling rooms with data ports and network access at each station, support space for multimedia equipment, such as control rooms and technician spaces, and places to store rolling equipment at those institutions which do not have permanent media equipment in each classroom. This additional classroom service impacts the classroom findings, since service space is normally included within the space per student station factor that is used in space needs models.

For those institutions who are still measured based on the 15 square feet per student station, they will start at a major deficit. If they actually averaged 18-20 square feet per station across all the rooms coded as classrooms, they have to increase their utilization by 20 to 30 percent or more above the target number to make up for the greater existing space per station, or they will show a space surplus in the needs analysis of their coordinating board or governing board.

In our work with many campuses across the country, we see 18 square feet as the most widely average number of square feet per station when we calculate the figure for all classrooms. It is rare that we find an institution with as little as 15 or 16 square feet in this category. The number will only increase with the likely average heading toward 20 square feet per student station as more of the active learning and computer-based rooms are added to the classroom mix.

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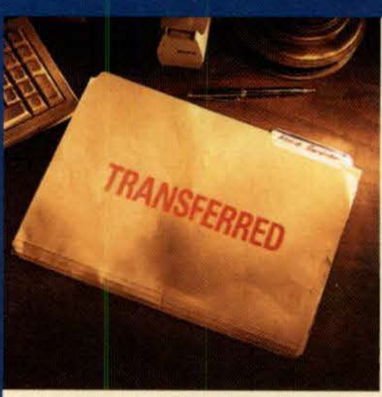

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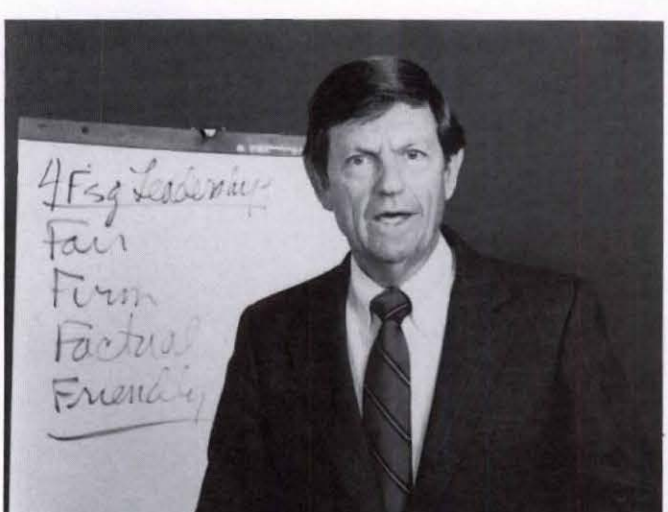

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PLACE-MAKING: A NEW SPACE PLANNING MODEL

"Sense of place" is a complex concept that until now has not been able to be adequately evaluated. When an individual experiences "fit" with a place, he or she experiences "sense of place"—an atmosphere that promotes interaction and comfort and uplifts the spirit. Colleges and universities can effectively use the design elements of place-making to transform uninviting spaces into vibrant places where students feel comfortable and at home. When systematically applied, place-making gives logic to interior design decisions that otherwise may be made on an arbitrary basis. For colleges and universities, sense of place is a powerful force in building and reinforcing image and in recruiting and retaining students, faculty, and staff.

A set of tools for place-making and methods of evaluating their effectiveness draw upon the unique qualities and images of a campus, while reinforcing the overall character and context. Design solutions are tailored to each campus and help make institutions more competitive.

Place-Making Affects Mission

It is clear that many of the features most directly connected to users' perception of the campus—quality of the learning environment, community and interaction, ease of movement, security, and comfort—are fundamentally functions of the interior space. Place-making analysis explores not just physical realities but the experiential side of campus life. This planning approach creates guidelines that systematically address ways to nurture individuals and create meaningful settings for learning and for the life experiences that occur within the campus interiors.

The role of interior space in place-making is varied and diverse. There are hundreds of ways that design elements can be used to enhance sense of place. Grouped into three categories, these elements:

- fulfill fundamental requirements typically associated with traditional facility management practices,
- strengthen personal and social context, and
- enrich the physical setting.

Campuses need a mix of types of place-making. The days when success was defined as providing spaces that are clean and functional are past. Success is now measured by the individual's positive experience of memorable places where learning and collegiality occur. Place-making, artfully applied, will over time forge a coherent campus image and enhance perceptions of the institution. These positive perceptions and memories cannot be underestimated as factors in alumni giving.

The process of place-making is different than master planning or programming because it looks at facilities from a broader perspective. The following are some of the issues to be explored in a place-making study.

Beth Worthington is a designer at Christner, Inc., St. Louis, Missouri.

BASIC TYPES OF PLACE-MAKING

Objective	Design Element
I. Fundamental Facility Management	Examples
Function ability to learn, do research	Ambient qualities, acoustics, lighting, temperature, spatial, ergonomic and accessibility issues
Comfort for a range of activities and individuals	Ambient qualities, acoustics, lighting, temperature, spatial, ergonomic, and accessibility issues
Security	Security system, lighting, landscaping, Accessibility, community programs
Way-finding	Way-finding system with landmarks, use of focal points, lighting, interior landscaping, entries and boundaries, accessibility issues
Ease of movement/clarity of campus	All of the above and well conceived functional spaces and corridors that connect
II. Enrich Personal and Social Context	
Promote the individual	All of the above and amenities, coffee kiosks, recreational and residential opportunities, ability to personalize, dining services
Promote self-esteem	Way-finding, sense of control and ability to perform tasks, opportunity for solitude
Promote interaction	Spatial arrangements, variety of gathering spaces, comfort, accessibility, and discovery
Promote community	Opportunities to see and be seen, build in a variety of gathering spaces that promote comfort, accessibility and discovery
III. Enrich Physical Setting	
Connect to nature, time, season	Each window and door is an opportunity for views of the campus and context, window seats
Connect to history and traditions	Reinforce symbols with special ceremonial, cultural, social aspects
Reinforce existing architectural style	Create distinctive image with materials, color and lighting, focal points, windows, ceiling
Reinforce existing landscape elements	Create views of nature, Seasonal focal points, emphasize entries
Discovery	Ingelnooks, fountains, secret gardens, fireplaces, niches for individual and group
Demonstrate technology	Integration of computers across settings, well designed library and research facilities

Process/Results

The process of implementing a place-making study to guide improvements to campus interiors requires a methodical approach and a defined timeline. As an outside consultant, the place-maker has the ability to review a campus from an external and critical eye to determine what areas work and what areas need improvement. Many times administrators and facility managers are so focused on the day-to-day activities and challenges on campus that they don't see the big picture.

Another critical component of place-making is getting input from all stakeholders and facilitating a process that will build consensus and support from the campus community. By having a series of working sessions and asking the right questions, certain evaluations and recommendations start to evolve.

Once the database is created and the list of priorities identified, specific recommendations for improvements, budgets, schedules and even performance criteria can be developed. The final product is a working document that identifies a plan for place-making on campus. One of the great advantages of the place-making process is that the recommendations can be included in ongoing maintenance projects.

The following is a list of questions most often asked about place-making:

Who?

Who should be involved in master plans for place-making? Be as inclusive in the planning process as possible. Build consensus through the planning process.

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What?

Include place-making when addressing fundamental facility issues, especially as deferred maintenance is implemented.

When?

As soon as possible. As part of a comprehensive master plan or more typically a separate study.

Where?

Campus-wide is of course the ideal; however, on a building by building basis, it is the formal and informal spaces where people gather that should be enhanced.

building by building basis, it is the formal and informal spaces where people gather that should be enhanced.

Why?

It makes sense. It weaves together a collective vision of the future that can sustain the vital character of campus life, uses facilities most effectively and helps demonstrate student-centered concerns, and most importantly, place-making expresses mission.

How?

Look at areas where students gather in a wide variety of ways. Campus is community.

The Value of a Place-Making Model

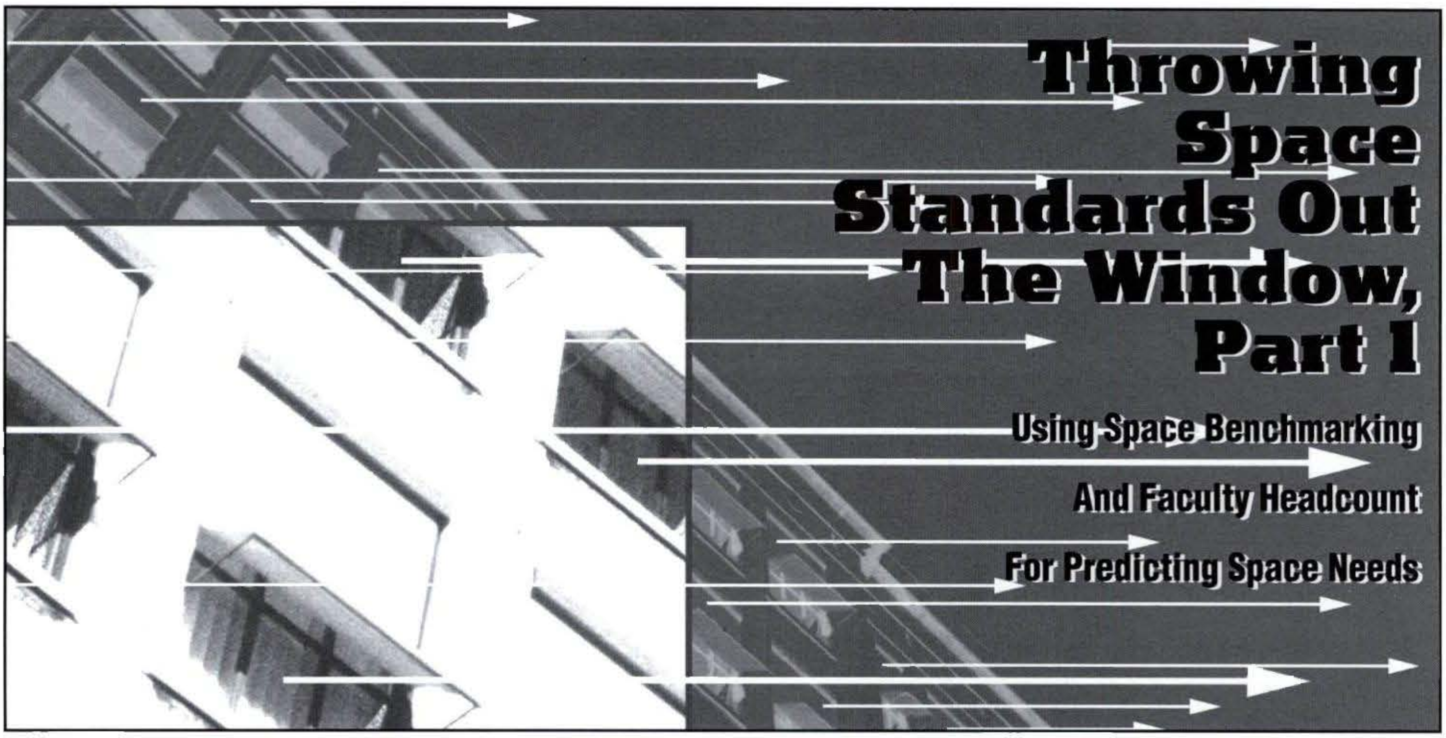
The benefit of this place-making model is that it requires administrators and facility managers to think about facilities in a far broader context. The process goes beyond traditional facilities planning issues with a number of critically important results.

Place-making:

- Helps differentiate a college or university in an increasingly competitive market place.

- Focuses on unique campus characteristics and places.
- Signals attention to the individual.
- Builds consensus about the image and goals of an institution.
- Provides logic to design decisions.
- Encourages integration of space improvements with phased renovation.
- Factors marketing objectives and quality of life into the aesthetic equation.
- Communicates the institutional mission.
- Tells the campus story.

It is obvious from the amount of enthusiasm generated since the notion of place-making emerged, that this new way of thinking about facilities strikes a chord with university administrators and facility officers. By applying these principles in a well-conceived plan, place-making will boost the appeal of campus facilities and positively impact campus life.



Throwing Space Standards Out The Window, Part 1

Using Space Benchmarking And Faculty Headcount For Predicting Space Needs

By Ira Fink, Ph.D., FAIA

Institutions do not remain static. They grow, they decline, and they change. At each stage, a common question occurs—do we have adequate space? Or, more importantly, how do we know if we have adequate space? In other words, how much space do our academic units need?

One of the primary interests of space management on a campus is to create an equitable system of projecting future space needs and allocation among academic and administrative units. Space on campus is an important resource. Too little space can hamper the ability to accomplish a unit's objectives; too much space is wasteful of limited institutional assets. The limits derive from the need to manage university resources, including space; the cost of upkeep of space; and the perpetual need for renewal, replacement and additions of space as the institution moves forward. Much of this discussion is contained in my earlier APPA *Facilities Manager* article, "Space Counting is Not Space Management."[1]

Approach and Methodology

This article examines traditional numerical methods of space projections, questions some of the fundamental assumptions about space projections, and presents an alternative approach to space projections based on a new, straight forward benchmarking methodology. This approach is based upon projection methods that have not been derived from fixed space guidelines or standards, but instead on space per faculty member as the basis for prediction and allocation. This is an innovative and easily understood space projection methodology that my firm has pioneered and used most recently at Georgia Tech and are currently using at the University of California, Davis and St. Mary's College of California. This article also presents the results of a unique national space benchmarking study among Research I universities that were part of the projection methodology. The results, covering a range of disciplines, provide data on space per faculty member in nine Research I universities.

Ira Fink is president of Ira Fink and Associates, Inc., University Planning Consultants, Berkeley, California. Part 2, a case study of the concepts in place at Georgia Tech, will appear in the January/February issue.

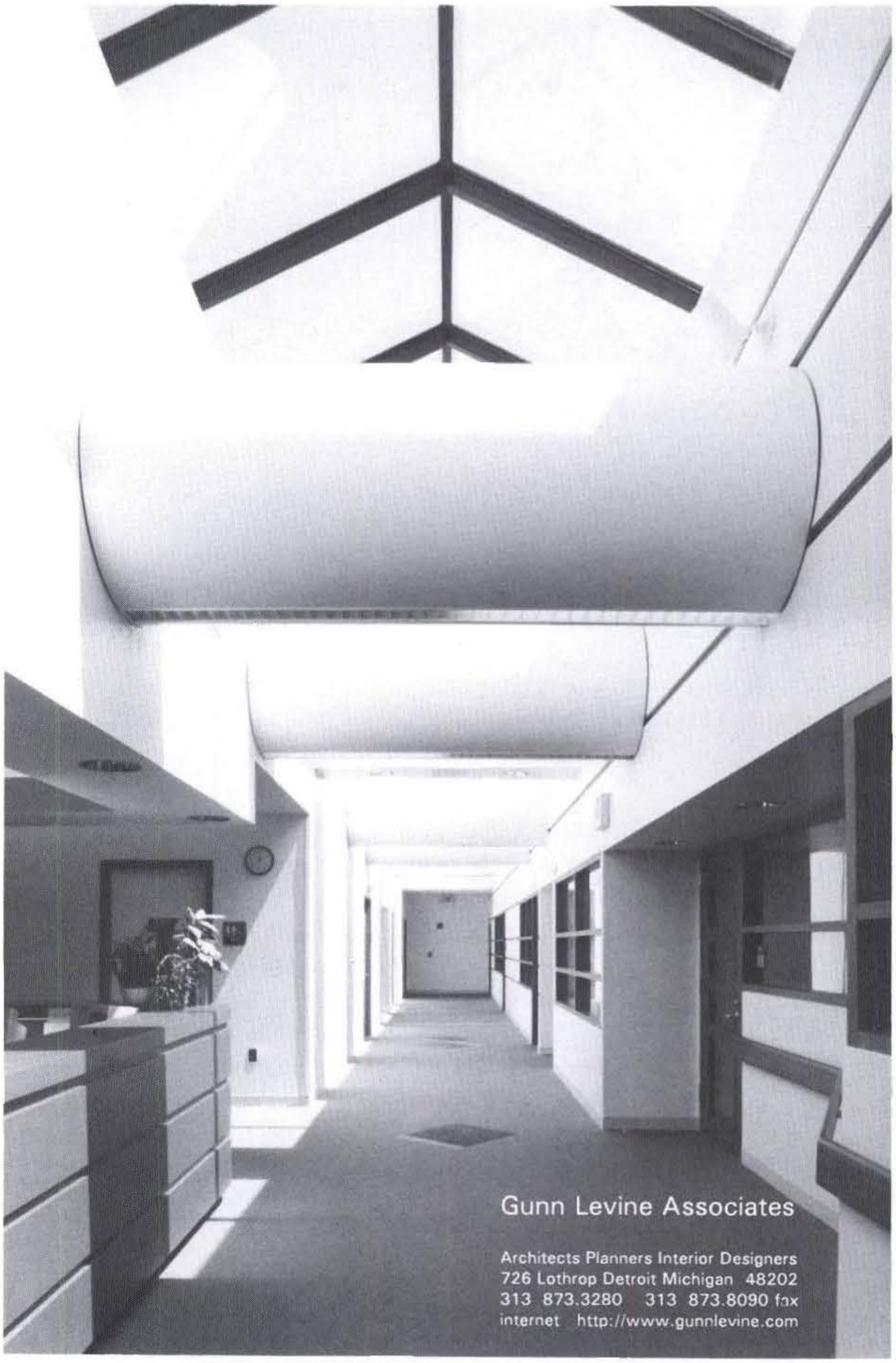
HISTORY OF SPACE STANDARDS

High School Origins

Traditional methods of space planning have their origins in reports about high schools and junior high schools in the 1920s and California public higher education in the 1940s and 1950s. The following summary, based on key space planning documents from 1948 to 1989, highlights the assumptions of traditional methods that I have challenged in developing the new space benchmarking approach. For readers interested in a more complete list of articles and books, please refer to my bibliography on this topic.[2]

1924 and 1926: Junior High Schools and High Schools

As near as I can tell, the idea of the use of space standards began with a study of high schools in the year 1924. A reference to a source document in *A Restudy of the Needs of California in Higher Education* (1955) [3] makes the following



statement: "Several years ago the School Planning Division of the California State Department of Education developed a building formula for computing classroom space requirements for the state colleges. That formula as currently used, and which follows in general the pattern earlier developed by Packer in 1924 for high school buildings and by Anderson in 1926 for junior-high-school buildings...".[4] This is the earliest reference I can find as to how and where space standards were introduced into higher education. Interestingly enough, the first higher education standards in California were based on the space required for movable tablet arm chair seating which occurred in World War I-vintage high schools and junior high schools.

1948: *Report of a Survey of the Needs of California in Higher Education*—Strayer Report

The procedures of the 1924 New York high schools' formula for computing classroom space requirements was augmented by what is known as the Strayer Committee Report published in California in 1948 and which included a chapter on the physical plants in California state colleges and the University of California.[5] This report makes a number of assumptions about space, based primarily on net square feet (later called assignable square feet or ASF) per full time equivalent student, and established the first standard in California for the utilization of classrooms (65 percent utilization based on a 45-hour course week [6]).

This report cemented the pattern of projecting space needs based on students. Most likely this was the result of believing that space needs for higher education parallel that of high schools and junior high schools.

1955: *A Restudy of the Needs of California in Higher Education* (Restudy Standards)

In 1955, concerned with the cost of public higher education, and in anticipation of a tidal wave of students who would be entering higher education a decade later as a result of the baby boom following World War II, the California legislature approved a restudy of the higher education needs of the state. This report, ***A Restudy of the Needs of California in Higher Education,*** carefully reviewed space on public campuses in California, and recommended higher utilization rates for classrooms[7]. More importantly, the Restudy report defined the amount of floor area that should be allowed for instructional purposes, including: offices, research laboratories, shops, storage, and miscellaneous areas for nine general subject fields ranging from agriculture to social sciences. These Restudy standards added one more step in codifying and reducing the space needs of higher education to a set of standards—with data based on buildings in place and square feet per student as it existed in California in 1953.

1966: *Space Utilization Standards, California Public Higher Education*—CCHE

The 1966 report of the California Coordinating Council for Higher Education (CCHE), *Space Utilization Standards, California Public Higher Education,* summarizes another major assumption: "Standards to be used in determining need must necessarily be established on an arbitrary basis. They may be based on average practice or some point on a scale where a certain percentage of the institutions lie. They can be based on a theoretical computation which might appear reasonable to persons sophisticated in facility space planning. In any event, the imposition of new or revised standards on a group of institutions may cause some anguish to those who have an excess amount of space, but are still desirous of additional state support." [8]

This CCHE statement raised two observations about standards — they are likely to be arbitrary and they represent average practice, not necessarily best practice. It should also be noted that the CCHE *Space Utilization Standards* also imposed standards for the size of class laboratories, based on assignable square footage (ASF) per station, and per 100 weekly student contact hours.

1968: *University Space Planning*—Bariether and Schillinger Book

In 1968, Harlan Bareither and Jerry Schillinger of the University of Illinois published their book *University Space Planning: Translating the Educational Program of a University into Physical Facility Requirements.* They developed a procedure called "the numeric method" for translating the educational program into physical facility requirements that was based upon "building blocks." According to Bareither and Schillinger, "The total amount of space required at an institution for each "building block" is dependent upon the number of FTE "full time equivalent" students, the level of student, the fields of study, the institutional philosophy pertaining to scheduling patterns, size of library, etc." [9]

According to Bareither and Schillinger, the purpose of the numeric method was two-fold: to present a logical system in the calculation of space requirements and to present space standards that should be usable for most institutions of higher learning. While the permanent value of their work, as the authors stress, lies mainly in its analytical methodology, it is often the specific numerical values of station size and allocation that have been regarded as fixed standards. While they indicate that the underlying assumptions about the size of staff for a given program should be subject to a continuous review—as staff size is obviously an important determinant of space requirements—the process of internal checking and cross validation of the numerical values is often overlooked.

Bareither and Schillinger note that research space is very difficult to evaluate, as it involves space requirements for types of activities that are not predictable. They state that the purpose of projecting space is to "establish a boundary condition within which to work." Space would then be allocated on the basis of productive research programs.

The Bareither and Schillinger book begins to examine two additional assumptions of space standards used in higher education. First, that all space requirements can be codified and calculated. Second, that the basis for projecting needs should be based on student enrollment. The work of my firm challenges both premises.

1971: *Higher Education Facilities Planning and Management*—WICHE Manuals

In 1971, the Western Interstate Commission for Higher Education (WICHE) published its seven volume *Higher Education Facilities Planning and Management manuals.*[10] One of the key statements made in the manuals is as follows: "The content of these manuals has been influenced strongly by an assumption that they can be of maximum use if the procedures deal with the problems as they are recognized currently rather than as they *may* develop in the future. As a result, these manuals are largely a compilation of the existing state of the art. The methodologies presented reflect the more traditional forms of education and the conventional measures of educational activity (e.g., student credit hours and weekly student hours)."[11]

The WICHE reports identify another questionable aspect of traditional space standards. They are based on solutions to current space problems, and they do not look ahead. This would certainly bother someone like the great hockey player, Wayne Gretsky, who is reported to have said, "I like to skate to where the puck is going, rather than where it has been." It is also a particularly important point as campuses today struggle with how much space technology requires, which has been completely overlooked in any set of standards or guidelines in use today. For example, our own research indicated that for classrooms with 100 or fewer stations, the average ASF needed per station in a fixed table, technology rich room, is 50 percent greater than for a movable tablet arm room.[12]

1985: *Space Planning Guidelines*—CEFPI

In 1985, the Council of Educational Facility Planners International issued its *Space Planning Guidelines*.[13] The introduction to the CEFPI report states, "The guidelines are directed to identify types and amounts of non-residential facilities that are required by departments on a campus. These are guidelines and not standards. Each institution should select planning modules which address its institutional mission, program mix, teaching techniques, and philosophies."

The CEFPI guidelines also cover space for research labs, based on the concept of planning modules which vary by discipline and also have a range of values in terms of square footage per module per discipline. It is not clear how one would choose to be at the low end or the high end of the CEFPI planning (design) module. The CEFPI guidelines describe in words the flexibility that should occur with the use of the guidelines. And indeed, the values presented are given in ranges. Yet at the same time, they represent one additional issue with guidelines or standards. We do not know the sources from which these guidelines are based. Are these opinions of a single author or committee? Are they based on empirical evidence from field work at unidentified institutions, or are they one more arbitrary and cumulative addition to the literature of higher education space planning?

1986: *Time and Territory*—CPEC

In 1986, The California Post Secondary Education Commission tried to bring together the complicated existing factors used in determining space needs. The needs analysis had been fine tuned, but basically not changed for more than four decades. CCHE hired a consulting firm to construct what became known as the Council's Facilities Analysis Model. As noted in a frank statement in the CCHE report, *Time and Territory: A Preliminary Exploration of Space and Utilization Guidelines in Engineering and*

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Continued from page 44

the Natural Sciences, CCHE indicates, "This model involved some rather sophisticated computer modeling and required the regular collection of massive amounts of data, so much so that it was finally abandoned due to the incapacity of campus data processing systems to manage it."[14]

CPEC was on the right track; not only is space data hard to model and process, but it is also hard to understand.

1989: *A Capacity for Learning*—California Post Secondary Education Commission

Again in 1989, the California Post Secondary Education Commission again reviewed space standards and guidelines that were in place in states across the nation. The CPEC report, *A Capacity for Learning: Revising Space and Utilization Standards for California Public Higher Education*[15], represented a massive effort to show where California public higher education stood relative to other states in facility space. The report pointed out the difficulties of maintaining space and utilization information. As the report indicates:

> A major finding of the study is that virtually all space standards tend to increase in detail and complexity over time and that—perhaps because of some fundamental quality of human nature—there is a tendency to try to draw greater and greater precision out of formulas that were never intended to be anything more than general guidelines. The result is often an architectural and academic straight jacket—a planning system that assumes too much from mathematics and fails to account for the fact that campuses are systems of buildings that must work together if the entire enterprise is to function effectively. Drastically limiting the amount of space that can be built in one category can have hidden effects on other space types, resulting in such unexpected and unwanted results as overcrowding, the construction of unneeded or overly expensive facilities, and general reduction in campus morale.[16]

A well-stated conclusion by CPEC.

Problems with Traditional Space Standards

The use of traditional space standards and guidelines raises many issues. First, too little is known about how institutional data were collected or how the standards and guidelines were actually derived. For example, the 1955 California studies were based on data obtained in 1953 at four University of California and ten California State College campuses. In other words, a precise measurement of past space use was being used as the means to project an unpredictable future. But for the other standards or guidelines, there is little information about how the space data was collected, how it might have been combined or weighted, and how anonymous data points were treated. Little is known about the characteristics of the institutions providing data—were they large or small, public or private, research universities or regional colleges, and how were their standards derived? Furthermore, there is no evidence that the premises were ever validated or tested. For example, the CEFPI Guidelines state that a review was made of guidelines from various state higher education coordinating boards and universities—but there is no further reference to the sources or their choice of one guideline number versus another.

Second, fixed standards imply that one size fits all institutions. Campuses vary considerably in culture, instructional modes, requirements for degrees and amount of research, all of which influence the amount of space needed for a program. Yet the guideline studies do not indicate how users of the guidelines should make important modifications or policy decisions when they use the standards.

Third, the standards or guidelines have a strong public institution bias. Do they work as well or apply to the hundreds of private colleges and universities in the U.S., many of which are the top ranked institutions in the country?[17] Of the list of 21 institutional participants in the WICHE study, only four represented private college or universities. While institutional affiliation is not shown for the 21 persons listed as the CEFPI Higher Education Committee, all of the names I recognize come from public higher education. Moreover, all of the named institutional sources are public.

Fourth, space guidelines often work best if they are administered as part of a centralized system and are used to create equity across institutions. But, in reality there are very few states that have higher education systems where multiple institutions have the same mission, are on par with one another, and where cross-campus space equity would be important.

Fifth, existing, commonly used space guidelines are averages based on unidentified institutions. What if your institution does not want to be average, but wants to excel? Where are the space standards or guidelines that promote excellence? How does an institution that wants to be best compare itself?

Lastly, these early documents suggest that the initial intent and purpose of space guidelines was to provide an umbrella, or envelope of space, as an entitlement for a discipline. Separate discipline entitlements would be added together to create a campus-wide allotment. This process has now deteriorated to the point where the space allotments have in some instances been used as a means to project room by room space needs as design standards for individual spaces rather than budgeting standards for an institution in aggregate.

It is the great diversity of institutions and of their student populations, faculty, and staff that make higher education so unique. It is important that guidelines and standards do not create a non-thinking mode of determining space needs and create average institutions across the board in terms of space. Guidelines should not remove discretion. They should be based on translating academic policy into facility needs. And they simply don't work well for some types of institutions.

Fatal Flaw of Standards

The most serious shortcoming of traditional standards or guidelines is their mechanical link to changes in student enrollment, either head-count or FTE. This connection may work well for enrollment formula funded public institution operating budget purposes, but it is inadequate for institutional space projections.

Most public institutions and some private institutions have experienced cycles and shifts in their enrollment base from full-time to part-time, from traditional to nontraditional, from day to evening. These institutions continue to survive, and even flourish, regardless of changes in enrollment. One reason these institutions remain stable is that most have a set cadre of faculty, regardless of enrollment fluctuations. The budget process that allocates funds for faculty positions, regardless of whether the institution is public or private, is rigorous. Faculty positions, once established, tend to remain in place. Faculty, once hired, also tend to stay. The process of creating faculty slots is usually more deliberate than the process that internally allocates funds based upon changes in student enrollment. *In other words, space standards and studies using student enrollment as the base use the wrong input. Space standards should be based on the number of faculty, not enrollment.*

Using faculty as a base presumes a response to issues not addressed by traditional enrollment standards. First, it assumes a student-to-faculty ratio. Second, it acknowledges that academic units know their own needs and that faculty have a sense of what space is required to execute their programs, more so than "space accountants" with calculators and computers. Finally, using faculty as a base allows faculty research space needs to be built into the result at levels that are appropriate to an institution's individual research missions.

Goals of Space Projections

The goals of space projections should be a "buy in" by faculty, staff and administration. They should provide understandable results and reflect a reproducible process. They should propel institutions to create a facility environment consistent with their academic environment. They should put space decisions into the hands of those who allocate related resources (i.e., directors, deans and faculty). They should provide a road map of facilities needs as a base for future master planning. Space planning, based on numbers of faculty derived from a benchmarking process, can accomplish these results.

An Alternate Approach to Space Projections

A New Methodology

My interest in creating a new methodology for space projection began nearly 35 years ago and has its roots in many different areas. First, while a staff member of the Office of the President of the University of California, I watched Donavan Smith and the late Bob Walen precisely estimate space needs for the nine campuses of the University of California, using state mandated formulas, and dutifully compute them by adding machine and calculator. Through the 1960s and 1970s, Donavan and Bob would crunch data on how big a campus should be, based on formula driven space entitlement from the State of California Restudy Standards.

Second, while interviewing faculty at George Washington University, Middle Tennessee State, John F. Kennedy University and other institutions where we have worked on space planning assignments, I was told by faculty that they would rather be next to their colleagues than be separated from them, even if they didn't get as much space as national space "standards" might provide. Adjacency, more so than size alone, was important.

Third, throughout my years in higher education, it became apparent that almost all institutions have a group of peer institutions with whom they compare themselves. Information from this respected group of comparison peer institutions is valued for establishing equity in a number of areas, whereas "national" data or standards, including space, is often considered of lesser value.

The provost or chief academic officer carries enormous influence in directing an institution's future through the allotment of faculty positions that allow one department to expand while another contracts. This is done by providing or taking away faculty slots. The provost, while concerned about enrollment, has a major involvement in faculty recruitment and the space requests that often accompany the hiring of faculty. By contrast, it is the admissions officer, registrar, or enrollment manager, who is concerned much more about the details of student enrollment, which here-to-fore has been the primary basis for projecting space needs, using the standards that have just been explained.

The Challenge: How Much Space is Needed?

One challenge of space management is consistently overlooked — how to create a space guidelines system that will allow highly complex and research rich universities, as well as other institutions, to understand how much space would be required to meet their needs due to programmatic growth, in comparison to space they already have.

Against this background of reservations about the value of traditional, fixed space standards, we have worked as a firm to develop a simpler, and more easily understandable system of how much space a campus requires. Rather than rely on guidelines derived from unknown institutions and complex formulas, we have developed a methodology based on benchmarking among peer institutions. We started with the assumption that the lead institutions in this nation (both public and private) have figured out how to become and remain successful, and, in the process have built a physical plant that allows them to carry out their work effectively. Their facility inventory is a good place to start.

To develop space needs projections for a preeminent research university without using space standards or guidelines authored by organizations such as the Council of Education and Facility Planners, or those in place in the state of California or elsewhere, we derived a system of space requirements for the Georgia Institute of Technology based upon assignable square feet per faculty member, by college, and by academic space unit. Developing this system involved two major activities: first, identifying as a baseline how much space was currently held by each of the units (exclusive of classrooms and residential space) and second, creating a benchmark space allotment measure that could be agreed upon by the campus and its academic unit heads.

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5. *Ibid.*, p. 307, Reference to Strayer Committee Report, Chapter IV.

6. *Ibid.*, p. 315.

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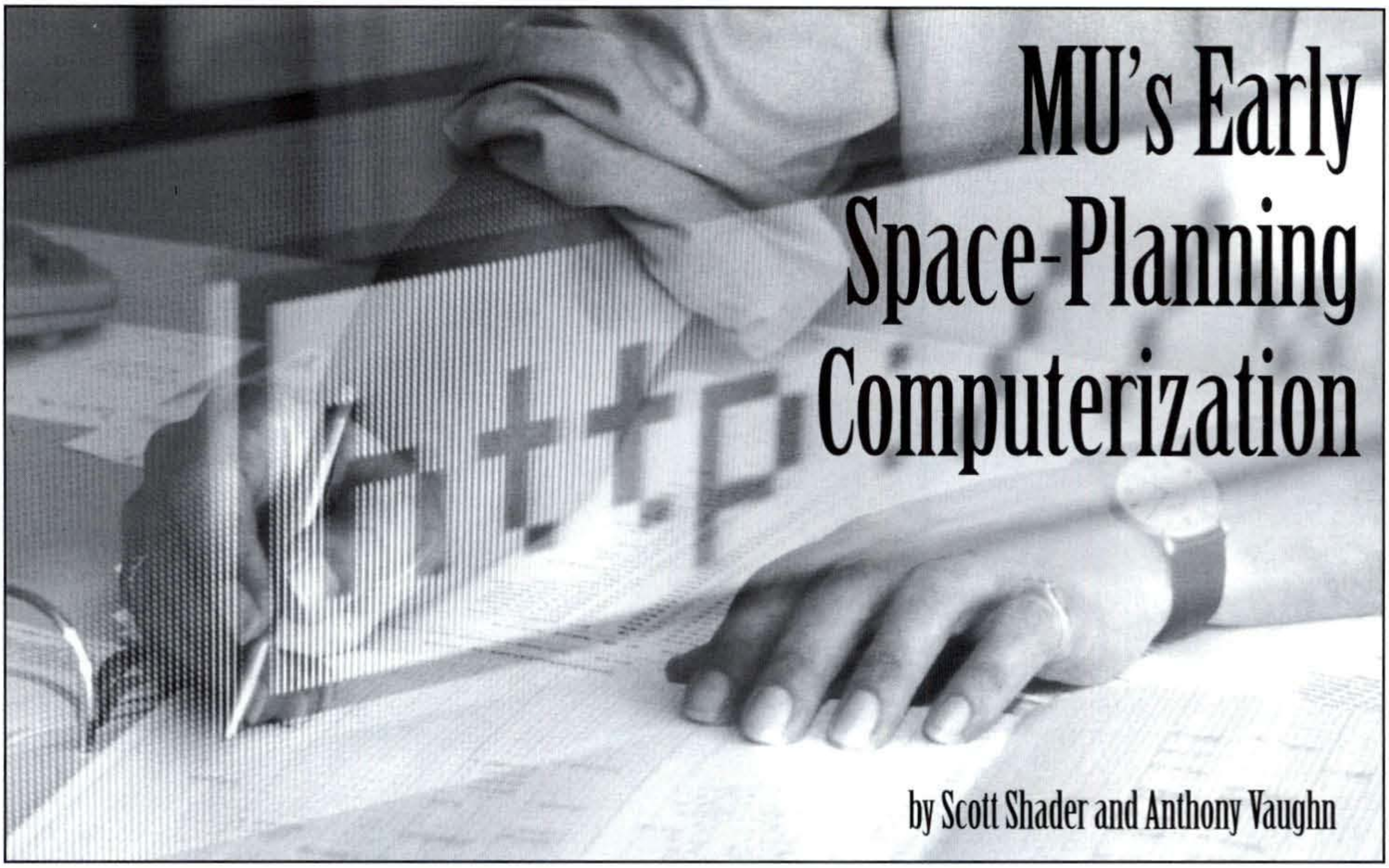
14. *Time and Territory: A Preliminary Exploration of Space and Utilization Guidelines in Engineering and the Natural Sciences.* Sacramento, California: (published by California Postsecondary Education Commission), Commission Report 86-2, February 1986, p. 9.

15. *A Capacity for Learning: Revising Space and Utilization Standards for California Public Higher Education.* Sacramento, California: (published by California Postsecondary Education Commission), Commission Report 90-3, January 1990, pp. 146.

16. *Ibid.*, p.3.

17. According to the 1999 "America's Best Colleges," issue of *US News and World Report*, of the 29 best national universities in the U.S., 24 are private. The highest ranking public institution is the University of California, Berkeley, which is ranked 22nd. (*US News and World Report*, 1999, p. 36). Of the 29 best national colleges, as ranked in *US News and World Report*, all are private. (*Ibid.*, p. 42).

The second part of this series, to appear in the January/February 1999 issue of *Facilities Manager*, will describe the process of facilities benchmarking. This approach is based upon projection methods that have not been derived from fixed space guidelines or standards, but instead on space per faculty member as the basis for prediction and allocation. This is an easily understood space projection methodology that has been used most recently at Georgia Tech and is currently being used most recently at Georgia Tech and is currently being used at the University of California, Davis and St. Mary's College of California. This second part of the series will also present results of a present results of a unique national space benchmarking study among Research I universities including an analysis of assignable square footage per faculty member in 23 separate academic disciplines at nine universities. The methodology for facilities benchmarking will also be shown. — *I.F.*



MU's Early Space-Planning Computerization

by Scott Shader and Anthony Vaughn

Prior to 1995, architectural and construction drawings at the University of Missouri-Columbia (MU) were maintained by Campus Facilities' Planning, Design and Construction Department where they were used primarily by the department's Design Services for remodeling and renovation plans, and by the Maintenance Department for electrical and plumbing work. Paper and mylar drawings were stored on hanging racks in a converted paint shop, and in tube files in the basement of the Campus Facilities building. Renovation plans were hand-drafted on existing documents or new drawings were created. In the early 1990s, Design Services personnel began using the AutoCAD (computer assisted design) program in architectural work. As a building, or section of a building, came up for renovation, university students employed part time, on an "as-needed" basis and using the original floor plans and field measurements, would draw building floor plans in AutoCAD files for use in developing renovation plans. When completed, CADD drawings were stored on a local network until the project was finished, and then transferred to storage on floppy disks.

Concurrent with the use of AutoCAD, Campus Facilities utilized a main frame database system for space inventory information. The DataFlex software program, maintained separately from Design Services' CADD files, was used to store building and room information, including square footage, room use and department ownership. This system suffered, however, in that square-footage information was derived from "measuring off" paper floor plans, and room use and ownership were only sporadically checked or changed. To this point, space planning at MU had been rather undervalued; its potential unrealized—a perspective that, toward the mid-90s, was to change.

Scott Shader is manager, space planning and management, at the University of Missouri/Columbia, Columbia, Missouri. Anthony Vaughn is a space planning analyst at MU.

The Space Planning and Management Office is Created

Space planning efforts began in earnest at MU in February 1995 when the Space Planning and Management office (SPAM) was created by MU's assistant vice chancellor for facilities. A space planner was hired to coordinate and manage the office, which consisted of one semi-retired employee who maintained the DataFlex program, a drafting technician, and three part-time student workers.

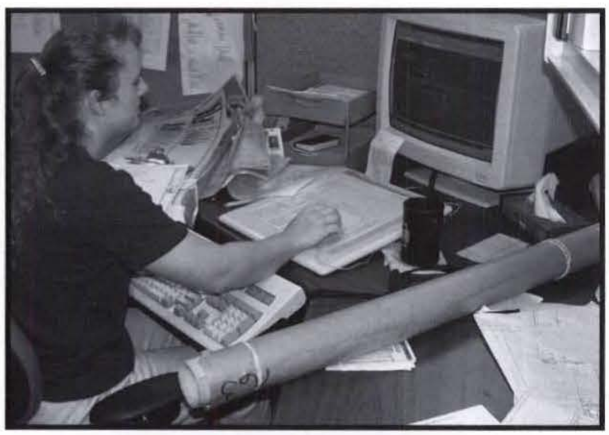
Standardization Begun; New Software Selected

The first priority for SPAM staff was developing and maintaining an accurate space inventory and CADD floor plans for buildings owned or leased by the university. Future space planning by the office would require this foundation of reliable information from which to work. Floor plans were drawn and maintained in AutoCAD R13; and Paradox 5.0 was selected to temporarily replace the DataFlex main-frame data base system until a permanent data base could be constructed using Archibus FM10, which directly ties drawings to the space inventory. A building-touring process and schedule were developed to ensure accuracy and consistency in the CADD drawings.

Before field touring and building space measurement began, existing floor plans were compared to data base information to isolate problems, such as rooms appearing in the inventory but not on floor plans, and vice versa. Structural changes, architectural features, seating, room use, and department ownership were recorded in the field for inclusion in the AutoCAD drawings and the Paradox data base. Exterior measurements were also made to serve as checks against interior dimensions.

The SPAM Manual is Created

The touring process and standards and procedures ensuring consistency between the buildings and CADD drawings were incorporated into Space Planning and Management's *Policies, Standards, and Conventions Manual,* which has approximately 40 pages devoted to the space inventory update process and floor plans. The manual also covers SPAM's customer service philosophy, floor and room numbering, polylines, complex plans, drawing and title-block prototypes, scaling, and procedures for processing information requests. A large portion of the manual covers layering standards.



Drafting technician Rebecca Sanders transfers, "from scratch," an architectural, as-built drawing to the AutoCAD system. Over the last four years, all of MU's 1,100 campus-area buildings (comprising some 15 million square feet of space) have been converted to AutoCAD.

While some in-house layers were created for polylines, hatching, and descriptive text the office maintains, SPAM has conformed—for the most part—to American Institute of Architects layering guidelines for drawings. Space Planning and Management in 1996 converted to AIA's Proposed Standards, which were replaced by the institute's 1997 Adopted Standards. Revisions to the adopted standards are now in process and will be incorporated in SPAM's *Policies, Standards and Conventions manual.*

Computerization of MU's Space Continues

By 1995, only 5 percent of the university's owned and leased buildings had been converted to AutoCAD drawings. Computerized floor plans of all the university's 1,100 buildings, comprising some 15 million square feet of space, are now available, and the buildings are regularly retoured for drawing revisions. The university's Education & General buildings are on a two-year retouring schedule; recharge or auxiliary buildings are revisited every three years.

Layer information is included in the border and title-block prototype used for all new construction and floor plan updates. The space planning office has developed AutoCAD routines that, in existing drawings, update layers to current standards. Due to AIA revisions, a different routine has been developed for each change, with the appropriate routine run when the floor plan is inserted in the new border—a necessary standardization due to the variety of people using the drawings.

MU's Buildings and Floor Plans on the Web

Through the Internet capabilities of AutoCAD R14 and the AutoDesk Whip program, floor plans for some 200 major campus buildings are now on the Web, accessible via an interactive campus map or building list through MU's campus facilities' home page (http://www.cf.missouri.edu). Square footage information and buildings where security and safety issues exist—e.g., the nuclear reactor, power plant, etc.—are excluded.

Floor plans are maintained on the Web in a 'rasterized,' or read-only format for non-technical use by faculty, students and staff in locating particular buildings, classrooms, offices, or other areas within buildings. Web users can pan, zoom, and print from the computer monitor but cannot manipulate or replace original drawings.

Technical users who need floor plans for planning and programming must request from SPAM "vectored," or "live" CADD drawings that can be copied to their network and edited. Campus Facilities' Design Services use AutoCAD drawings for preliminary planning and programming, as do off-campus architectural and engineering firms for other construction projects. Telecommunications personnel overlay telephone and computer network lines and connections for tracking and line maintenance. Environmental Health and Safety tracks chemical and radioactive material use and storage information; and Residential Life and the University Hospital access drawings for independent in-house design and maintenance programs. While technical users can copy and modify drawings, like Web users, they cannot change or replace the originals.

While this process allows tighter control and maintains the integrity of the AutoCAD drawing files, it also creates extra steps in placing floor plans online. Drawings are replaced as revisions are made. Whenever floor plans are revised in

In the "field verification" process, drafting technicians Rebecca Sander (l) and Joey Riley verify a floor plan's accuracy before AutoCAD drawings are released on the Internet. This process is performed with new construction, renovation, and regularly scheduled semiannual "touring" to confirm and update space.

CADD, a copy of the drawing must be converted to a Web format for non-technical users. Whenever floor plans are created, a copy of the drawing must be converted to both Web *and* CADD formats for non-technical and technical users, respectively.

Future Web Plans. Phase II of SPAM's space computerization—placing on the Web drawings of approximately 900 buildings located on agriculture experiment stations or farms and other locations throughout the state of Missouri—will soon follow. Like floor plans presently on the Web, Phase II drawings will be accessible through MU's home page, and available via an interactive campus map or an alphabetical listing of buildings.

SPAM's Space Modeling Surveys and Reports

Floor plans, such as those now on the Web, are the basis for accurate space planning and, in some ways, are a by-product of this effort. Space inventory data, square footages, room use and department ownership, is derived from information gained by touring facilities and creating precise CADD floor plans. While a valuable reporting tool, space inventory information is still only one piece of the total space planning process.

SPAM's Annual and Alternating Surveys. An annual and alternate survey conducted every other year contribute to the university's final space model, as well as to indirect cost reporting.

The annual space utilization survey is a two-purpose report is sent each January to officials in all academic and non-academic divisions of the university, listing all space under their control. Each is asked to first verify space ownership and confirm that the reported use of space is correct. Space owned and/or controlled, but not listed, can then be added by report recipients and the information updated. The space-use database then is changed when this ownership is verified by SPAM. Second, report recipients are asked to break out each room's activities, by percentages, into the following categories: instruction, university-funded research, externally funded research, public service, departmental administration, student services, general administration, plant operation and maintenance, library, auxiliary enterprises, service operations, and teaching hospital and clinics. Room percentages and square footage information, used for the space planning model, are also used for indirect-cost reimbursement reporting.

These reports, along with copies of floor plans tied to each department and an instruction packet, are sent each year to more than 300 departments. To meet the January deadline, staff and students begin in November to copy and print floor plans and instruction packets. The reports themselves are printed after January 1, the date on which space data base information is frozen. The information is then submitted for revision and updating to the 20-member Space Utilization Coordination group, which represents various academic and non-academic divisions of MU. During this transition to electronic reporting, the surveys that will be conducted in 1999 will have the floor plans and instruction packets available on the Web. For those users yet uncomfortable with electronic reporting, a printed report will also be published and distributed. Surveys conducted by SPAM eventually will be

Space analyst Nancy Boon searches through paper mechanical drawings that are being replaced by AutoCAD files on the Internet. Myriad details in such documents are now accessible by computer for design and maintenance-related needs.

distributed electronically over the Internet or campus networks as reporting methods and security issues are worked out.

The Three Alternating Surveys. Space Planning and Management also produces three other surveys—office, instruction, and research space information is collected in separate surveys developed to garner particular types of information.

The office space survey is designed to determine how many people, by FTE, require office space. Including employees simply by title or other generalizations, overinflates office space requirements—not all employees require office space to do their jobs or work in the department paying their salaries.

A research space survey is used to gather similar information. The purpose of this survey is to gather data on the number of FTEs who are performing university-funded and externally funded research. This information will be used to help the campus plan for adequate research space.

An instance of the overgeneration of research space occurs when staff conduct research in one department but are paid by another, a situation that develops when a type of space required for research is used or when research is in conjunction with the second department. In this instance, space requirements for the paying department are overgenerated, while the needs of the department providing the space are undergenerated.

A unique difficulty associated with both research- and office-space surveys is the inclusion of payroll data base information. While income information is excluded, Social Security numbers are shown to distinguish individuals with similar names.

The instructional space survey identifies space requirements for classes and students outside of those needed for actual instruction. Many instructors today expect students to spend a minimum number of hours per week in computer and other learning laboratories. While formulas exist with which to determine types and amounts of space needed based on enrollment, the instructional space survey allows SPAM to refine the generated needs. While space utilization reports and office and research surveys are normally completed at an administrative level, this survey requires involvement at the instruction level. Different instructors may require different levels of outside work for the same class, thereby generating additional hours and square footage. These surveys and reports, along with the inventory information, contribute to the space model generated by SPAM.

SPAM's Space Generation Model/Report

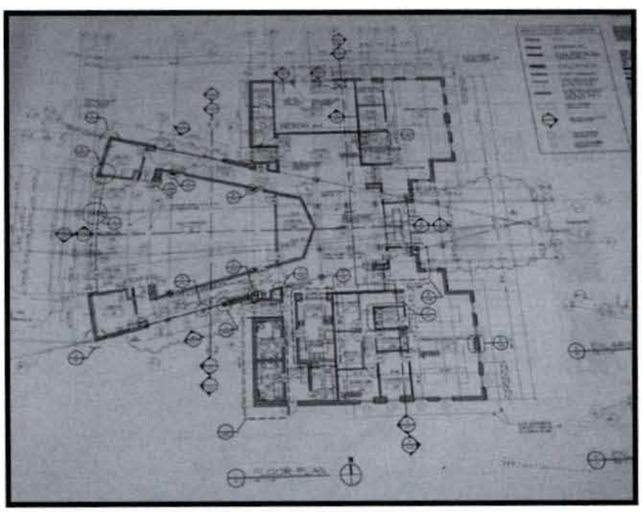
With information gathered from the above surveys, SPAM produces a formula-driven Space Generation Model, a report on space-use on the MU campus, which is presented each July to the MU provost and chancellor. The report categorizes existing and generated space department needs along lines described in the *1992 Post-Secondary Education Facilities Inventory & Classification Manual* published by the National Center for Educational Statistics.

Classroom facilities, office and conference space, research-, class- and open-laboratories areas, storage space and an all-inclusive "other" category, are classified by department for additional space-needs study. Existing space information is derived from the space inventory data base, while generated-space needs are developed from FTE information on students, faculty and staff, as well as office, instructional, and research space surveys.

Scott Shader, standing, installs the "Whip!" viewer plug-in with Bob Grant, contract document coordinator for MU's College of Agriculture, Food, & Natural Resources.

Refining the Space Generation Model's Planning Standards. Formulas for generating certain types of space needs on campus involve standards researched and developed by SPAM. The office currently has square footage for typical offices, classrooms, animal labs, and library space. Office space is broken down by title and function to account for varying responsibilities and duties. A more extensive list, based on academic disciplines, has been created for research and teaching laboratory space. Planning standards for other types of space—e.g., student recreation space, animal facilities, greenhouses, etc.—are currently being studied; square footages for all planning standards are continually being refined and benchmarked against information gathered from peer institutions.

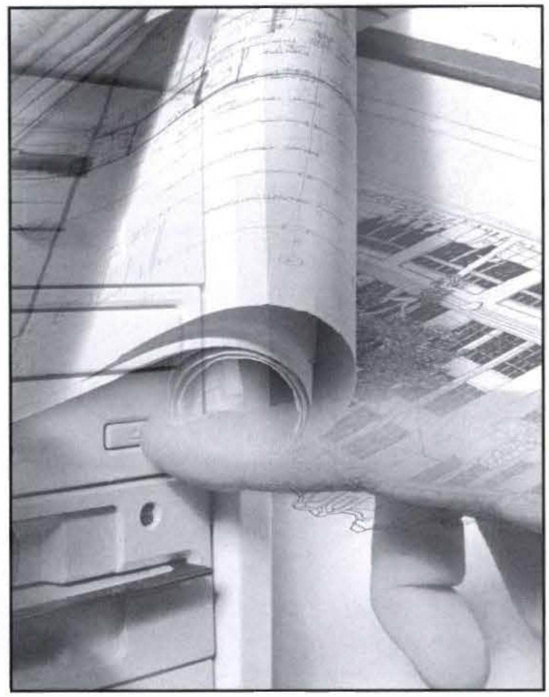
Getting MU Administration More Involved. The next step in refining the space generation model involves bringing more people into the space-planning process. Results of the space model will be reviewed with deans or other administrative heads of the university's divisions to discuss the space findings generated by the model. The survey process is relatively new to department heads. As campus administrators are coming to rely on information generated by the model, it is imperative they understand the importance and implication of information they report to SPAM. The possibility exists they may not yet fully understand either what is expected of them, or the use and importance of the information sought — both of which can result in inattention to, and the inaccuracy of, requested information.



Floor plans of MU-Columbia's 1,100 buildings are accessible via an interactive map and building list on MU's Campus Facilities' home page (http://www.cf.missouri.edu).

Inventory and Calculation of Replacement Costs

While surveys and modeling comprise an important component of space planning, SPAM has myriad responsibilities. The data generated through the space inventory are also utilized in calculating replacement values for the MU campus. Working with the University of Missouri System's Facility Planning and Development Office, SPAM generates annually the replacement cost for all buildings and structures on campus. In conjunction with the UM system, the state has developed a schedule of replacement costs by square foot for approximately 75 types of structures, the dollar figures of which are adjusted each July to reflect changes in the *Engineering News Record's* inflation rate—guidelines within which SPAM works.

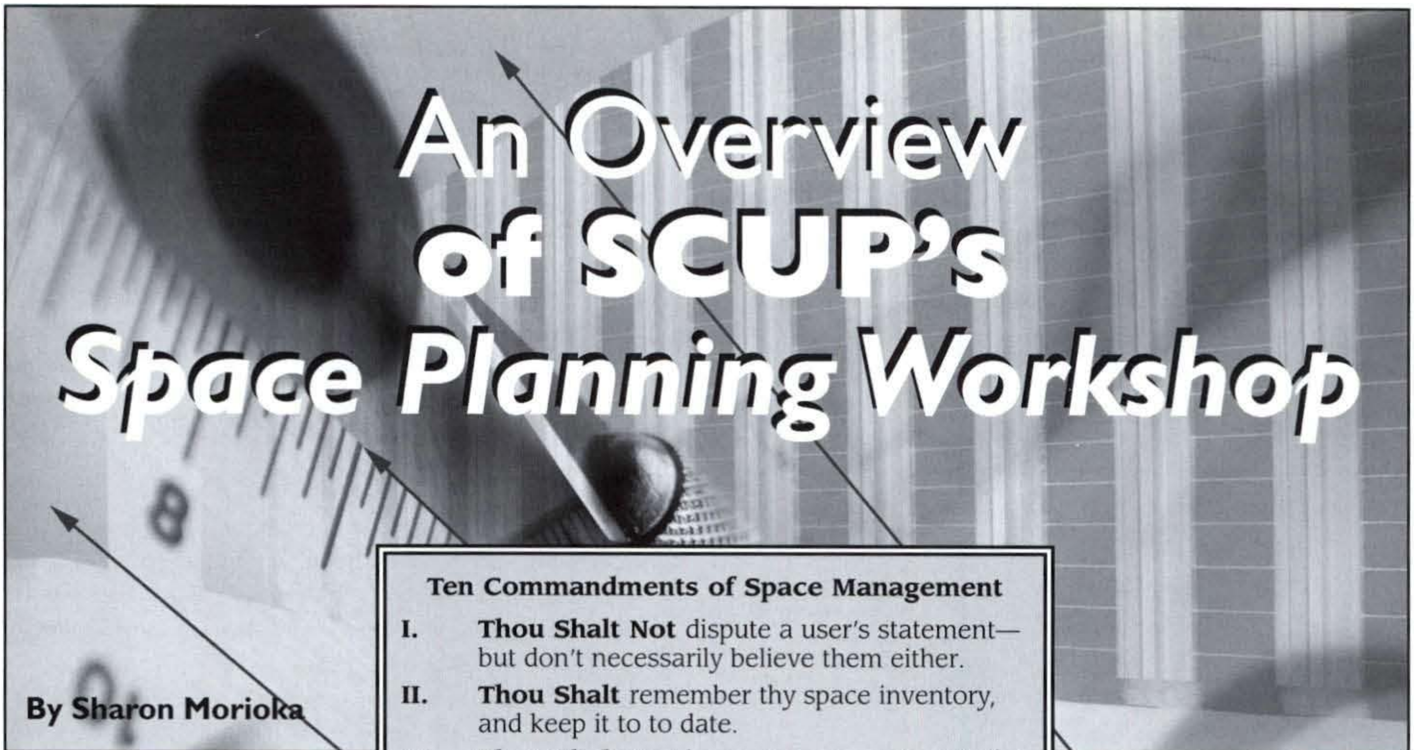


In addition to its use in calculating insurance replacement values and premiums, the replacement-costs-by-square-foot figure is used each year by the university to determine maintenance and repair monies received. Of consideration in the present replacement-costs system is the classification of buildings by singular uses—no building is entirely an office or classroom building, or high-tech laboratory. A more accurate method under consideration is the use of this schedule for calculating the building's actual square footage on the basis of space-use categories.

The amount of funding Campus Facilities now receives for maintenance and repair is based on one and one-half percent of the replacement value of its facilities. It is therefore essential that an accurate space inventory is maintained. As matters now stand, since 1996, MU campus space has increased by over 2 million square feet and some $252 million in replacement value.

Space Planning at MU: A Summary

In maintaining accurate space information and floor plans, SPAM provides data for significant broad-based financial, space planning and Web activities. The space inventory data have proven to be credible with federal, state and local governments for financial and space-related purposes and, for the last several years, have aided MU in recovering additional monies through Indirect Cost Reimbursements and Medicare/Medicaid. The computerization of information and maintenance of floor plans and space inventory data now allow computer access to floor plans not only by staff, faculty, students, and visitors to the MU campus, but to the world at large. Through these accomplishments, which culminate in the assembly of the space generation model, SPAM is not only looking at the short-term data and space needs of the campus, but is also setting a pace for the electronic exchange of information and ideas in the areas of strategic, space and financial planning that will make MU a national leader in space planning and management as education moves into the 21st century.



An Overview of SCUP's Space Planning Workshop

By Sharon Morioka

Imagine that you are the new space planner at a college that still has most of its facilities information stored on 3" x 5" cards and in the heads of administrators who have been with the college for the past several decades. Your job is to provide the new college president with a facilities and space management planning process as part of an effort to modernize the college's management systems and evaluate its physical resources. What would you do?

That is just one of many case study scenarios that facilities managers confront during the two-day space management workshop sponsored by the Society for College and University Planning. The goals of the workshop are to provide an introduction to the skills and techniques of space planning and management and to give participants an opportunity to test those skills on actual cases through the use of case studies. "It's an opportunity to utilize skills they acquire and to see how they should be thinking about the application of these tools and techniques in planning issues on their own campuses," says O. Robert Simha, workshop faculty member and director of planning for the Massachusetts Institute of Technology.

The workshop provides a learning opportunity for the novice planner, who often comes to the job with little formal training in the skills necessary to oversee a campus's space plan. "In space planning and facilities planning, there's really no place to train," says workshop faculty member Jack F. Probasco, president of Comprehensive Facilities Planning, Inc. "There are few institutions that provide training, academic courses, in space planning and management unless you're a student in a planning office. When I got into the business, my background was management information systems. The first two years, I had to learn everything on my own. Many people are thrown into that situation."

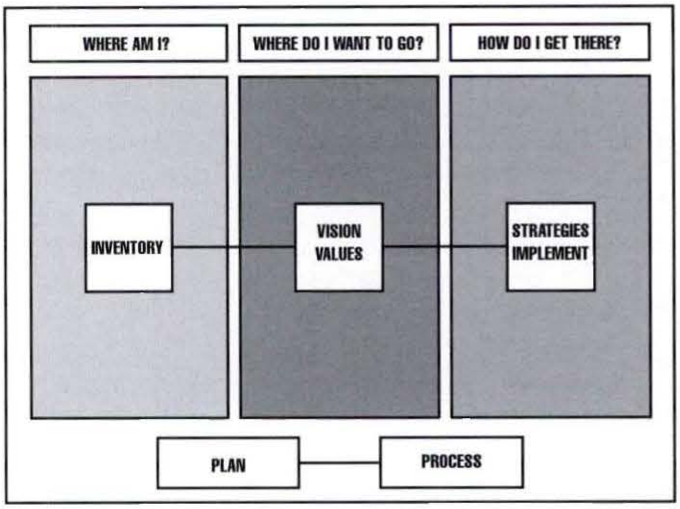
Simha concurs: "It's essentially on-the-job training. You don't take a course in space management, which is a combination of planning, operations, and so on. You might take a course in each of these areas, but this workshop is an opportunity to integrate them." He adds that space planning and management cuts across the principle planning issues that an institution faces as it changes or grows. "Planning has to

Ten Commandments of Space Management

- **I.** **Thou Shalt Not** dispute a user's statement—but don't necessarily believe them either.
- **II.** **Thou Shalt** remember thy space inventory, and keep it to to date.
- **III.** **Thou Shalt Not** leave space unassigned—for squatters will immediately lay claim to it.
- **IV.** **Thou Shalt Not** locate everyone in the center of the campus—with all necessary instructional space immediately adjacent to each person's office, (and adequate parking for everyone and their visitors within a half block.)
- **V.** **Thou Shalt** respect all space standards—even when cash flow is tight, and people approach you with money to spend.
- **VI.** **Thou Shalt Not** disregard the need to take away space from programs with declining staff and enrollments.
- **VII.** **Thou Shalt Not** worship all administrators of higher rank, nor provide them with over-sized offices (and private toilets).
- **VIII.** **Thou Shalt Not** substitute the user's knowledge of space management for legitimate space analysis techniques.
- **IX.** **Thou Shalt Not** assign daily space problems to a "Space Management Committee."
- **X.** **Thou Shalt** remember that all spaces are not created equal.

Source: Clint Hewitt, University of Minnesota

Sharon Morioka is assistant director for print media at the Society for College and University Planning, Ann Arbor, Michigan.



Source: Clint Hewitt, University of Minnesota

address people, program, space, and dollar issues. It's where the rubber hits the road."

The workshop strives to provide a holistic approach to space planning, says workshop faculty member William R. Tibbs Jr., architect and founder of Tibbs Associates. "In planning the workshop, we decided to look at four areas—space inventory, space utilization, space standards and guidelines, and space management. We thought that people in institutions had a tendency to know one or two of those areas very well, but not all four."

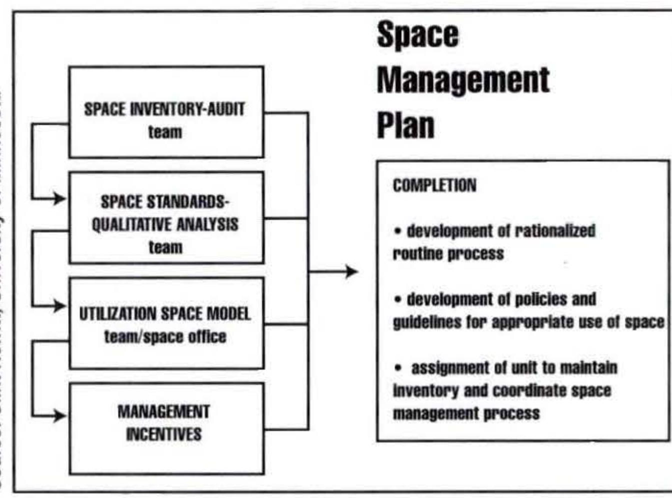
It is these components that make up the space management plan, which workshop faculty member Clinton N. Hewitt stresses as a strong tool for the space planner. "I'm a firm believer that you must have a plan to achieve objectives over time," says Hewitt, associate vice president for master planning and associate professor at the University of Minnesota. "Often, we pursue a problem with quick solutions; we don't always focus on the long-term impact." In his discussion of a space management plan, Hewitt tells workshop participants that there must be an organized approach to space planning, an approach that determines what space exists (inventory), how space is being used (utilization), what space is needed (projection), and how to meet space needs (implementation). With such an approach, he says, "you can begin to establish desired outcomes." It also allows the planner to understand the types of resources needed to carry out the plan, and it allows others on campus to see what their roles are in the plan. "We have to make people more sensitive to the costs associated with poor use of space." Successful implementation of a space management plan requires the cooperation and active support of the top levels of administration, space users, and support units.

Following Hewitt's presentation on the space management plan, Simha leads a discussion of one of the four areas that make up the plan: space inventory. He outlines how to inventory campus space, the elements of a space inventory system, and the recognized categories and terminology that are used throughout higher education.

Participants then hear from Probasco about space utilization. This includes how to analyze the use of a room based on the concepts learned about space inventory, space standards/guidelines, and considerations of enrollment data and institutional goals. Probasco says the proper use of space on campus can have a tremendous effect on both capital and operating costs. For example, if an institution uses its classrooms on an average of 28 hours per week rather than 24 hours per week, it could reduce the number of classrooms required by 10 percent.

On the second day of the workshop, all faculty lead a discussion of space guidelines or allowances: how to predict the amount of space needed for specific tasks based on criteria such as enrollment. Participants learn to discern the difference between space standards and design standards.

Tibbs then makes a presentation on space management. He discusses how to combine the analytical tools learned with the human relations and the political reality to create a systemic approach to space management. Such an approach organizes the right information, keeps it up-to- date, and makes it readily available to appropriate end users and decision makers.



Source: Clint Hewitt, University of Minnesota

Case studies

Participants take the information from these presentations and apply it to case study discussions of real-world situations. The case studies cover a variety of situations, from institutional growth conditions to leadership changes to the special problems that research universities face.

"The case studies were designed to provide a spectrum of problems so that they cover a variety of institutional situations," says Simha, who developed the case studies based on real-world problems. "They're designed to give participants the opportunity to explore different space planning scenarios at different levels at different types of institutions." Participants are divided into smaller groups, which allows people to interact and share their experiences. "The case studies have a tendency not to ask people to do a lot of technical analysis," says Tibbs.

"They force people into providing support for decisions that an institution should make, decisions like enrollment planning or master planning."

The majority of participants have some space management experience within their institutions. By getting together with people from other institutions and trying to work out a problem, they learn something about the problem and, more importantly, they learn how some of their peers begin to sort out the same kinds of information.

Challenges Facing Space Planners

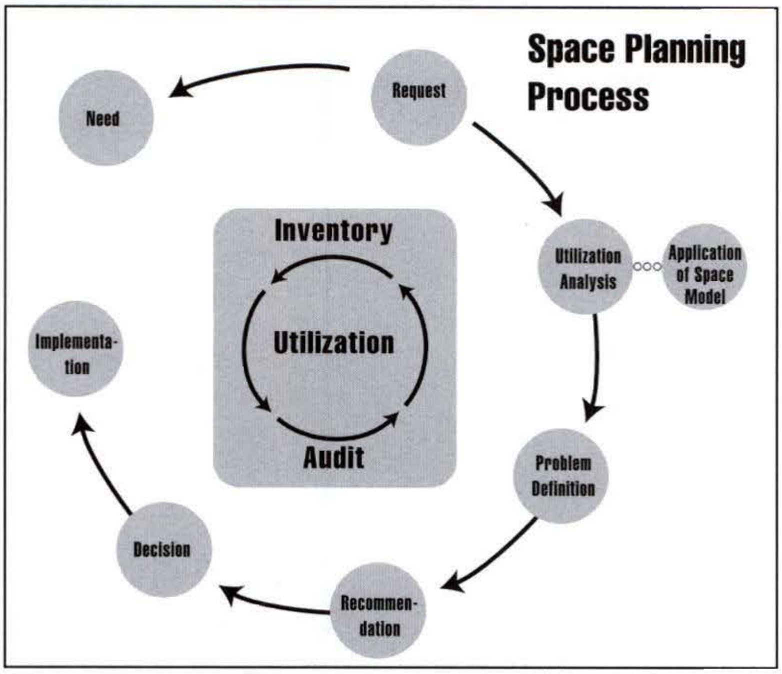
Throughout the workshop, the faculty found that participants faced the common challenge of how to develop and accomplish space management goals with limited resources. "Most space management operations are undersized in terms of staff and, by implication, budget," says Tibbs. "Surprisingly, in a lot of institutions the space management function is not an organized function. Some institutions don't have full-time people devoted to space management." Many institutions don't realize the importance of a space management plan and how it can be used to support the institution's mission. Tibbs says that institutions should look at space management as a way to support its mission rather than just as a space planning tool. "In most institutions, space decisions are very political," says Tibbs. "In some institutions, space is more valuable than money. Different groups may want space that the institution doesn't have and the institution has to spend money to get."

Hewitt agrees that an institution must establish a plan that relates to its mission and stated objectives. And once that plan is established, the planner has to convey its importance to managers at the institution. "Everyone involved in space management issues should have as their prime objective ensuring that informed decisions are made. The ideal organization is the one where the space management office does not make the decisions but provides the kind of information decision makers need to make informed decisions." He also stresses the development of a culture of space management, in which everyone at the institution thinks about how he or she can use space most efficiently and effectively.

Even those institutions that have been fortunate enough to receive substantial resources for their physical needs have to be careful in managing their space, says Hewitt. "If they're not careful, they will spend money, perhaps, not as wisely as they should, particularly if they don't invest it where they will get the greatest return on their funds. In order to do that, they must have an accurate inventory, a clear analysis of needs, a documented record of how their facilities are assigned and being used." Therefore, the need for a space management plan becomes critical. Hewitt adds that an excellent job of space management might result in continued resources even in more difficult economic times.

Another challenge planners face is deciding how to use new technologies that are available. "You have to understand the technology to link it into the space management function," says Tibbs. But he finds that people fixate on the technology rather than focus on its applicability to space management. "A real focus on technology is something that you should do after you're well grounded in space management." But once they are well grounded, planners should seek out technology that they can query and receive instant information from in order to make decisions. "Many of the old systems are mainframe based and take days to get information," says Probasco. "I think that just making people aware of the resources available is valuable." Getting that data is the first step. Planners then have to look at financial considerations and the utilization of space. Many institutions have central control of classrooms and labs and offices, so planners need to develop formulas they can use to show the administration what they're doing and what it costs. "We're really talking about giving people the tools to make good decisions," says Probasco.

As the workshop evolves it will cover new ground to appeal to planners with different levels of experience. It is in constant development and will be responsive to the needs of participants. As many planners know, there will always be challenges to meet and to share with other planners. "With the problems of finances and new technology and the challenges of changing from a teaching to a learning environment," says Probasco, "we need to look ahead."



Source: Clint Hewitt, University of Minnesota

SCUP is offering the next Space Management Workshop as part of its 1999 Winter Workshops, to be held January 24–26, 1999, in San Diego. For more information about this workshop and other SCUP programs and services, visit www.scup.org.

Architectural Graphics Standard Gets Bigger and Better

by Howard Millman

Sure its unfair, but architects and engineers seem to have more days when they feel like the statue than days when they feel like the pigeon. That's because, once past the creative phases of a project, much of what architects do is routine such as redrawing or customizing architectural details.

Howard Millman operates the Data System Services, LLC a vendor-independent consultancy that helps universities and university hospitals select the best products and practices to automate their facility management processes and transform data into knowledge. Reach him at 888-271-6883 or hmillman@ibm.net.

Just as software programs like AutoCAD and its competitors have automated and accelerated project design, so then the new CD-ROM version of John Wiley's and Sons' Architectural Graphics Standard (AGP) eases the task of blueprinting a project's many architectural details.

Version 2 of the program contains more than 10,000 drawings. More than 5,000 are vector graphics enabling you to export them in .DWG and .DWF file format. MicroStation users can now choose the new, native .DGN file format instead of relying on DXF. Another new feature, a link to First Source online, looks to be a significant timesaver and convenience. This context-sensitive link to FirstSource's website, provides access to more than 9,600 building product manufacturers and 11,500 product trade names. Hyperlinks allow you to jump directly to a manufacturer's website for more information (providing your computer or LAN has a modem.) If you're in the spec writing phase, the link to the Construction Specifications Institute and its SPEC-DATA and MANU-SPEC technical specification sheets, provides a full selection of downloadable data to directly incorporate into your project documents.

Leveraging on digital technologies strengths, AGS provides a full complement ofsearch features including searches for topics and titles. A comprehensive index lists all of the information on the voluminous disc. Finally, a special interest segment lists data related to specific design areas, such as ADA and historic preservation.

Despite its depth, AGS offers a clean interface and intuitive menu structure. AGS has modest hardware requirements, will run on an 486 PC with Windows 3.1 up to a P-450 with Windows NT boxes. Unfortunately, Mac users have to continue to use the printed version.

With its timesaving and comprehensive search menus, encyclopedic assortment of vector and raster graphics plus online links, AGS 2.0 just might smooth the ruffled feathers of overworked architects and engineers.

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Book Review Editor: Dr. John M. Casey, P.E.

This final edition of The Bookshelf for 1998 presents three reviews, two covering R.S. Means Company publications on estimating and one concerning lobbying for federal funding by higher education associations.

As mentioned in this column in the past, the Means group holds a preeminent position in the construction industry for compiling accurate cost data of all types. I recall that the first Robert Snow Means book I used back in the late 1950s was very thin indeed. The Means publications today number in the dozens, and are marketed both individually and as texts for nationwide seminars which award continuing professional education credits. David Patnaude of Harvard Medical School presents his considered opinions regarding the often-controversial world of "value engineering" in his review of Means' lengthy publication on the subject. Eric Shawn of the Catlin Gabel School reviews an equally complicated summary of costing methods for environmental remediation projects.

The book on the higher education lobbying is essentially a study of the "Big Six" higher education associations, and I review this work by Professor Cook of the University of Michigan. This study fills a gap in the history of such groups, continuing where Hugh Hawkins stopped in his study of them during the period 1877 to 1950. —*JMC*

John Casey is manager of the engineering department of the physical plant division at the University of Georgia, Athens, Georgia. If you are interested in reviewing a book for The Bookshelf, contact Casey at jcaseype@uga.cc.uga.edu.

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Value Engineering: Practical Applications, by Alphonse Dell'Isola, P.E., Kingston, Massachusetts: R.S. Means Company, Inc., 1997. 427pp., hardcover, software included.

Like many others in facilities management, I came to it by way of construction project management. That is where I got my introduction to value engineering. My understanding then, as it is now, was that the customer's needs dictated how one "value engineered" a project and brought it within budget. During this customer-driven process, we often sacrifice the quality of the "hidden" mechanical, electrical, and plumbing systems while being sure to include the finishes and many other visual and architectural extras the customer wants. What I have come to conclude after being both a construction project manager and one who inherits completed projects (a facilities manager) is that the customer's ultimate goals are frequently incompatible with those of long-term maintenance and operation of the space. A common saying amongst those of us in maintenance and operations is that there might not be enough money to install the correct mechanical system the first time, but there always seems to be enough money to fix it!

In Value Engineering: Practical Applications you will find a very detailed financial and engineering economic analysis of value engineering, perhaps too detailed. This book was written for the engineering economist that is part, or the leader, of a specialized team within an architectural and engineering firm which wants to start the practice of value engineering consulting. In short, this book has some very good information regarding the financial analysis of project alternatives that finance folks will flip over. Much of this is very similar to a typical college course in engineering economics. There are examples for comparisons based on present worth and annualized costs, there is a section dedicated to the forming of the value engineering team, there is an entire chapter about creativity and interpersonal skills. This book would make a good text for a course in value engineering; it's full of examples, specialized jargon, and acronyms. Replete with bundled software.

As a facilities manager I would prefer to see the book more focused on life cycle costing. The book defines life cycle costing as "the process of making an economic assessment of an item, area, systems, or facility by considering significant costs of ownership over an economic life, expressed in terms of equivalent costs." The author mentions that maintenance and operational costs should be considered. Being on the receiving end of many newly completed projects that have been value engineered I would have greatly appreciated seeing more information on how a value engineering team integrates maintenance and operations personnel.

At the end of chapter eight, the author indicates that maintenance and operations is an area of "least penetration" when it comes to value engineering. He very accurately states that the difficulty lies within the typical process for budgeting with capital projects being separated from day-today maintenance and operations. He concludes that value engineering should be integrated into operations. Unfortunately, that is where the author leaves this topic. It left me searching and yearning for more.

Looking from the facilities perspective I would have preferred that more effort be put on the life cycle costing aspect of value engineering. It is my experience that typical value engineering has little concern for the long term care, maintenance and operations of a building. First, or installed, cost is the engine that most commonly drives the machine of value engineering. I agree with the author that value engineering teams need to work on the integration of maintenance and operations personnel.

From the perspective of your average facilities manager this book has too much specialized economic jargon and is truly written for the engineering economist or financial manager of an A&E firm. I would have preferred to see this book focus much more on how building owners and operators could manage engineers and architects to keep the long term costs of operations and maintenance down through the installation of value enhanced mechanical, plumbing, and electrical systems. From the perspective of continued operations, that is true value engineering.

David E. Patnaude
Manager of FMO—Longwood Campus Area
Harvard University Medical School
Boston, Massachusetts

***

Environmental Remediation Estimating Methods, by Richard R. Rast. Kingston, Massachusetts: R.S. Means Company, Inc., 1997. 594 pp., hardcover.

Facilities officers at K-16 (K-12, community colleges, colleges, and universities) facilities throughout the world are faced with the management and disposal of hazardous waste. Every effort to simplify the estimating process and clarify remediation options is welcome. Although this reference is more sophisticated than most facilities officers need , it is no replacement for experienced engineering; however, it does provide a solid presentation of the range of alternatives.

Environmental Remediation Estimating Methods claims to be different from specialized texts. Its purpose is to make cost information available at the early stages of planning and design, to provide information for engineers to develop accurate cost estimates for remediation projects, and to provide a comprehensive reference that can be used by site owners, environmental consultants, and interested parties.

The book is well organized and contains a valuable glossary of terms. Part one provides general information for the common types of remedial action technologies in use in the U.S. today. Part one covers regulations, overview of the remediation process, and special conditions that affect costs. Part two describes specific approaches to estimating for fifty remediation technologies. Technical information has been gathered from a variety of sources, including government publications, manufacturers' literature, and remediation contractors. The cost estimating information and the cost estimating process have been tested on hundreds of projects throughout the United States. Part three describes a variety of estimating methods for contractors' general conditions, overhead, and profit.

Environmental Remediation Estimating Methods is a well-organized reference work and accomplishes its purpose of providing estimating guidance. Although the book is not essential to the general facilities manager, it covers remediation processes (e.g. drum removal, underground storage tanks, transportation, and landfill disposal) that touch even small facilities. It is a useful reference and presents the range of remediation alternatives in a clear readable form. The book is not at the top of my professional reading list, but I count it among the top twenty-five on my reference shelf.

Dr. Eric Shawn
Plant Manager
The Catlin Gabel School
Portland, Oregon

***

Lobbying for Higher Education: How Colleges and Universities Influence Federal Policy, by Constance Ewing Cook. Nashville, Tennessee: Vanderbilt University Press, 1998. 248 pp., hardcover.

If you are living in the United States and you read *Lobbying for Higher Education,* you will probably understand why your college president spends time in Washington, D.C. The capital is the home of countless associations which represent various interest groups in the academy, and the author reviews the role of presidential higher education associations, known as the "Big Six," in the pursuit of favorable legislation and funding from Congress. Chances are pretty good that your president is checking in with one or more of these associations when his airline ticket lists Dulles or National airport as the destination.

APPA members should remember that our association has been active since 1914, and has been very effective in representing the facilities management position in critical higher education issues. In the past decade, APPA has emerged as the preeminent group which has attempted to place itself on the cutting edge of such issues, has an active and expanding publication record, and sponsors a variety of national and regional seminars and institutes to promote professional development among its members. Our group has spent considerable effort reminding other administrators in the academy that the operation of campus facilities is a highly complicated and essential function of each institution, and that funding for facilities represents about ten percent of each school's expenses. Thus, APPA is a legitimate association in the galaxy of higher education associations, and its members should be concerned with the efforts of the academy in an important issue like lobbying at the federal level. Since APPA is older than all but two of the "Big Six" associations and is, according to my research, a very productive association when compared to professional association benchmarks established by the American Society of Association Executives, our seniority alone allows us to cast a critical eye on all other postsecondary education associations.

Federal involvement in higher education is an interesting topic, if only for the fact that the United States Constitution never mentions the term "education." Over the past two centuries, however, federal programs have been directed to the members of the academy, based on a very liberal interpretation of the general welfare clause in the Bill of Rights. Public higher education always has been funded primarily from the state level; federal funding has exceeded state and local funding only in four reporting years (1944, 1948, 1950, and 1966). The author's review of federal involvement, then, fills in only one patch, albeit a very large one, in the higher education funding quilt.

Professor Cook provides an excellent summary of the history of higher education associations, and then concentrates on the "Big Six" groups which represent presidents and other higher education associations. The oldest of the six is NASULGC, the National Association of State University and Land-Grant Colleges, which was originally founded in 1877. The AAU group, the Association of American Universities, was founded in 1900 as an exclusive club of fourteen institutions. The other four presidential associations are NAICU, the National Association of Independent Colleges and Universities (1915); ACE, the American Council on Education (1918); AACC, the American Association of Community Colleges (1920), and AASCU, the American Association of State Colleges and Universities (1961). The role of ACE is featured throughout the book since that association acts as the umbrella group for the other "Big Six" members and coordinates all lobbying activities at the Federal level. APPA has been an active member of ACE since the 1930s, when membership costs were very reasonable (APPA's financial statement in 1939 listed a ten dollar payment for yearly dues to ACE).

The book is logically developed, and casts two events as the critical times for the executive-based associations at the federal level. The first crisis, dubbed a debacle by the author, occurred in 1972, when direct student grants replaced some institutional grants. At this time, Pell grants, named after the principle sponsor of the enabling legislation Senator Claiborne Pell of Rhode Island, were offered to individual students, rather than the former practice of granting lump sums of federal money to higher education institutions. Politically, of course, Congress was recognizing that direct loans to individuals, who vote, was much more practical than direct grants to institutions who did not vote. Congress was also reacting to the complacent attitude of the higher education lobby, which was "out to lunch" while the committees were discussing the ramifications of the proposed changes.

The second crisis was precipitated by the arrival of the Republican-controlled 104th Congress in 1994, because this body requested that the higher education community validate their requests for funding. The lobbying community for the academy attempted to minimize the potential damage which could have resulted from this sudden assault on the federal funding for higher education institutions. In both cases, the lobbyists for the executive groups were subjected to stress tests; these people failed the former, but passed the latter, according to Professor Cook. Throughout this period, of course, individual institutions continued to pursue time-honored "Academic Earmarking," the practice of requesting specific grants for institutions based on the political ability of local federal representatives to steer money to their favorite institutions. The author concludes by suggesting that members of the academy, through these Big Six associations which are presidentially-based, have been able to adapt to federal pressures and have become effective as lobbyists in the highly-charged world of Washington politics. All this has occurred, Cook claims, in spite of the fact that typical academics deplore the thought of begging for money, even though the academy has a long history of being a Blanche DuBois, often relying on the kindness of strangers for its existence.

As a fan of higher education history, I like this book and recommend it for APPA members. Further, I would suggest that facilities managers first read the book, and then present it to their president along with the understanding that APPA members appreciate the problems associated with funding at the federal level. On a negative note, references in the book to the 1972 debacle cast that event in terms of the presidential associations; while this may have been a cataclysmic failure for those groups, some would argue that it was a most successful event for the academy as a whole. Finally, the subtitle of the book is "How Colleges and Universities Influence Federal Policy." Based on the information presented by Professor Cook, the opposite could be a more appropriate description.

Dr. John M. Casey P.E.
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University of Georgia
Athens, Georgia

Coming Events

For more information on APPA seminars and programs, contact the APPA Education Department at 703-684-1446, ext. 230 or ext. 231.

Jan. 17-22, 1999—*Institute for Facilities Management.* Reno, NV.

Feb. 7-13, 1999—*Professional Skills Program.* College Park, MD.

Mar. 14-19, 1999—*Individual Effectiveness Skills.* Stanford, CA.

Apr. 11-16, 1999—*Organizational Skills.* Notre Dame, IN.

June 20-22, 1999 —*Educational Conference & 86th Annual.* Meeting Cincinnati, OH.

July 16-18, 2000—*Educational Conference & 87th Annual.* Meeting Fort Worth, TX.

Other Events

Jan. 11-13—*Fundamentals of Industrial Hygiene.* Salt Lake City, UT. Contact the University of Utah, Rocky Mountain Center for Occupational and Environmental Health, 801-581-5710.

Jan. 21-22—*Behavior-Based Safety.* Salt Lake City, UT. Contact the University of Utah, Rocky Mountain Center for Occupational and Environmental Health, 801-581-5710.

Jan. 24-26—*SCUP Space Management Workshop.* San Diego, CA. Contact SCUP at www.scup.org.

Jan. 25-26—*Environmental Sampling and Data Analysis.* Scottsdale, AZ. Contact Government Institutes, 301-921-2345.

Jan. 28-29—*Fundamentals of Energy Management.* Chicago, IL. Contact the Association of Energy Engineers, 770-447-5083.

Feb. 8-9—*Accident Investigation, Analysis, and Prevention.* Salt Lake City, UT. Contact the University of Utah, Rocky Mountain Center for Occupational and Environmental Health, 801-581-5710.

Feb. 10-12—*12th Annual College/University Conference.* New Orleans, LA. Contact IDEA, 202-429-5111.

Feb. 16-19—*2nd Conference for Canadian APPA.* Calgary, Alberta. Contact John Watson.

Feb. 16-19—*The Advanced RCRA Institute.* Salt Lake City, UT. Contact Government Institutes, 301-921-2345.

Mar. 15-17—*NOx Control XII.* Durham, NC. Contact the Council of Industrial Boiler Owners, 703-250-9042.

Apr. 7-8—*GlobalCon '99.* Denver, CO. Contact the Association of Energy Engineers, 770-447-5083.

Apr. 11-16—*1999 IEEE/PES: Transmission and Distribution Conference and Exposition.* New Orleans, LA. Contact the Entergy Corporation, 504-576-2400

Apr. 21-22—*Winning at Deregulation: Measurement & Verification for Load Profiling.* Atlantic City, NJ. Contact the Association of Energy Engineers, 770-447-5083.

May 4-5—FEDFacilities '99. Washington, DC. Contact FEMP, 800-731-6106.

May 17-18—*Operations & Maintenance Management.* Chicago, IL. Contact Amy Tilton or Nicole Ray at FEMP, 509-372-4368

June 12-15—*90th Annual IDEA Conference & Trade Show.* Boston, MA. Contact IDEA, 202-429-5111.

June 17-88—*West Coast Energy Management Congress '99.* Anaheim, CA. Contact the Association of Energy Engineers, 770-447-5083.

July 17-18—*Life Cycle Costing.* Rockville, MD. Contact Amy Tilton or Nicole Ray at FEMP, 509-372-4520

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