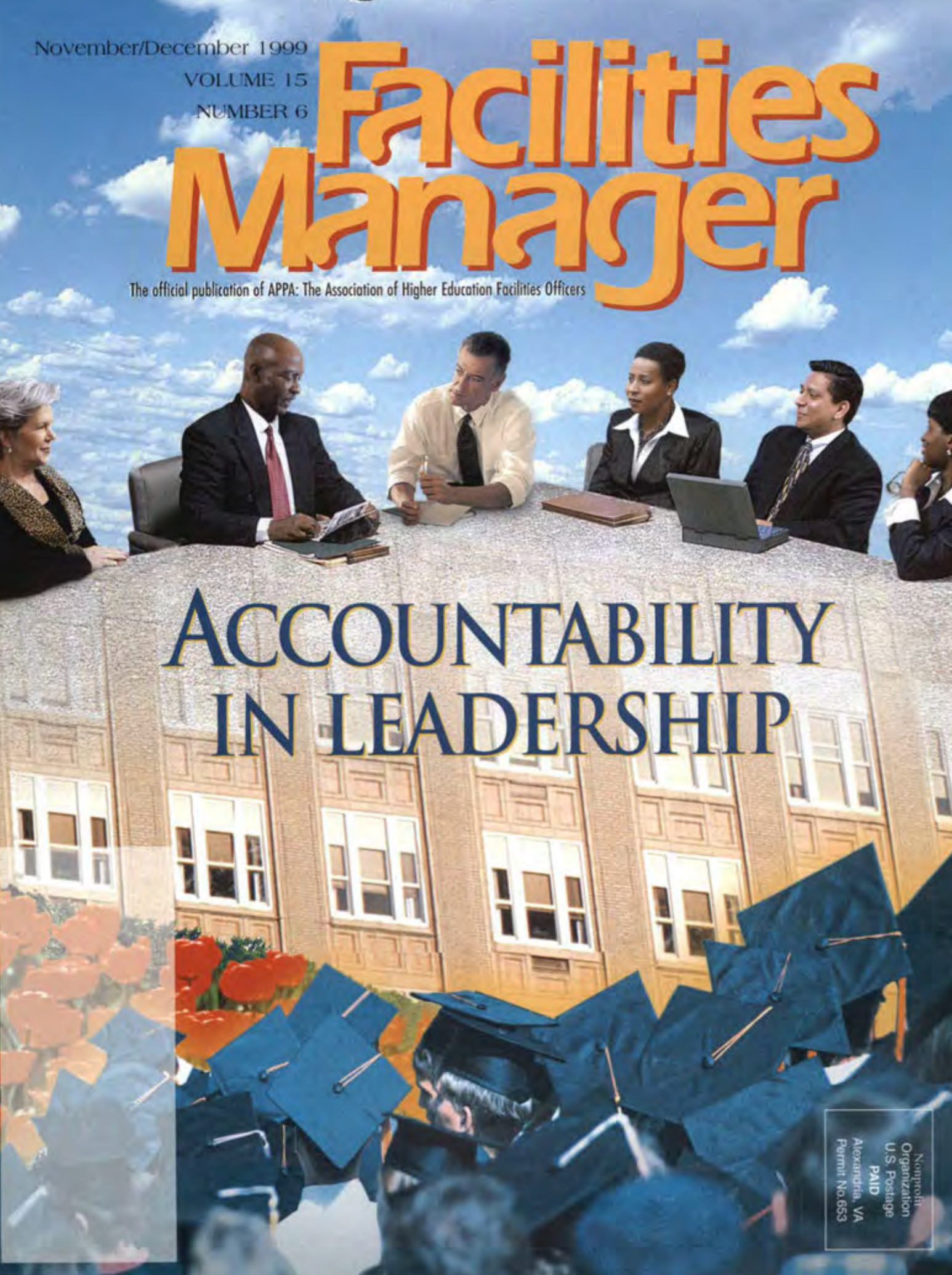
November/December 1999
VOLUME 15
NUMBER 6

Facilities Manager

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



ACCOUNTABILITY IN LEADERSHIP

Nonprofit
Organization
U.S. Postage
PAID
Alexandria, VA
Permit No.653

Truth Can Be Stranger Than Fiction

8:59 am: ***The Dean is panicked.*** The weather report calls for 105° on the first day of summer school.

NO PROBLEM: Based on your improved Preventive Maintenance schedules, you're confident the HVAC systems will handle the heavy load.

9:48 am: ***Housing is frenzied.*** They need a new dorm built ASAP to meet increased student enrollment.

NO PROBLEM: You show them how to better utilize existing space to accommodate the fast growing student body.

10:17 am: ***The President wants*** his house renovated before Alumni Weekend.

NO PROBLEM: In an afternoon you can organize the work, line up the right labor, secure materials from inventory, and order the new furniture. And you can easily share the information with your in-house financial system.

11:34 am: ***The Controller is having a fit*** over the total costs for contracted maintenance.

NO PROBLEM: You can point to the first-ever reduction in total contracted maintenance costs — you used the right contractors for the right jobs.

Finally! A day where you can quickly and confidently respond to complaints with ideas and information that count. Fiction? It doesn't have to be. Make these conversations a reality with FM Enterprise from AssetWorks. A comprehensive solution for professionals like you who want to more effectively use your physical assets — people, facilities, space, equipment and materials. Help your organization be more profitable — achieve measurable results, do more with less, and still provide high quality service to your customers.

Turn fiction into reality with FM Enterprise.™

Visit us at www.assetworks.com

New Utility Management Module!

Call today for more information. 1-800-659-9001 Ext. 30

AssetWorks

THE FUTURE OF FACILITIES MANAGEMENT

AssetWorks, Inc., formerly known as AEC Data Systems, Inc.

Facilities Manager

The Official Publication of APPA: The Association of Higher Education Facilities Officers

Volume 15 Number 6 November/December 1999

FEATURES

Departments

Facilities Manager

PRESIDENT: Maggie Kinnaman, University of Maryland/Baltimore
EXECUTIVE VICE PRESIDENT: E. Lander Medlin, Alexandria, Virginia

EDITOR: Steve Glazner
ASSOCIATE EDITOR: Medea Ranck
ASSISTANT EDITOR: Alycia Eck
SUBSCRIPTIONS: Cotrenia Aytch
CREATIVE DIRECTION: Corporate Design
PRINTING: Corporate Press, Inc.
EDITORIAL OFFICE: 703-684-1446 ext. 236
FAX: 703-549-2772
E-MAIL: steve@appa.org, medea@appa.org, alycia@appa.org, cotrenia@appa.org
WEB: www.appa.org
ADVERTISING:
Gerry Van Treeck
Achieve Communications
3221 Prestwick Lane
Northbrook, Illinois 60062
Phone: 847-562-8633
Fax: 847-562-8634
E-mail: gerryvt@concentric.net

Facilities Manager (ISSN 0882-7249) is published six times a year (January, March, May, July, September, and November) Editorial contributions are welcome and should be sent to the address below.

Of APPA's annual membership dues, $40 pays for the subscription to ***Facilities Manager***. Additional annual subscriptions cost $60 for APPA members, $90 for non-members. For information on rates and deadlines for display advertising, telephone 847-562-8633 or 703-684-1446 ext. 238.

POSTMASTER: Send address changes to Facilities Manager, 1643 Prince Street, Alexandria, VA 22314-2818.

Published by APPA:
The Association of Higher Education Facilities Officers
1643 Prince Street
Alexandria, VA 22314-2818

Global Partner in Learning

From the Editor

Steve Glazner

Leadership is everyone's responsibility and not just that of the person in the top position of an organization.

Sounds simple, but this is a concept not yet fully accepted by everyone in facilities management. To be sure, that "top" person possesses primary authority and responsibility for his or her department. They are indeed accountable for their stewardship of the human, financial, and facilities resources within their purview. They must plan, implement, communicate, make decisions, and much more. Yet isn't that true for everyone within the facilities organization?

APPA's Professional Leadership Center takes the view that leadership is indeed the responsibility of each person in the organization. From the custodian, groundskeeper, and electrician, to the vice president, director, and utilities manager—each person has a distinct and valuable role within the total campus facilities operation. Each one has specific responsibilities for which they are accountable. Each does not work within a vacuum, but instead is part of a larger whole that serves the mission of the institution.

This issue of Facilities Manager explores various ways in which the facilities professional can acknowledge their accountability and improve their performance and response to their institutions and other constituencies. We thank Cheryl Keown for providing us with a report of a recent survey on outsourcing and privatization. Her article shows that there are many more complex factors than cost reduction alone affecting the consideration of outsourcing today.

APPA President Maggie Kinnaman discusses how the Strategic Assessment Model can help you in using a set of performance indicators as a valuable self-analysis tool. This issue also includes articles on utilities accounting, building commissioning, and energy submetering—topics focused on accountability and responsibility for you, the leaders education facilities management.

Electrifying News from APPA

After nearly four years of effort, APPA has been granted a position of principal with voting rights on an American National Standards Institute's code panel. The institute grants standards-making authority for power and telecommunication systems in the U.S. to fewer than 200 principal members of the National Electric Code. Principal members are selected by the National Fire Protection Association on the basis of the nature and size of a given interest group and the ability of the principal to promote the science and methods of electro-technology.

Beginning in January 2000, APPA will sit at the table and assist in the creation of the 2002 National Electric Code. Other member organizations include: Airline Pilots Association; American Society for Healthcare Engineering; Bell Communications Research; Canadian Standards Association; Chemical Manufacturer's Association; Edison Electric Institute; Electric Power Research Institute; Electrical Generating Systems Association; Illuminating Engineering Society of North America; Information Technology Industry; Institute of Electrical and Electronic Engineers; International Association of Electrical Inspectors; International Brotherhood of Electrical Workers; National Electrical Contractors Association; National Electrical Manufacturer's Association; U.S. Department of Veterans Affairs; U.S. Motion Picture Industry; and many others.

The APPA appointment is to Code-Making Panel No. 1. This is one of 20 code-making panels and it covers the legal, interpretative, and policy issues of the other 19 panels. APPA members who have an interest in participating in the electrical code-making process may direct inquiries to Michael A. Anthony at the University of Michigan by e-mailing maanthon@umich.edu. Visit www.appa.org for updates.

New Opportunities for Research through APPA

The second of the three Leadership cornerstones of the Professional Leadership

Center, the Research Component, provides educational facilities professionals and other administrators with support and encouragement to undertake the discovery and evaluation of new information that will lead to improved education management practices. Proposals are now being accepted for research efforts that will provide information and knowledge vital to providing facilities professionals and the educational enterprise with the information needed for innovative and improved decision-making and management. The Professional Leadership Center Research Council will evaluate submissions and accepted applicants will have their papers published in *Facilities Manager* and on the APPA website. Visit www.appa.org/education for more information on the Professional Leadership Center and for guidelines on submitting your proposals.

EPA Launches Project XL with New England Colleges & Universities

Three colleges in New England, Boston College, the University of Massachusetts at Boston, and the University of Vermont, will attempt to meet a target for increased recycling of hazardous chemical wastes from laboratory experiments within the parameters of an experimental program of the U.S. Environmental Protection Agency (EPA). Project XL is a national pilot program that tests innovative ways of achieving better and more cost-effective public health and environmental protection. Through site-specific agreements with project sponsors, EPA will gather data and project experience to help the agency redesign current approaches to public health and environmental protection. Under Project XL, private facilities, multiple facilities, industry sectors, federal facilities, communities, and states can implement innovative strategies that produce superior environmental performance, provide flexibility, cost savings, paperwork reduction, or other benefits while promoting greater accountability to stakeholders.

If the schools are successful, the agency, in return, will relax federal environmental rules governing such wastes. The experiment initially will last four years. The experiment is limited to those three institutions at this time; however, other U.S. colleges will be eligible to join after the first 15 months, if they meet certain conditions. To read the complete project agreement, visit www.epa.gov/ProjectXL.

Leadership Through Relationships

by E. Lander Medlin

This past spring and summer, I was truly blessed with the opportunity to further grow and develop my leadership skills by co-facilitating, with Charlie Jenkins, APPA's *Individual Effectiveness Leadership Skills* program at the institutional level.

We were fortunate to have two institutions—the University of Missouri, Columbia (who first thought of the idea) and Colorado College—lead the way in bringing this much-needed program and its powerful set of leadership skills to a large audience of individuals who work together day-in and day-out. Obviously both are very different institutions; one is a top public research university and the other a leading private liberal arts college. However, what's not so obvious is that we not only taught the course to over 70 individuals at the Facilities Department at the University of Missouri, Columbia, but we also had the opportunity to deliver the program to those individuals working across all the departments in the Administration and Finance Division of the Colorado College.

Although somewhat different audiences, the results were equally impressive. Both organizations provided extremely positive feedback for the quality of the program content and its deliverables (founded on the Franklin-Covey Seven Habits program, which includes a book, participant's workbook, and a 360-degree feedback profile and action plan). The quality of the individual participants at both institutions was impressive. Their willingness to stretch to achieve new levels of learning and understanding about

themselves and their organizations; their sincere interest in improving their individual leadership effectiveness; and their overall eagerness and enthusiasm was inspirational. You always learn more when you teach, and I found that to be a fact.

So, why did I choose to focus on these events in this article? It's mainly because of my concern for the facilities professional and his or her future. I am more convinced now than ever before of the need for leadership skills development. Let's face it. The world as we know it is changing and at a rapid pace. I have written and spoken about change highlighting the critical driving forces affecting society, higher education, and the facilities profession. Let me reiterate what your colleagues have said those driving forces are:

- Information technology
- Resource scarcity
- Societal needs (such as public accountability)
- Governmental intervention
- Environmental deterioration

These critical driving forces will, and in many cases already are, driving our profession toward significant role changes. We anticipate that those role changes will include:

- Information technologist
- Operations expert
- Asset manager
- Partner
- Strategist
- Executive

Our primary resource for meeting such challenges is leadership, but our understanding and application of the skills required is still lacking and the practice of leadership is tenuous.

Why do I say this? Because the most prevalent belief is that leadership is positional; that is to say, leadership resides with the position (top level management) rather than viewing leadership as "everyone's" individual responsibility. Second, the myth still exists that leaders are born, not made, and that leadership is based on personality traits and personal style rather than character and competence.

Continued on page 7

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

We provide innovative solutions to complex problems.

At the heart of this highly sophisticated, complex audio-visual installation is the SmartPanel™.

The SmartPanel was developed for Minnesota Western as a replacement for established, more complicated audio-visual control systems. It is a permanently installed system that allows a presenter to walk into a room with any kind of communication device (computer, VCR, etc.), plug it into the SmartPanel and project the image on the screen with seamless integration. The SmartPanel is the ideal solution for any size meeting room, classroom or auditorium. Its simplicity and intuitive design lets the presenter focus on the presentation, not the equipment.

Minnesota Western/MCSi is proud to have been asked to design and install the audio-visual systems for Stanford University's Regional Teaching Facility in the Science and Engineering Quadrangle (SEQ).

We provide a complete line of meeting and presentation products and systems integration services. Our solid background and technical expertise come from over twenty-five years of experience providing creative presentation solutions.

Our **Systems Integration Group** provides design and engineering, space planning, system studies, and equipment recommendations. This coordinated effort ensures the development of technologically advanced, cost-effective and productive conference rooms, boardrooms and training facilities.

Call for a copy of our free 36-page brochure, PRESENTING SPACES, *and see how we helped 25 organizations improve communication by incorporating electronic media into their presentation environments.*

MCSi.
Media Consultants • Systems Integrators

1-800-516-0600
www.minnwest.com

Partial Client List

Andersen Consulting
AT&T
Bank of America
Boeing
Chevron Corporation
Chiron
Disney Televentures
Gen-Probe
Hewlett-Packard
Isis Pharmaceuticals
Kaiser Permanente
Kirkland AFB
Lockheed Martin
Lucent Technologies
Microsoft
NEC Technologies
Next Level
Nordstrom
Nike, Inc.
PG&E
People Soft
Toshiba of America
UC Berkeley
U.S. Postal Service

Continued from page 5

Leadership consists of a set of learned skills that with practice can be utilized successfully to improve individual human effectiveness and to build lasting relationships. Just as a tennis player can improve with practice, so too can individuals improve their ability to lead. We must move from the narrow view that leadership is about efficiency, control, and stability in maintaining the status quo towards an understanding of leadership as encompassing effectiveness, continuous improvement, innovation, empowerment, and relationships.

Catch the language? Management is the act of efficiently managing things, and *leadership* is the act of effectively leading people. Simple to say; extremely difficult to do and do well.

The fact remains that our largest renewable resource and most important asset is decidedly the people we work with, support, and serve. And, correspondingly, our training and development programs are primarily focused on technical competency rather than on the skills associated with building effective human relationships—the heart and soul of APPA's leadership skills program. Our leadership skills development must begin with the individual from the inside-out. Only then can we begin to lead others more effectively, lead an organization more effectively, and ultimately contribute to the profession.

So why is this so important? The key here is *relationships*. Charlie Jenkins wrote about the value of relationships in the May/June 1999 issue of *Facilities Manager*, and I recommend that you read it. Charlie is right on the money! The premise is that "the demise and derailment of high potential leaders is more often the result of individual factors involving *relationships* rather than technical skills and perceived competence in their professional area of expertise." Where is your focus?

It has been said many times that the only thing constant is change. I would add a second constant given today's environment: learning is an absolute requirement and an ongoing process. We must be equipped to deal with the challenges we face from the critical driving forces and the role changes we must grapple with well into the future. Where will you learn and discover the necessary leadership skills for your future success? APPA can help. We are ready, willing, and able to do so. As always I am available to discuss your needs in more detail at any time you would like to do so.

3TH ANNUAL

College/ Iniversity Conference

bruary 23-25, 2000
aterfront Centre Hotel
ncouver, British Columbia
nada

osted by The University of itish Columbia

Plan now to attend the **13th Annual IDEA College/ University Conference** hosted by The University of British Columbia. Whether you operate or are considering installation of a district heating, cooling or cogeneration system, the conference will help you improve your operations through technical presentations, case histories, and sharing ideas with your peers. The meeting will also update you on the latest technologies and legislation.

Topics of discussion include:

BUSINESS

- Energy Procurement/Contracting
- Using Energy Service Companies (ESCOs)
- Privatization/Outsourcing
- Performance Contracting
- Rates, Metering & Billing for Universities
- Energy Conservation Programs/Strategies within Universities
- Innovative Contracting & Project Financing Strategies
- Financial Planning & Budgeting for Future Utility Systems
- Fiancial & Contractual Options for Plant Upgrading
- Water Treatment Technologies & Contracting Strategies

MAINTENANCE AND OPERATIONS

- Predictive Maintenance Practices
- Disaster/Recovery Planning
- Asset Management
- Environmental Compliance
- Continuous Emissions Monitoring (CEMs) Experience
- Successful CMMS Implementaion Cases
- Remotely Operated Plant Issues
- Central Plant versus Individual Building Systems
- GIS/GPS Practices

NEW EQUIPMENT AND SYSTEMS

- Synopsis of New Equipment (micro-turbines, dual-drive chillers, new absorption designs, etc.)
- Influencing Energy Efficient Building Designs
- Alternate Energy Sources (photo voltaics, fuel cells, solar, wind, geothermal, lake cooling)
- Central & Satellite Plant Design/Construction

ANALYSIS AND CONTROL

- Metering/Data Acquisition
- Real-Time Analysis
- Demand Management/Limiting Technologies
- Control Systems: Building/Plant Controls; Integrated Systems

ADMINISTRATIVE CHALLENGES

- Reliability & Capacity Planning for Campus Systems
- Capital Renewal
- Benchmarking
- Personnel Management
- Technology-Based Solutions to Administrative Processes

For more information contact:

IDEA
1200 19th Street, NW
Suite 300
Washington, DC 20036-2422
(202) 429-5111
(202) 429-5113 FAX
E-mail: idea@dc.sba.com

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

Selling the Customer

by H. Val Peterson

Accountability in a facilities management organization is a must. As a service organization we are fiscally and organizationally accountable to the governing board or regents, to the administration, to the chief business officer and perhaps others. It stands to reason, however, that those to whom we must be most accountable are our customers. The providing of satisfactory services to people within our institutions—administration, faculty, staff, students and visitors—is the primary reason for our existence. Selling the customer is part of our accountability.

Joe Girard is listed in the *Guinness Book of World Records* as the world's greatest salesperson. Joe is a car salesman. He maintains that customers "don't buy Chevrolets—they buy me." In today's marketplace people making major purchases must "buy" the person selling the product before they'll purchase the product. In other words, salespeople must sell themselves to their customers. In most cases, the services provided by the salesperson are as important as the product itself. Facilities management organizations can learn important lessons from the world of sales.

While we in facilities management organizations do not sell a product, per se, we do provide a service and in many cases we literally "sell" this service to our customers as chargeback work. Irrespective of whether or not customers pay for our services, we must, in effect, sell ourselves as individuals and as a service department in order to earn their respect, trust, confidence, and approval for the services provided.

Here's how to be successful in this area:

- ***Be the customer's consultant.*** Many of our customers have a vague idea

of what they want, but need guidance in getting the desired result. In this instance we must provide professional assistance to guide their decisions. We must function as a consultant. The key to successful consulting is fact-finding. Ask questions, listen, and survey for information as needed.
- ***Have a high level of enthusiasm.*** Experts in the art of salesmanship agree that at least half of all successes in business, art, science, or politics can be attributed to enthusiasm. In fact, Ralph Waldo Emerson said, "Nothing great was ever achieved without enthusiasm." Facilities management departments must be organized and structured to meet customer needs. Employees within the facilities management organization must themselves be "sold" on the organization and its ability to meet customer requests. Not only that, but staff should be empowered within established guidelines to meet those needs. Employees who are enthusiastic about solving customer problems and concerns and making the customer's work-a-day lives better are those who are most successful.
- ***Be extraordinarily organized.*** Humans are drawn to order. Customers, in particular, are more comfortable if work is done in an orderly and organized manner. In fact, they expect it to be done that way. For departments and individuals, the more organized you are, the more you are trusted. You don't need to tell people you're organized, they will know. Be on time. Workers should have everything they need when they arrive on the job site. One should never "wing it" on a service visit, since the customer's time is much too valuable for that. Always plan ahead and be prepared.
- ***Build a bond.*** Most people would rather do business with someone like themselves. However, no mater what a person's background or job, they can always find things in common with the customer. Be friendly. Be sincere and comment on shared interests. As Dale Carnegie said, "You can make more friends in two months by becoming interested in other people than you can in two years by trying to get other people interested in you."
- ***Focus on the customer.*** In the marketplace we buy from people who demonstrate that they care about us. Our customers not only want and need our services, they also want to know we care. It has been said that

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.

"people don't care how much you know until they know how much you care." Start with little things such as using the customer's name (pronounced correctly of course). Take notes of what they say or request. Show interest in what they have to offer. Working from an understanding of the customer's point of view helps both you and the customer to become a problem-solving team. Take full responsibility to solve their problems or meet their needs.

- *Provide your expertise.* Expertise is proven by action, not words. Emerson said, "What you do speaks so loudly, I cannot hear what you say." Don't tell them how good you are—show them. Be ready to provide your expertise. Experts are confident, even when facing a problem for the first time. You don't need to be an authority in all areas, but you must discover problems and recognize needs in order to provide good solutions.
- *Build trust.* Experts in human relations maintain that the mental impression you make on a new acquaintance in the first two seconds is so vivid, it takes another four minutes to add 50 percent more to the initial impression. Before you reach out your hand or open your mouth your customer's subconscious mind is processing years of imbedded information to determine if you can be trusted. Make sure the first "clues" say, "*This person is trustworthy.*" Trust is absolute confidence in the honesty, reliability, and integrity of another person. Trust is hard to gain, easy to lose, and critical to your success.

Facilities management organizations and staff who follow these suggestions will not only find that relationships with customers will be at the highest levels, but staff will also find more satisfaction in their jobs.

Outsourcing: It's Not Just about MONEY Anymore

by Cheryl Keown

As an architect who specializes in design, planning, and programming for academic institutions, I have daily contact with facilities managers and business officers from North America's colleges and universities. One of their main concerns is outsourcing. Whether it is operations and maintenance or planning and construction, outsourcing is growing in popularity. At the same time, it can be a contentious issue for facilities professionals, business officers, and the campus community at large.

In an effort to learn more about the issue and to understand the driving forces behind this phenomenon, I collaborated with APPA and the National Association of College and University Business Officers (NACUBO) to survey their members about their respective outsourcing needs.

The results of the survey confirm our initial hypothesis: the trend to outsource traditionally in-house services continues to grow. We were surprised, however, to find that the levels of outsourcing were virtually identical in public and private institutions, small and large colleges, and those in different geographical areas. Outsourcing is increasing almost evenly across the board.

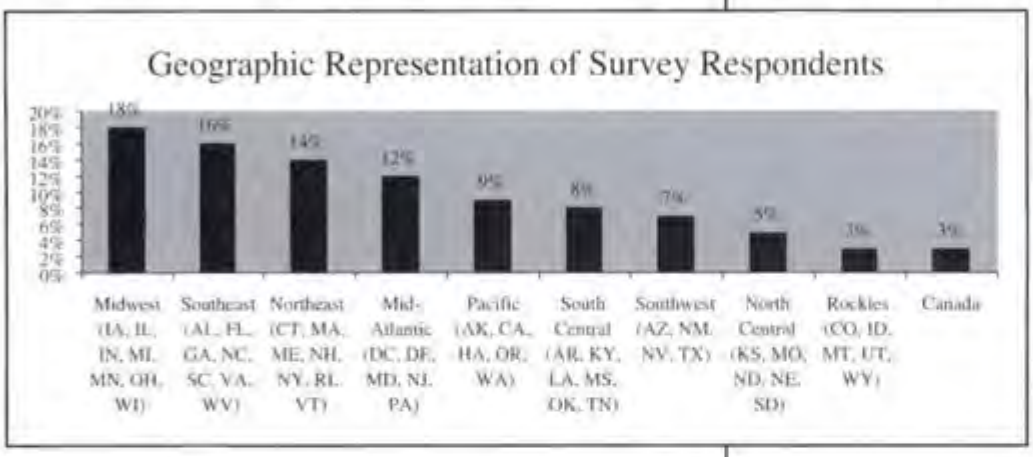
Another surprise was to find that colleges and universities are not outsourcing as a means to reduce costs, but rather due to the expansion of existing facilities and the need for specialized skills that in-house employees increasingly lack as technology continues to advance. There was a consensus on this among business officers and facilities managers, yet a certain amount of historic animosity continues to exist between the two. Perhaps this conflict originated from the economic downturn in the late 1980s and early 1990s when outsourcing was used as a cost-saving measure and facilities managers were forced to reduce their in-house staff. I hope the results of this survey help the two sides to realize that there is now a consensus among them.

The content of the survey questionnaire was developed by The Design Partnership of Cambridge, Inc. (TDPC) in consultation with Lander Medlin, executive vice president of APPA and Larry Goldstein, senior vice president for accounting, finance and institutional management at NACUBO. Matt Adams, a consultant to APPA who is authoring a book on the topic, *Outsourcing's Role in Facility Management*, was also instrumental in the development of the questionnaire wording and the content of this article. The questionnaire was critiqued by facilities managers from large and small, public

Cheryl Keown is a principal of The Design Partnership of Cambridge, an architectural design firm also providing master planning, programming, educational technology, and interior design services. TDPC is located in Boston, Massachusetts; Keown can be reached at ckeown@tdpc.com.
This article presents the results of a comprehensive survey of higher education facilities managers and business officers conducted by TDPC in alliance with APPA and the National Association of College and University Business Officers (NACUBO).

and private academic institutions including Philip Cox at Cornell University, John Dempsey at the University of Illinois, Lee Nason at the University of Massachusetts Boston, Gary Reed at Eastern Illinois University, and Norman Ricker at Haverford College. Victoria Ford, public relations coordinator with TDPC, analyzed the survey's data.

The survey questionnaire was distributed to NACUBO and APPA institutional members by e-mail and fax. Members also received a postcard that encouraged them to respond to the survey via its website. Responses to the survey were received by TDPC by e-mail, through the website, fax, and U.S. mail.



Indicating that facilities managers and business officers are wired, 82 percent of the respondents submitted their answers through the website while 13 percent sent them by e-mail. The remaining 5 percent arrived by fax or U.S. mail.

Profile of Survey Respondents

The approximately 400 survey respondents represented the midwest United States and Canada. The areas with the largest share of respondents were the Midwest, Southeast, Northeast, and Mid Atlantic, accounting for 18, 16, 14, and 12 percent of all respondents, respectively.

Of the respondents, 56 percent were from public institutions while 46 percent represented private colleges or universities. Smaller schools, those with less than 2,000 full-time undergraduates, represent the largest share of respondents and those with the most students, 20,000 or more, represent the least. Institutions that tend to have smaller enrollments, liberal arts colleges and 2-year colleges, combined to represent 42 percent of those surveyed. Another 26 percent of our respondents were from a comprehensive college or university and 21 percent were from research or doctorate-granting universities. The remaining 11 percent indicated that they represented professional, specialized, combination, or another type of institution.

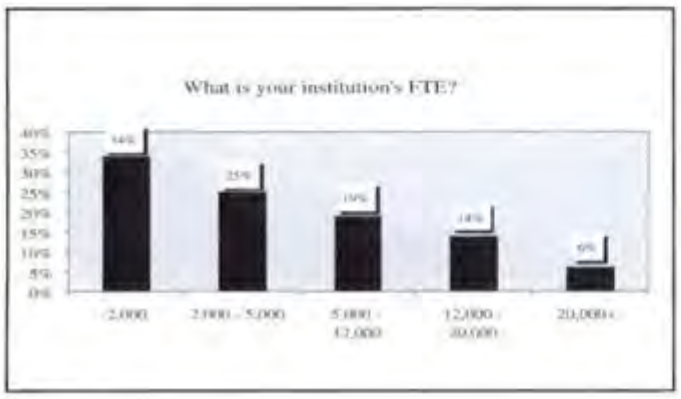
The average size of the campuses surveyed was 486 acres with 2.5 million gross square feet of facilities. The average annual planning and construction budget was $8.7 million. Of the two hundred thirty-five institutions whose respondents shared their average annual planning and construction budgets, the combined totals represent $2 billion in yearly planning and construction costs. The operations and maintenance costs averaged about $6.9 million annually with a combined total more than $1.7 billion. These figures are expected to increase as the majority of institutions continue to renovate and expand their campuses.

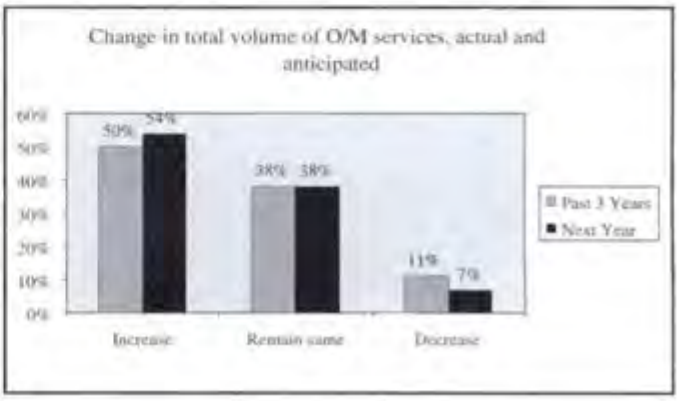
Of the respondents themselves, 71 percent were facilities managers, involved in plant operations or planning and construction while 29 percent were in the finance and administration department. Sixty-eight percent of those surveyed keep a comprehensive inventory and assessment of their facilities.

Several participants included insightful comments and elaborated on their answers with statistics, reasoning, and qualifications. From these carefully crafted responses, we believe that this survey is a true representation of outsourcing trends in higher education as we head into the new millenium.

Overview of Operations and Maintenance Outsourcing

The level of operations and maintenance (O/M) services purchased by colleges and universities has increased over the last three years and is expected to continue growing during





the next year. Several factors contribute to this trend. Among them are the high-tech components used in new and upgraded facilities. With the continual advancement and digitization of mechanical and electrical systems for everything from heating and cooling units to computer networking and media classrooms, facilities managers are being forced to rely more heavily on the expertise of outside vendors to maintain their campus' systems.

Contrary to prevailing opinion and past trends in the industry, the survey suggests that the increase in outsourcing is not primarily motivated by business officers trying to cut costs. Only eleven percent of all respondents rated it the number one reason for increasing the level of purchased O/M services while four times as many respondents indicate that a shortage of trained staff and the need for specialized services are the main reasons for outsourcing. In fact, of the business officers who were surveyed, only 14 percent rated cost savings as a primary contributor to outsourcing, ranking it fourth behind an increase in facilities, access to specialized services, and a shortage of trained staff.

Conversely, for those seven percent of respondents who expect the total volume of O/M services purchased to decrease next year, their number one reason for doing so was cost savings—they can accomplish the task for less using in house forces. This is conversely related to the causes of outsourcing's growth. Other important factors for those who are decreasing their outsourcing include poor contractor performance, lack of discretionary funds, and shortage of qualified or local service providers.

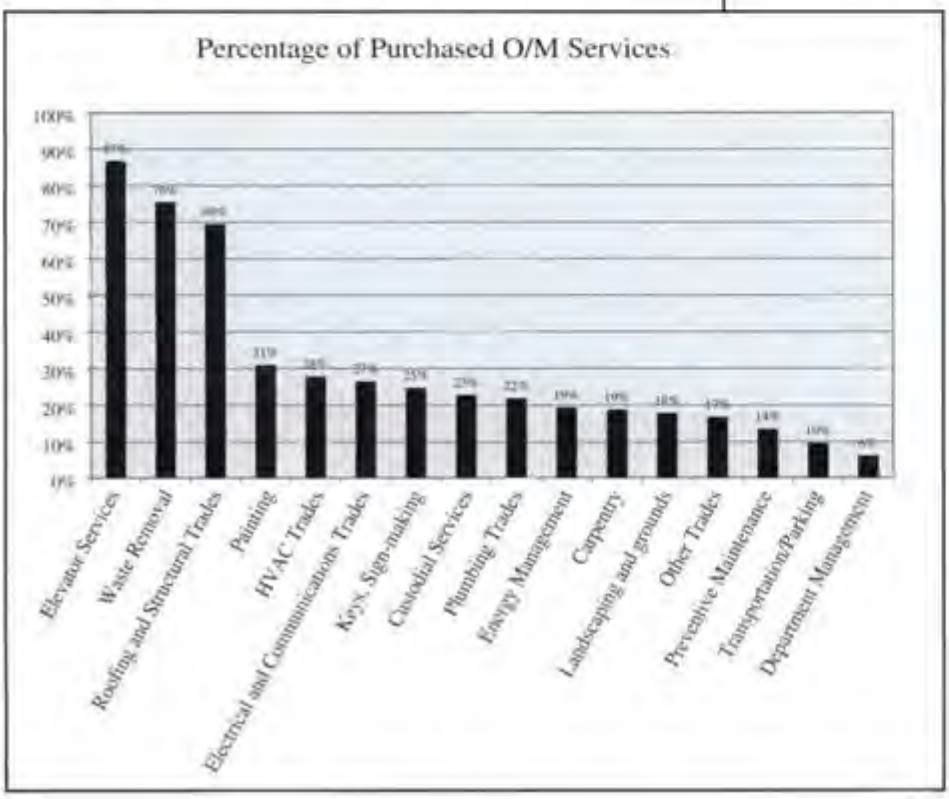
A few institutions have indicated that they are attempting to rectify their shortage of trained staff by either sending in-house employees for training, hiring specially-trained technicians or both. However, these attempts do not seem able to keep pace with the increasing amount of facilities to maintain and the ever-changing technology used to run them.

Of the technical O/M services, elevator maintenance and roofing (and its associated structural trades) are the most heavily outsourced at 87 and 69 percent of volume, respectively. Contributing factors include liability and warranty issues for both elevator and roofing services as they often require the use of licensed professionals and/or the use of the vendor who installed the equipment to complete repairs and maintenance. In addition to new roof systems, which require specialized expertise and equipment to install, major roof repairs or upgrades can require the building to be brought into structural compliance with new state seismic codes that also require outside expertise.

For the other services that have witnessed significant technological advancement in the past three to five years, such as life safety and HVAC systems, none are currently outsourced more than 35 percent of the time. However, a closer look at the survey data demonstrates an increasing trend toward outsourcing in these areas. Fifty percent of institutions surveyed say these services are being outsourced more now than they were just three years ago and 54 percent expect the volume of services purchased to grow in the next year.

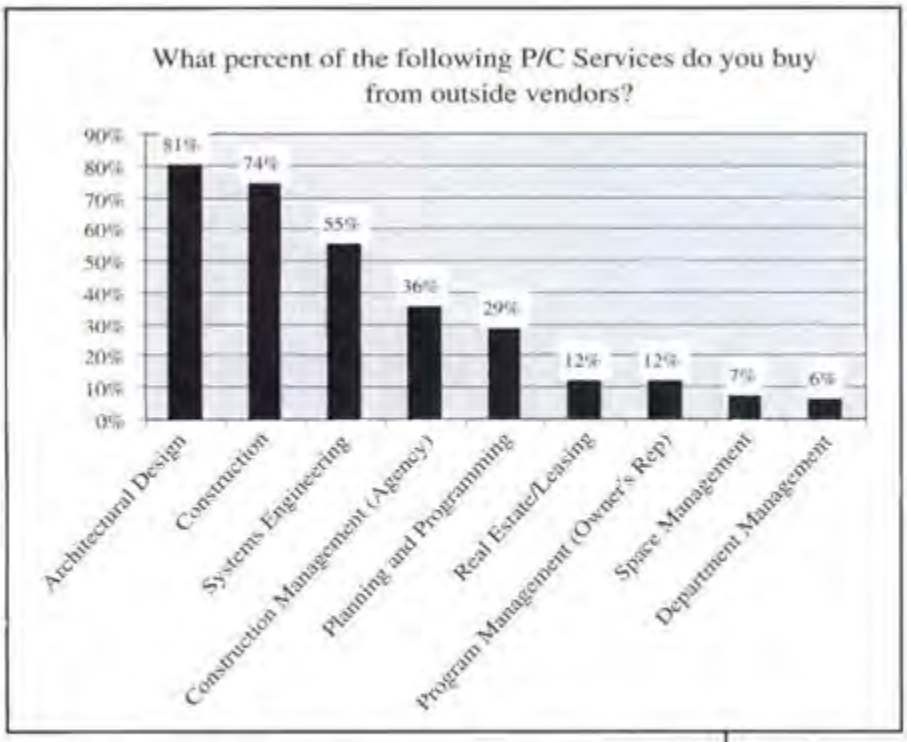
For the non-technical or less technical services, reasons for increases in outsourcing, in order of importance, include the expansion of facilities, cost savings, the ability of outside vendors to provide more effective services, and an irregular demand for the service. However, even such traditionally non-technical services such as landscaping and grounds, keymaking and locks, and plumbing are experiencing the effects of modernization.

Colleges and universities are increasingly using electronic entry devices for such areas as dormitories and laboratories; installing automatic flush valve toilettes and electronic sink faucets; and landscaping and grounds often require expertise for sprinkler systems and environmental consultants for fertilizer use and general landscaping issues due to environmental regulations. For smaller or urban campuses with less ground to maintain, the service contracts offered by landscape contractors can be an attractive option.



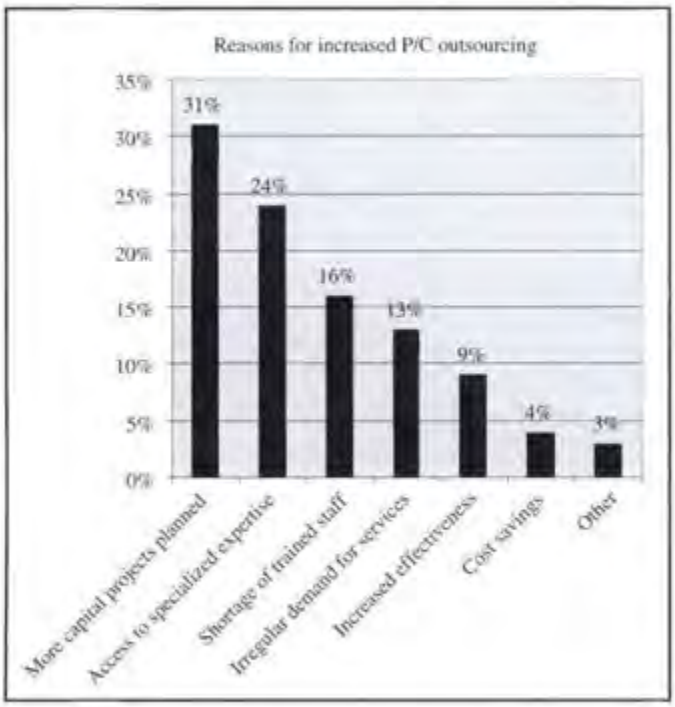
Overview of Planning and Construction Outsourcing

The verdict is in, colleges and universities are building and renovating more today and expect to continue this trend into at least the next year. A growing campus is the single most influential factor when



institutions consider purchasing planning and construction services (P/C). The most commonly purchased services are architecture, construction, and systems engineering, at 81 percent, 74 percent, and 55 percent of volume, respectively.

Once again, cost savings barely registers when colleges and universities consider outsourcing their planning and construction services. In fact, it came in last in our survey, even among the business officers. Other reasons for outsourcing planning and construction services include access to specialized services, shortage of trained staff, and irregular demand for these services.



Colleges and universities need additional staff to pull-off some of the fastest-tracked construction in the industry. In order to avoid losing vital space when schools are in session, the majority of construction projects take place while students are on breaks or away for the summer. These are short windows of time that require a maximum effort if a project is to be completed on time. Independent architects, engineers, and contractors can better realize these goals for the institution.

Construction management and planning and programming are outsourced approximately one third of the time while real estate and leasing, space management, program management, and departmental management account for less than 15 percent of the total volume purchased. While most of these services have a history of being handled in-house, more institutions are experimenting with outsourcing such services as property and departmental management.

A small women's college in the Midwest has found that outsourcing its facilities management has added value as the vendor has greater expertise and resources on which to rely. On the other end of the scale, the University of Pennsylvania, a co-ed campus with more than 20,000 students, outsourced the maintenance of all its facilities to a property management company.

Several respondents commented that planning and construction outsourcing was increasing due to a renewed effort to remedy deferred maintenance issues. In an effort to maintain a strong in-house force for operations and maintenance services, some assign their tradespeople exclusively to deferred maintenance projects and outsource for planning and construction needs. Others need to provide their local zoning boards with documentation and plans from architects even on smaller projects that they typically would have handled in-house without complete drawings.

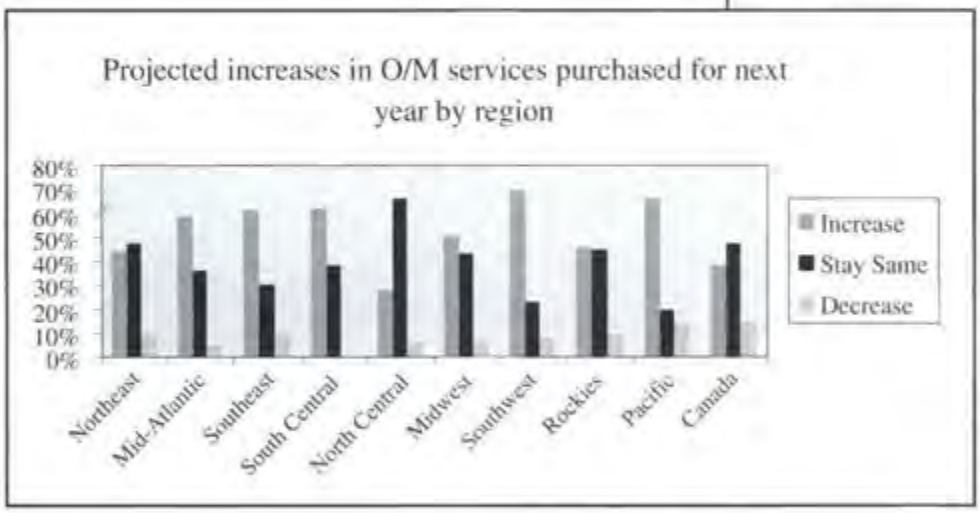
Analysis by Region, Type, Size, and Role for O/M Services Outsourcing

Breaking the survey data down by region, type (public or private institution), size, undergraduate enrollment, and the role of the respondent (facilities manager, business officer, or plant operator) revealed that all institutions are increasing their outsourcing for mostly the same reasons.

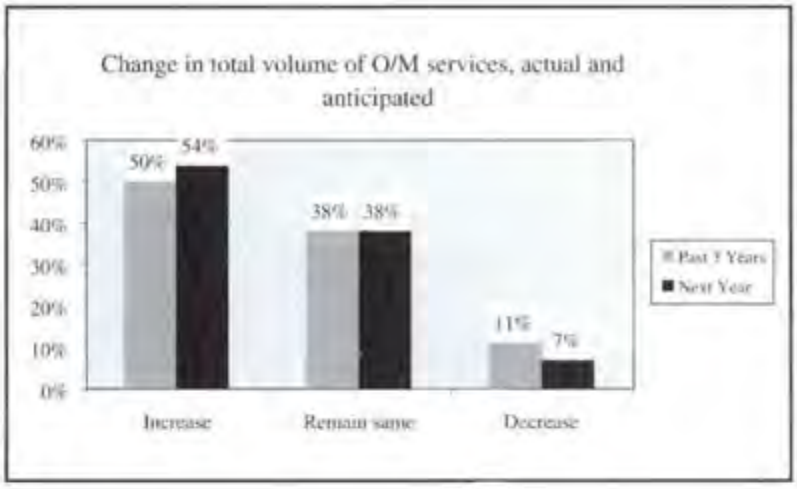
In nine out of ten regions of the United States, institutions of higher education are increasing the outsourcing of operations and maintenance services. The Pacific region has seen the broadest increase in the past three years (62 percent) and about the same number of institutions (66 percent) expect to continue increasing purchased O/M services next year. The Northeast differs from this pattern as a majority of schools

(52 percent) have seen the level of outsourcing remain the same during the past three years and 47 percent expect no change in the coming year. For Canadian institutions, only 31 percent have experienced a growth in O/M outsourcing and another 46 percent have seen no change in three years. Almost a quarter of all Canadian institutions have experienced a decrease in outsourcing during the past three years.

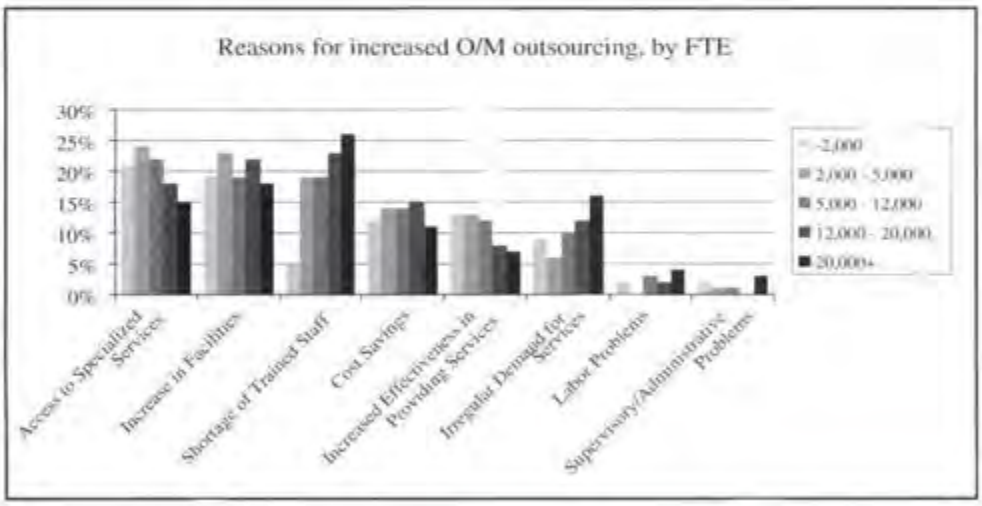
The primary reasons that colleges and universities in the various regions are increasing purchased O/M services are the need for specialized services, an increase in facility size, and a shortage of trained staff. Only the Mid Atlantic states placed any significant importance on cost savings while the second most popular reason from the Northeast is increased effectiveness in providing services.



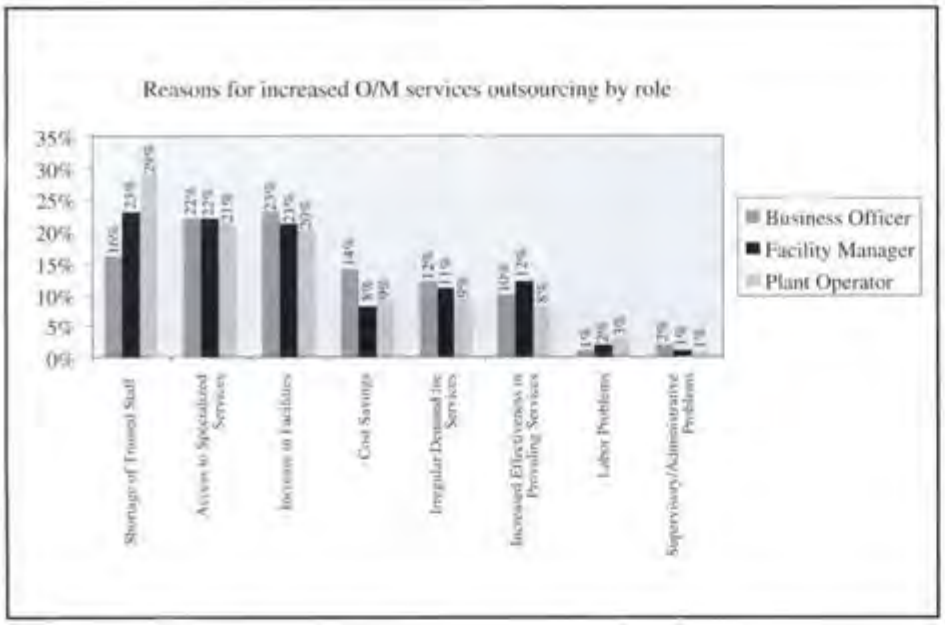
Public and private institutions are experiencing an increase in outsourcing O/M services at the same rates. In the last three years, 52 percent of public and 51 percent of private institutions have seen an increase in purchased services. Eleven percent of each has seen a decrease, and the remaining 37 and 38 percent have experienced neither an increase nor a decrease. Fifty-eight percent of public institutions expect to see the volume of outsourced O/M services to increase in the next year, while 52 percent of private institutions make the same prediction.

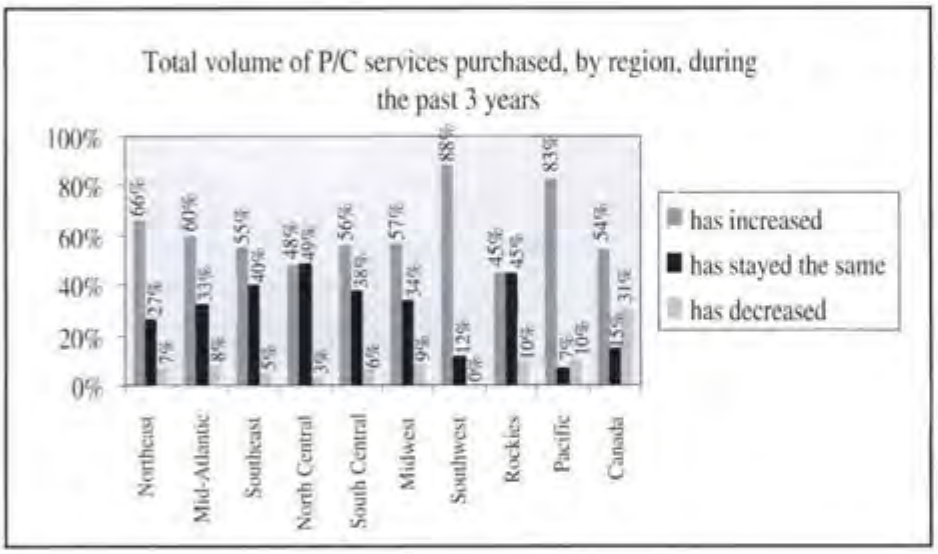


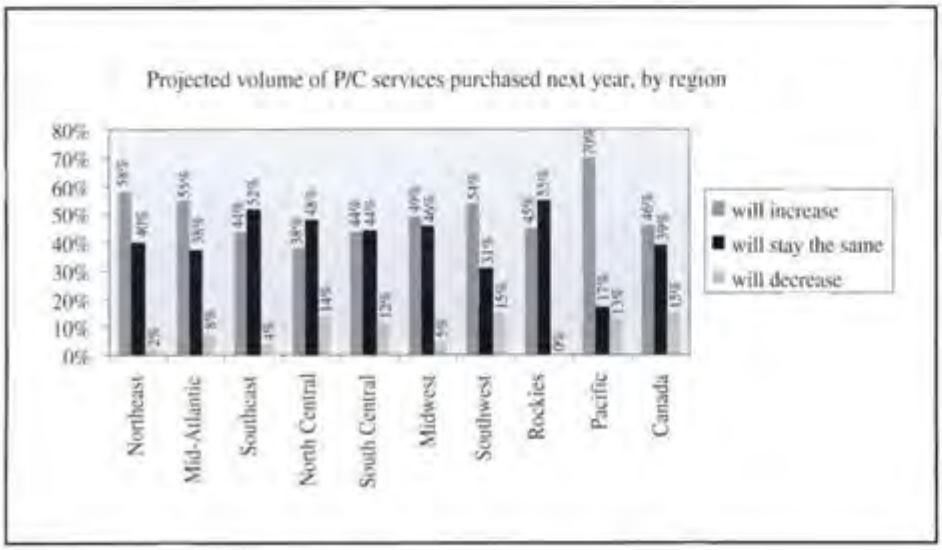
When looking at the survey results by size, according to the institution's full-time undergraduate enrollment, what stands out is that for every category an increase in facility size is the second-leading cause for the increase in outsourcing of O/M services. Colleges and universities with less than 12,000 undergraduates cite access to specialized services as the number one reason to outsource while institutions with more than 12,000 undergrads cite a shortage of trained in-house staff as their number one reason. Access to specialized services was third among the large institutions while the small and mid-sized schools were split on their third-leading cause between better service from vendors, shortage of trained in-house staff, and cost savings.



While there has been some division (perceived or otherwise) between facilities managers and business officers over the merits of outsourcing, our survey indicates that both groups are on the same page whether they know it or not. When asked why outsourcing of operations and maintenance services is on the rise at their institution, 23 percent of business officers cited more facilities and 22 percent access to specialized services. Twenty-one percent of facilities managers cited the increase in facility size and 22 percent access to specialized services with 23 percent noting a shortage of trained in-house staff. Only 14 percent of all







business officers felt that cost savings was a significant reason for outsourcing O/M services.

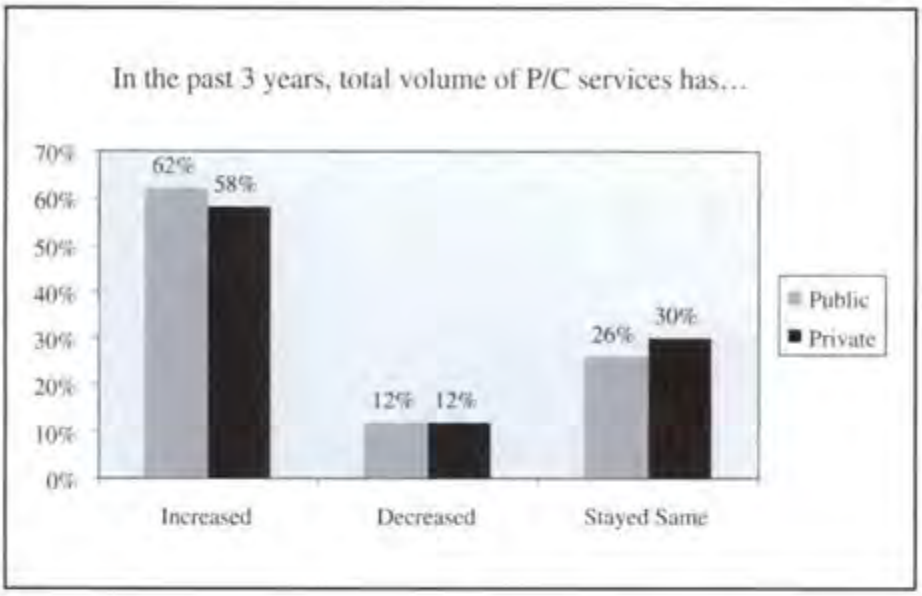
Analysis by Region, Type, Size, and Role for P/C Services Outsourcing

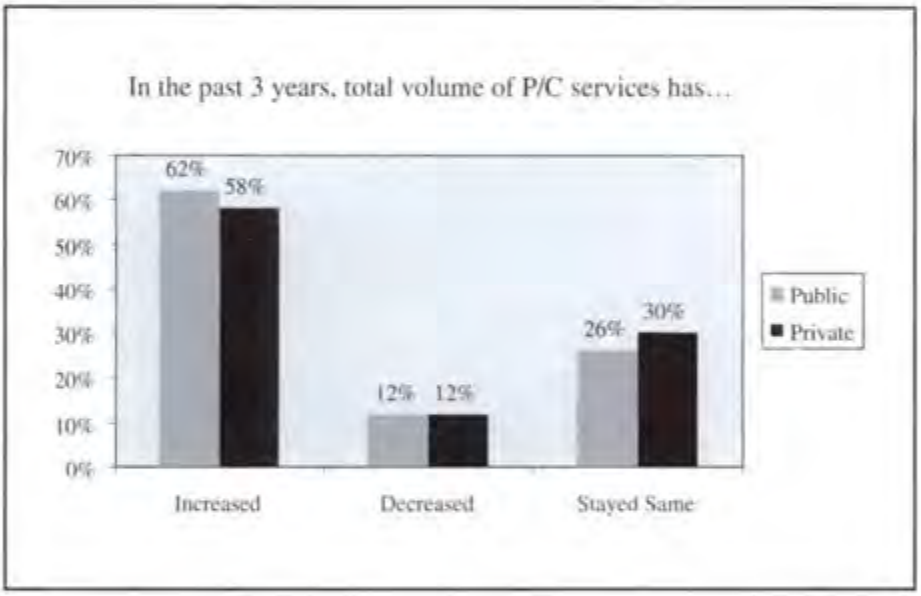
The total volume of purchased planning and construction services is growing in all regions of the United States and Canada. Only Canadian institutions have experienced a decrease of more than 10 percent in purchased P/C services during the last three years. Of the 31 percent of Canadian institutions that experienced a decrease, the most commonly cited reason was the lack of funds and even the freezing of capital outlays from provincial governments. Still, 54 percent of Canadian institutions have seen an increase in planning and construction purchasing during the last three years. None of the regions had more than 15 percent of institutions predicting a decrease in the outsourcing of P/C services in the next year.

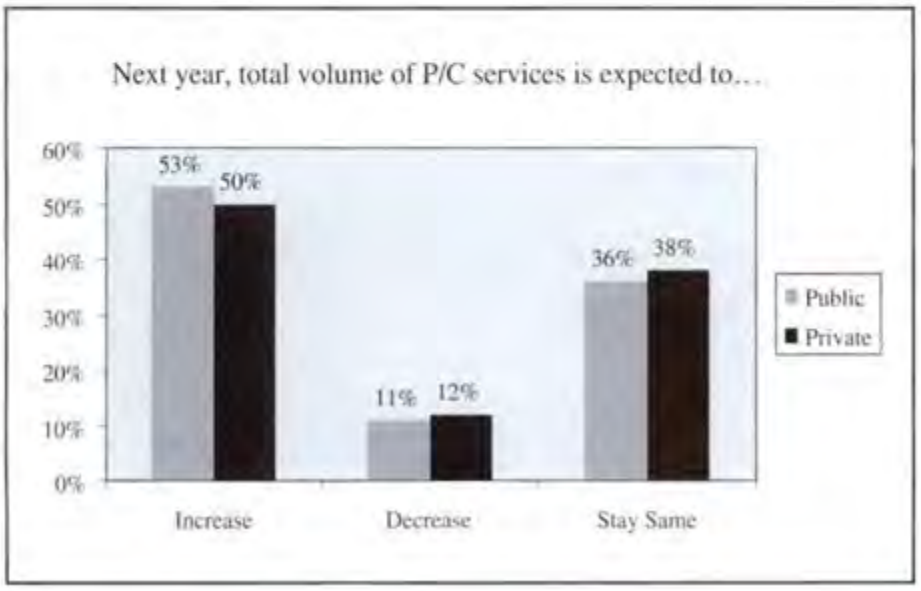
All regions cite the increase of projects as the number one reason to expand the purchase of P/C services. The second most commonly cited reason was access to specialized services followed by shortage of trained staff and irregular demand for services. Seven out of the 10 regions expect their outsourcing of P/C services to increase next year while the other three expect it to remain at current levels.

Both public and private institutions have experienced an increase in the purchasing of P/C services in the past three years at virtually the same levels with 62 percent of public and 58 percent of private institutions in this category. Only seven and nine percent of public and private institutions, respectively, expect their outsourcing to decrease next year while 53 and 50 percent expect their outsourcing to continue to increase.

When looking at the data by college size, the majority in all five categories experienced an increase in the outsourcing of P/C services and expects that increase to continue into next year. The schools in the largest two categories, those with full-time undergraduate enrollments of 12,000-20,000 and 20,000 or more, have







witnessed the largest increases at 78 and 71 percent, respectively. These numbers repeat when asked if the total volume of P/C services purchased will increase or decrease in the coming year. Sixty-seven percent of the 20,000-plus-student institutions and 63 percent of the 12,000-20,000-student institutions say outsourcing will increase next year compared to 48 percent of those with 5,000-12,000 and 2,000-5,000 students and 49 percent of those with less than 2,000 students.

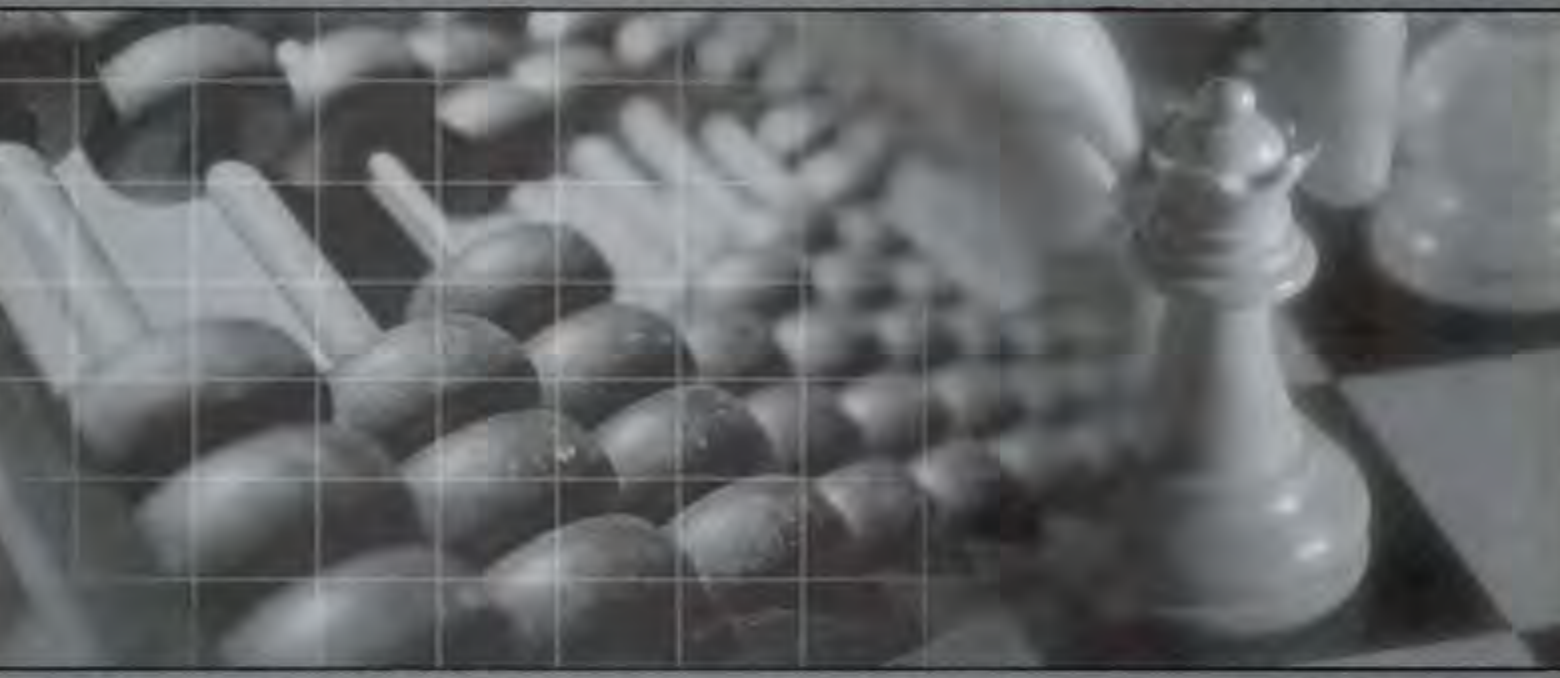
All size institutions report that the single most influencing factor in this increase is the growth in the number of projects on their respective campuses. The second most cited reason is access to specialized services followed by a shortage of trained staff.

Whether the respondent was a business officer or involved with facilities management, the reasons given for increases in purchased P/C services were the same. Fifty-two percent of business officers and 41 percent of facilities managers say the number one reason to outsource is to keep up with the increasing size of the facilities. The second most common reason is access to specialized services and the third is a shortage of trained staff. Only three percent of business officers and two percent of facilities officers cited cost savings as a significant reason to outsource P/C services.

Conclusion

Outsourcing is a major part of facilities management and administrative services at institutions of higher education and it will continue to be in the future. The main impetus of its prevalence has evolved from being cost-based to service-based, seeking ample technical expertise as campuses in an era of expansion and technology. Campus size, public or private control, and geographic location have little effect on this trend. The majority of all schools are experiencing the same issues of growth, technology, quality of service, and the ever-present budget. And, as the results of this survey demonstrate, facilities managers and business officers are making similar decisions about how and why use outsourcing as another tool in maintaining and expanding their facilities.

Ensuring Accountability



With APPA's Strategic Assessment Model

by Maggie Kinnaman

Webster's defines accountability as the act of being responsible for your actions and able to explain those actions to another party. Remember the good old days when your word was all it took to convince the campus that your physical plant was both efficient and effective? Today we are asked to be accountable—to convince our stakeholders that we are good stewards of the scarce resources entrusted to us.

In order to do this, and to do so in a compelling way, we must first understand our customer base and the way in which they make decisions. Higher education is heavily involved in research, and research is dependent upon data. In order to communicate effectively within this environment, we need to come to the table with more than just our perception of service. That perception needs to be grounded in comparative data—either our performance over time or our performance in relation to the performance of others.

Another dilemma faced by facilities professionals is confusion over what to measure and then how to collect comparative data from our peers. Perhaps APPA's evolving Strategic Assessment Model (SAM) presents a solution. Let me share with you how this tool is evolving and how it can be used within your environment to tell your story to your campus stakeholders.

Maggie Kinnaman is director of business administration and support services for the Office of Facilities Management at the University of Maryland/Baltimore. She is APPA's current President and also serves as chair of the Strategic Assessment Model Task Force. She can be reached at mkinnama@fm.umaryland.edu.

Task Force Charge

In early 1999, the APPA Board of Directors established a task force to breathe new life into APPA's Strategic Assessment Model. The charge was articulated as establishing an inventory of reliable and meaningful performance indicators that would greatly increase the credibility of the facilities management professional, who provides stewardship over his or her institution's greatest and most costly resource.

What Sam Is and Is Not

The SAM Task Force first met in May 1999 and tackled the hard question right up front: "Just what are we trying to achieve by developing the Strategic Assessment Model, and how do we envision our members using this tool?" After much deliberation we came to rest on the following:

- The SAM Model utilizes data to create performance indicators that are indicative of overall organizational effectiveness
- Participating institutions complete a survey whose results are captured and displayed within the model
- The display allows institutions to compare their performance against the performance of others
- An organization can utilize the information to initiate a benchmarking process
- Or they can utilize the model for self improvement
- Or they can even initiate a process of peer comparison

It is our hope that any of these endeavors may lead to more effective organizational performance which in turn could lead to added value for an institution. It is important to note that after much discussion, the task force members agreed that the SAM model is a collection of performance indicators for the facilities profession that could be used to drive more effective organizational performance. SAM specifically is not an example of the process of benchmarking.

SAM and the Comparative Costs and Staffing Report

Some may ask how the Strategic Assessment Model differs from APPA's Comparative Costs and Staffing Report for Educational Facilities. Aren't we duplicating efforts? The SAM Task Force sees CCAS as an effort to collect data that is primarily operational in nature. Users can pick and chose which elements are important to them for comparison purposes. SAM, on the other hand, is a strategic tool that looks at specific performance indicators that are indicative of overall organizational effectiveness within the facilities profession and brings them together in a model that captures the performance of a number of institutions.

Why is SAM Important?

We think SAM provides facilities professionals with a tool that helps to get the attention of and bridge the communication gap that often exists between the facilities manager and our campus decision makers. The model helps to tell the facilities story in the language of business by collecting data in such a way that an institution can see at a glance how their facilities performance fares with the performance of others within the profession.

What Has Happened with SAM to Date?

The current model and the story of what has been achieved to date can be read in the recently released handbook, *The Strategic Assessment Model*. The book is filled with valuable information, and I encourage you to take a look. [Ed. Note: see sidebar for contents and ordering information.] The 1997 SAM survey results were forwarded to the original 100-plus survey participants. The consultant, Constructive Concepts, Inc., indicated that after data scrubbing, our survey results were quite solid. In their opinion, and based upon their broad knowledge of benchmarking and assessment, SAM is one of the best performance measurement tools in the industry.

What we have learned from our first survey results is that we still have work to do. We need to ensure we have the appropriate performance indicators that are truly indicative of our profession's overall organizational effectiveness. We need to ensure that our definitions are clearly presented so that folks understand what they are collecting. And we need to survey every other year and get the results out to our members in a timely fashion. With our new business partner, Constructive Concepts, Inc., we're confident that this is possible.

The Strategic Assessment Model

Contents

softcover, 177 pages, Item #A728

$60 APPA member institutions; $80 others

To order or for more information, visit http://www.appa.org/resources/publications or call 703-684-1446 ext. 235.

What Still Needs to Be Done

What we see in the crystal ball of SAM's future is a great deal of activity and attention. First, we've talked about the new handbook. Second is the establishment of the new SAM Task Force. We've heard from our members over the years that SAM is an important project, and the APPA Board has responded by showing a level of intense support so that we can firmly establish SAM as a valuable APPA resource.

Next, we need to integrate this model into the fabric of the facilities management profession by creating a cycle for conducting a survey and sharing the resultant information with our members. Finally, we need to identify a strategy for capturing and sharing case studies that describe how others have effectively utilized the model to add value to their operations and in turn to their institutions.

Project Success Defined

So one may ask, "How will you measure success for this project?" The task force sees three major indicators of success. First, when we're able to collect ranges of performance for the

facilities profession through use of the model's performance indicators, we will have experienced success. Likewise, when SAM becomes a critical and credible tool that can track facilities effectiveness over time, success will be ours. And finally, we can consider our efforts a success when we provide our members with a collection of performance indicators that can serve as a platform for initiating a process of benchmarking.

Task Force Approach

I'd like to take a moment to share with you the detailed thought process that is being used by the task force in approaching this project. Remember our charge, to establish an inventory of reliable and meaningful performance indicators that would greatly increase the credibility of the facilities management professional, while providing stewardship over his or her institution's greatest and most costly resource.

In order to achieve the charge and capture ranges of performance for the facilities profession, the task force felt that we must review SAM's current structure as well as its content.

To do that we needed to review the column headings and use of the balanced scorecard concept.

We then reviewed the use of levels of effectiveness and decided that these were best suited to the qualitative description of organization effectiveness. Next we wanted to make sure that we have the right performance indicators. To accomplish this we decided to review each of the profession's four core competencies: General Administration; Operations and Maintenance; Energy and Utilities; and Planning, Design, and Construction. And finally, we need to ensure that our definitions are clear and easily understood by our members.

Task Force Accomplishments

First, the SAM Task Force has been able to review and validate the use of the Kaplan-Norton Balanced Scorecard Model for SAM's column headings. They are still appropriate. The Kaplan-Norton Balanced Scorecard Model suggests that organizational effectiveness can best be determined by connecting financial indicators of past performance with drivers of future performance. These drivers include internal business processes, organizational strategy, innovation and learning, and customer satisfaction. The model strives to give a well-rounded picture of an organization by utilizing both quantitative as well as qualitative performance indicators.

Strategic performance indicators have been identified under each of the four column headings that address each of APPA's four core competencies.

- Financial Perspective

REMEMBERING WILLIAM S. ROSE

As the current Strategic Assessment Model Task Force continues its work, the members would like to remember a fellow task force member, Bill Rose, vice chancellor for administrative services at the University of Alaska/Anchorage. We were saddened to hear that Bill and his friend April Relyea were killed in a tragic small floatplane accident while on vacation in Alaska on August 5, 1999.

Bill had been a part of the SAM project from its infancy over four years ago and was the author of the financial performance indicators. As we review the model today, it is these indicators that have stood the test of time and will be included, with minor changes, in the next evolution of SAM. Bill's insight, input, humor, and commitment to this project was significant, and his contribution will be a measure for many generations of facilities professionals to come. With Bill's death, the SAM Task Force has lost a major contributor, and the APPA organization has lost a loyal friend. He will be greatly missed.

–MK

- Internal Processes Perspective
- Innovation and Learning Perspective
- Customer Perspective

The Strategic Assessment Model will consist of two components, a data collection piece and a self-assessment tool that will allow our members to self rate using a qualitative scale, rating organizational effectiveness 1 through 5. We believe that by using the combination of trending quantitative performance indicators and the qualitative criteria for determining levels of organizational effectiveness, SAM has truly become a strategic tool. SAM can help you determine your current level of organizational effectiveness, recognize what is required to move to the next level, and develop strategies and action plans for improving in each of the scorecard perspectives. To review the current status of SAM, please visit http://www.appa.org/sam. We invite your comments and questions.

The following activities have been or will be accomplished this year:

- Introduce the new model during the 1999 regional meetings.
- Seek final Board approval during our February 2000 Board meeting.
- Conduct a new survey in the spring of 2000.
- Roll out the survey results during the APPA annual meeting in Fort Worth, Texas, July 16-18, 2000.

Finally, we will produce a workbook incorporating the new survey findings and sharing case studies from institutions who have successfully utilized SAM.

In Summation

We know this is an aggressive schedule, but we feel that any project that's important needs attention and focus in order to make it happen within a reasonable time frame. As chair of this task force, I am confident that our milestones will be met given the commitment of the APPA Board and the support and commitment of our fine task force members. I'm confident that in July of next year, we'll be standing in front of you sharing the results of our new survey.

Success Redefined

I'd like to digress for a moment and refer back to the indicators that will help us know when this project is a success. We said that success would be achieved when SAM became an integral part of the fabric of our association, when we were able to deliver a credible tool for our profession, and when SAM became part of our member services. I'd like to add a fourth—when SAM is integrated with other APPA programs.

Gazing into the future, it is easy and logical to see an opportunity for SAM to be incorporated into APPA's Award for Excellence, as well as the Facilities Management Evaluation Program. True success for the Strategic Assessment Model will only be achieved when we can weave the SAM thread throughout all parts of the fabric of our facilities profession and our association programs.

PREPARING FOR AN ACCREDITATION REVIEW

by John W. Greene

Large or small, private or public, 2-year or 4-year, residential or commuter, with or without graduate programs. One thing that virtually all institutions of higher education have in common is a process known as "accreditation." Often in the past, accreditation was primarily the concern of the academic side of the house. It still is today, as it should be, but administrative units such as the facilities department increasingly play a vital role in the process.

An Overview

What is accreditation? Accreditation is a voluntary process administered by non-governmental bodies through which educational institutions subject themselves to establish that the educational offerings of the institution meets quality assurance standards. It encourages improvement by an institution beyond minimum standards. In a rare twist, these private bodies accredit both private and public institutions.

Specifically, if an institution is accredited, it means that they have met some established level of criteria or standards. Generally these criteria are the same for all educational institutions, regardless of size or mission. In today's regulatory world, it seems quite amazing that the accreditation process is totally voluntary and is administered by non-governmental bodies. That process includes two basic types of accreditation: *institutional* and *program*. Both types are monitored by the Council on Higher Education Accreditation (CHEA); their website is www.chea.org.

For *institutional* accreditation in the United States, the accrediting bodies are six regional associations, each with their own set of criteria, standards, and procedures, yet all with the same mission: to help ensure the value of an education. These associations take their name from the general region of the United States in which they operate: Middle States, New England, North Central, Northwest, Southern and Western (see map). Many of these associations accredit institutions outside of the United States. Institutional accreditation looks at educational programs and support units of the whole institution. Virtually all institutions of higher education are institutionally accredited, though some may not be. Trade schools, bible colleges, schools of art, and other specialized schools may not be accredited by one of the six regional associations but may be accredited by a specialized accrediting body. Institutional accreditation is usually good for 10 years, though some accrediting bodies routinely require interim reports or reports for special concerns.

Program accreditation in generally conferred by national or international bodies, often associated with a professional organization. These bodies accredit a specific educational program or activity. Examples of educational disciplines that have program accreditation are medicine, engineering, teacher education, and business. For example, educational

---

John Greene is physical plant director at Trinity University, San Antonio, Texas. This article is adapted from recent presentations to CAPPA and APPA annual meetings.

programs in business are accredited by the American Assembly of Collegiate Schools of Business.

Assuring the quality of an institution or a program benefits many involved in the educational process:

- Parent and students
- Students transferring from another institution
- Government agencies that offer grants and other financial support
- Private donors to the institutions such as individuals, foundations, and trusts
- Employers of graduates

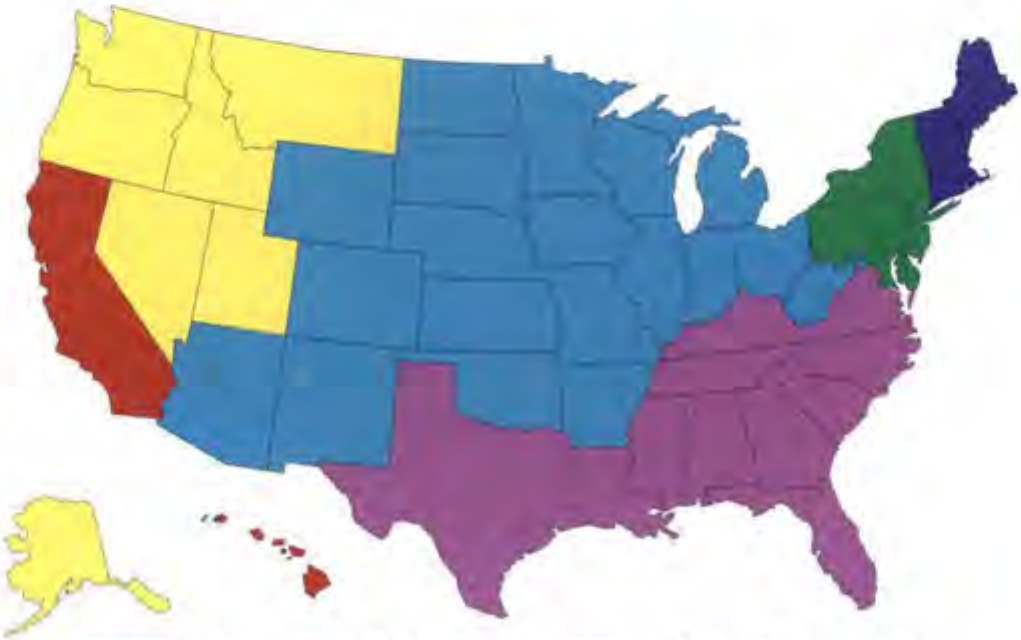
If a student wants to transfer from College A to College B, College B is much more likely to give that student credit for courses taken at College A if it (or its program) is accredited. The transferability of credits is totally up to the policies of the receiving institution.

Most U.S. government agencies require an institution be accredited to receive federal funds. In this way the agency can help assure the tax paying public that its funds are being well spent. One major federal program requiring institutional accreditation that most colleges and universities participate in is the federal work-study program. Such programs are a strong incentive for participation in the "voluntary" process of accreditation.

The Process

The focus in this article shall be on *institutional* accreditation. The process for program accreditation can be very similar, but obviously more program-specific. The process of accreditation relies largely on self-examination or, as it sometimes referred to by the accrediting bodies, a "self-study" and peer review. While each regional association has established its own procedures, many are similar. The North Central Association-Commission of Institutions of Higher Education describes its process in four steps:

- First, the institution undertakes a self-study aimed at examining how it meets the General Institutional Requirement (GIRs) and the criteria. The results of the self-examination are summarized in a Self-Study Report that forms the basis for the Commission's evaluation. The completed Self-Study Report constitutes the institution's formal application for initial or continued accreditation.
- Second, the institution is visited by a team of Consultant-Evaluators appointed by the Commission. This team gathers comprehensive information about the institution and summarizes its findings in a written Team Report. The Report assesses whether the institution satisfies the GIRs and the Criteria, offers advice and suggestions for improvement, and concludes with a formal recommendation for accreditation action. The institution has an opportunity to make a formal written response to the Team Report.
- Third, the Self-Study Report and the Team Report are reviewed by a Readers' Panel and/or by a Review Committee that meets with representatives of the institution and the team. If the review process results in suggested changes in the team recommendation, the institution and the team chair have an opportunity to respond in writing.



Western Association of Schools and Colleges

Northwest Association of Schools and Colleges

North Central Association of Colleges and Schools

Southern Association of Colleges and Schools

Middle States Association of Colleges and Schools

New England Association of Schools and Colleges

- Fourth, all recommendations are considered by the Commission, which takes official action on the institution's accreditation.

The North Central Association has established five basic criteria that each of its accredited institutions must meet.

1. The institution has clear and publicly stated purposes consistent with its mission and appropriate to an institution of higher education.
2. The institution has effectively organized the human, financial, and physical resources necessary to accomplish its purposes.
3. The institution is accomplishing its educational and other purposes.
4. The institution can continue to accomplish its purposes and strengthen its educational effectiveness.
5. The institution demonstrates integrity in its practices and relationships.

The Facilities Role

The facilities activity is a vital part of every institutional accreditation process. As with every other academic and administrative unit it will be expected to meet certain expectations, such as the preparation of a self-study of the facilities department itself. Does it have a mission statement that supports the institutions'? Does it have goals and objectives clearly identified? How is the progress toward the achievement of those goals and objectives measured? What progress is actually being achieved? Is the effort on-going?

The facilities department can also be involved in the accreditation process for any program accreditation. The facilities manager should be familiar with not only the requirements of institutional accreditation but should know which program at his or her institution have program accreditation and what the facilities-related criteria is for that accreditation. This is one of the ways that a facilities department can show its support for the educational mission of those programs.

Again using the North Central Association as an example, it provides a list of typical areas that area related to each of its five basic criteria for institutional accreditation. Some of those that the facilities/ physical plant activity has direct and/or indirect impact to are:

Criterion 1. The institution has clear and publicly stated purposes consistent with its mission and appropriate to an institution of higher education.

In determining appropriate patterns of evidence for this criterion, the Commission considers evidence such as:

- Long- and short-range institutional and educational goals.
- Processes, involving its constituencies, through which the institution evaluates its purposes.

Continued on page 27

Continued from page 25

Criterion 2. The institution has effectively organized the human, financial, and physical resources necessary to accomplish its purposes.

In determining appropriate patterns of evidence for this criterion, the Commission considers evidence such as:

- Effective administration through well-defined and understood organizational structures, policies, and procedures.
- Qualified and experienced administrative personnel who oversee institutional activities and exercise appropriate responsibility for them.
- Provision of services that afford all admitted students the opportunity to succeed.
- A physical plant that supports effective teaching and learning.
- Conscientious efforts to provide students with a safe and healthy environment.
- Management of financial resources to maximize the institution's capability to meet its purposes.

Criterion 3. The institution is accomplishing its educational and other purposes.

In determining appropriate patterns of evidence for this criterion, the Commission considers evidence such as:

- Staff and faculty service that contributes to the institution's effectiveness.
- If appropriate:
  - Evidence of support for the stated commitment to basic and applied research through provision of sufficient human, financial, and physical resources to produce effective research;
  - Evidence of support for the stated commitment to the fine and creative arts through provision of sufficient human, financial, and physical resources to produce creative endeavors and activities.

Criterion 4. The institution can continue to accomplish its purposes and strengthen its educational effectiveness.

In determining appropriate patterns of evidence for this criterion, the Commission considers evidence such as:

- A current resource base—financial, physical, and human—that positions the institution for the future.
- Decision-making processes with tested capability of responding effectively to anticipated and unanticipated challenges to the institution.
- Structured assessment processes that are continuous, that involve a variety of institutional constituencies, and that provide meaningful and useful information to the planning processes as well as to students, faculty, and administration.
- Plans as well as ongoing, effective planning processes necessary to the institution's continuance.
- Resources organized and allocated to support its plans for strengthening both the institution and its programs.

Criterion 5. The institution demonstrates integrity in its practices and relationships.

In determining appropriate patterns of evidence for this criterion, the Commission considers evidence such as:

- Student, faculty, and staff handbooks that describe various institutional relationships with those constituencies, including appropriate grievance procedures.
- Oversight processes for monitoring contractual arrangements with government, industry, and other organizations."

The Southern Association of Colleges and Schools also details requirements that are related to the facilities/physical plant activity:

Statements throughout the *Criteria for Accreditation* using the word "must" (or similar imperatives) are interpreted to mean that institutions are required to meet those specific criteria. The imperatives are indicated in bold. Statements with the word "should" are advisory and are not requirements.

3.2 Planning and Evaluation: Administrative and Educational Support Services

In additional to providing evidence of planning evaluation in its educational program, the institution **must** demonstrate planning and evaluation in its administrative and educational support services. For each administrative and educational support service unit the institution **must**

1. Establish a clearly defined purpose which supports the institution's purpose and goals
2. Formulate goals which support the purpose of each unit
3. Develop and implement procedures to evaluate the extent to which these goals are being achieved in each unit
4. Use the results of the evaluations to improve administrative and educational support services

Each unit, in its planning and evaluation processes should consider internal and external factors and should develop evaluation methods which will yield information useful to the planning processes of the unit.

6.4 Physical Resources

Physical resources, including buildings and equipment both on and off campus, **must** be adequate to serve the needs of the institution in relation to its stated purpose, programs and activities. The physical environment of the institution should contribute to an atmosphere for effective learning.

6.4.1 Space Management

Space allocated to any institutional function **must** be adequate for the effective conduct of that function.

6.4.2 Buildings, Grounds and Equipment Maintenance

An institution **must** have a plan for the upkeep of its property. At a minimum the plan **must** address routine, preventive and deferred maintenance of buildings, equipment, and grounds. Where appropriate, it should verify the estimated costs of maintenance as well as when and how it is to be performed. There should be a written schedule for regular maintenance activities and a written record of projects completed. The plan **must** be operational and evaluated annually.

6.4.3 Safety and Security

The institution **must** take reasonable steps to provide a healthful, safe and secure environment for all members of the campus community. Administrative responsibility for environmental health and safety programs must be assigned. A comprehensive safety plan **must** be developed, implemented, and evaluated regularly. The plan should give special attention to the adequate provision and use of safety equipment in laboratories and other hazardous areas; to the modification of buildings, if necessary, for easy egress in the event of fire or other emergency. And to familiarizing all building occupants with emergency evacuation procedures.

6.4.4 Facilities Master Plan

The institution **must** maintain a current written physical facilities master plan that provides for orderly development

of the institution and relates it to other institutional planning efforts.

For Additional Information

One should not wait until the year before a site visit by the accreditation team before seeking information on accreditation. The first stop for a facility manager should be their own institution's individual or office responsible for the coordination of all accreditation activities. Another obvious stop is the regional accrediting association, all of which have websites, some of which are more comprehensive than others.

A helpful book on the topic is *A Practitioner's Handbook for Institutional Effectiveness and Student Outcomes Assessment Implementation* by James O. Nichols. Which includes some samples of linkage between an institutional mission statement and administrative department goals/objectives and assessment criteria for those goals/objectives. One example given is from a fictitious physical plant department.

Other helpful references include:

- *Making A Difference: Outcomes of a Decade of Assessment in Higher Education* by Trudy W. Banta
- *Evaluating Administrative Services and Programs* by J.F. Wergin and Larry A. Braskamp
- A series of informational pamphlets on conducting surveys by the American Statistical Association

Future Challenges

Increasingly, changes in technology are challenging the educational process, including accreditation. Activities such as distance education are very much a part of education today. How will distance education affect the value of an education? How will changes in the business world affect business' expectation of education? What shape will it take in the future? How can we all be assured that educational institutions provide a product that will be meaningful? Accreditation has been one of the main parts of that assurance in the past. What role will accreditation and its facilities activities play in the future? Only the future knows.

Nomination Form *Meritorious Service Award & Pacesetter Award*

APPA's volunteers shape and strengthen both the association and the profession through their contributions of time, energy, and ideas. Each year, APPA recognizes the contributions and achievements of a few of these talented and hardworking individuals through the APPA awards program. But identifying the most deserving from among a large group of active individuals requires input from those who know best: other APPA members like yourself. Help us ensure that APPA volunteers get the credit and appreciation they deserve: Nominate an outstanding APPA member for the Meritorious Service Award or the new Pacesetter Award. Purpose and criteria for each award are described below.

To submit your nomination, complete the following nomination form and fax it to your regional Awards & Recognition committee member. The Committee will review jointly all nominations and select the recipients. Awards will be presented July 18, 2000 at APPA's 87th Annual Meeting in Fort Worth, Texas.

Meritorious Service Award

Each year APPA members bestow the Meritorious Service Award upon the individual member or members who have made significant, life-long contributions to the profession of higher education facilities management. APPA's highest individual honor, the Meritorious Service Award is given to no more than three individuals each year. To be eligible for the Meritorious Service award, nominees must meet the following criteria:

1. Active member of APPA for a minimum of five years.
2. Attended and participated in meetings and other functions at the international level.
3. Demonstrated continued and distinguished service to the association through one or more of the following:
   - ❑ Service as an officer to the Board
   - ❑ Chair or member of an official APPA education program, special project, or committee
   - ❑ Service to an associated professional organization whose principal purpose is related to the betterment of facilities management

Pacesetter Award

The Pacesetter Award is the newest addition to APPA's awards profile. The Pacesetter Award is designed to encourage further participation in APPA among those who have already made significant contributions at their regions or chapters. Up to seven Pacesetter Awards will be given each year. To be eligible for the Pacesetter Award, nominees must meet the following criteria:

1. Active member of APPA for a minimum of three years.
2. Service/contributions/accomplishments to the association through one or more of the following:
   - ❑ At the international, regional, or chapter level
   - ❑ As a member of an official member of an APPA committee, program, task force, etc.
   - ❑ Through participation in an APPA educational program or special APPA project
   - ❑ Authorship of a publication, article, or chapter for APPA or presentation at an APPA annual meeting or educational program
3. Other voluntary contributions of time, effort, resources, and leadership abilities to promote and enhance APPA and the educational facilities management profession.

Nomination Form

Please complete the information below as thoroughly as possible and submit this form to your regional APPA Awards & Recognition Committee representative listed below. Use additional sheets as needed. Attach supporting documentation when available (e.g., letters of commendation, recommendation, newsclips, etc.) All nominations must be received by **April 7, 2000** in order to be considered for the 1999 awards. This form may be copied for multiple award nominations.

I nominate the individual named below for the following award:

❑ **2000 Meritorious Service Award** ❑ **2000 Pacesetter Award**

Name of Nominee _____ No. of years in APPA: _____

Title _____

Name of Institution _____

List any positions and/or offices the nominee has held at the international, regional, or chapter level of APPA:

Office	Level (Int'l, Regional, Chapter)

List committee, task forces, or other special projects upon which candidate has served at the international, regional, or chapter level of APPA:

List and describe other ways your candidate has served APPA (e.g., presenting at the annual meeting, writing for an APPA publication, teaching at the Institute):

What other facilities-related organizations has candidate served?

Briefly state how this candidate has contributed to the growth and professionalization of the facilities management profession.

Submitted by _____

Institution _____

Eastern ..... Richard L. Jackson, Howard University
Fax: 202-387-1372; Ph: 202-806-1139

Southeastern ..... Michael Besspiata, Georgetown College
Fax: 502-868-8890 Ph: 502-863-7958

Midwestern ..... Robert A. Getz, William Rainey Harper College
Fax: 847-925-6035 Ph: 847-925-6350

Rocky Mountain .. Don Mackel, University of New Mexico
Fax: 505-277-1250 Ph: 505-277-2421

Central ..... Leo Yanda, University of Arkansas
Fax: 501-575-7268 Ph: 501-575-6601

Pacific ..... Tony Ichsan, CSU/San Bernardino
Fax: 909-880-7049 Ph: 909-880-5179

Australasian ..... Maurice B. Matthewson, University of Auckland
Fax: 011-64-09-373-7456
Ph: 011-64-09-373-7599

The Bowdoin College Experience With Commissioning

by David D'Angelo and Clifton W. Greim, P.E.

A new building usually means headaches for the facilities department. Once occupants are settled in, the phone starts ringing and the complaints start coming. Equipment is noisy. Fans don't work or won't shut off. Rooms are too warm or too cool. The more complex the building, the more problems, and the more time the facilities staff must spend to get them resolved.

But that's not what happened at Maine's Bowdoin College. When the $20.5-million, 100,000-sq.-ft. Druckenmiller Science Hall was completed, there were just a half dozen calls reporting problems despite systems that are especially complex because the building combines several science disciplines, each with different needs. The reason for the lack of headaches? The decision to commission the building before move-in.

Commissioning put the building through a sea trial before it was occupied. Every component of the heating, ventilating, and air conditioning system was physically checked to make certain that it worked as it was designed to work. When a problem was found, responsibility for correcting it was assigned and components were rechecked to verify that the problem had been corrected.

David D'Angelo is assistant director for planning and construction in the Facilities Management Department at Bowdoin College, Brunswick, Maine. He can be reached at ddangelo@bowdoin.edu. Clifton W. Greim is a senior associate at Harriman Associates, a full-service architecture and engineering firm, in Auburn, Maine, and can be reached at cwgre@harriman.com.

The methodical, thorough process fine-tuned systems for more efficient energy use and uncovered mistakes and omissions that might have resulted in safety and maintenance problems if they had gone undetected. Because complaints were minimal, the facilities staff could direct their attention to regular maintenance and operations or the next project. And because systems were checked thoroughly before the warranty period ended, contractors and subcontractors were still accessible and responsible for correcting problems.

The benefits were so apparent that commissioning is now an integral part of a $132-million construction program now in progress at Bowdoin. While not every project will be large or complex enough to warrant commissioning, it is now a standard line item on budget forms and is always considered. At a cost of about 1 percent to 2.5 percent of the cost of the HVAC system, Bowdoin has found that the benefits outweigh the cost.

And now, Bowdoin has begun to involve a commissioning agent earlier in the process. Instead of waiting until HVAC systems are built, the agent joins the team during the design development phase, after concepts and schematic designs have been approved, but before construction has begun. This brings another set of eyes to a project at a point when changes can be made economically if needed. The focus is on the synergism of teamwork to find potential problems and resolve them on paper. The early involvement also makes the commissioning agent more familiar with the project when physical checking begins, thus expediting the process. For its first commissioning project, however, Bowdoin opted to start the process in the construction phase.

Continued on page 35

Continued from page 33

Major Building Program in Progress

Bowdoin College is a coeducational, liberal arts institution, founded in 1794 in Brunswick, a town of 22,000 on the Maine coast. The college is residential and nonsectarian and its 1,550 students come from across the country and around the world. Over 37 departmental and interdisciplinary majors leading to a bachelor of arts degree are offered.

Over 80 buildings are part of the 110-acre campus. They range from Massachusetts Hall, built in 1802, to Chamberlain Hall, a new student residence, and the newly renovated and technologically upgraded Searles Science Building, both of which were completed in August 1999. Over the past five years, the college has invested $62 million on capital projects, and planning for the next five years shows the potential for an additional $45 million.

The facilities management department, headed by William S. Gardiner, has 100 employees assigned to operations and maintenance (trades); facilities services (housekeeping, grounds, and automotive); finance and property management; and construction management.

Responsibility for managing construction projects and setting up project budgets falls to the planning and construction unit within the department. A construction manager is assigned to each project and provides day-to-day oversight of the design and construction process.

Computerized management processes are central to project management. At the start of each job, a "folder" is set up in a spreadsheet program. Continually updated throughout the design and construction process, it becomes the key document, first for planning, and later for tracking costs and progress for all phases of the project. The system has been in place for almost five years and took about two years to refine to its current form.

Within categories such as construction cost, fees, and owner's costs, a standardized set of line items is included on the screen when a new job is established. The pre-set line items help expedite the budgeting process, with a fill-in-the-blanks approach where categories can be easily added or deleted. The initial budget is established by the facilities management department and then submitted to the building committee. Modifications are ongoing as the projects move through programming and concept, schematic design, design development, and construction phases.

Deciding to Commission

When planning began for the Druckenmiller Science Hall, it was apparent that the building would be more complex than many others. The building would bring together biology

and chemistry departments, and though the HVAC requirements for each discipline were different, they had to be integrated into one system. In addition, further complications would arise because the new facility would be created by constructing the new building and renovating two existing buildings, tying all three together.

The sheer number and interrelationship of components meant more opportunities for problems in both installation and operation. And since the competitive bidding process can lead to a system composed of components different from those the designer conceptualized, it was important that the entire system be tested to ascertain that each component would operate in the right sequence with other components.

Commissioning would put the systems through detailed operational tests, verifying that all components were working as designed, functioning at top efficiency, and meeting manufacturer's specifications. Problems would then be documented, along with identifying those responsible for correcting the problems. A follow-up check would verify that the correction had been made.

The standard pre-occupancy inspection would not offer the same level of thoroughness, detail, and focus. It typically brings owner, designer, and contractor together, walking through the building, making a visual check to determine if parts are missing or broken, or whether equipment and controls are where they should be. Often the emphasis in this type of inspection is to meet code requirements in time for move-in day, which is generally very close to the inspection itself.

Testing and balancing procedures, too, would not be as thorough as commissioning, since they measure air and water flow in HVAC systems. The procedures ensure that air and water are being distributed in the right amounts to various spaces, as designated on drawings, but do not check the operation of controls.

Although Bowdoin had not commissioned a building before, the facilities department staff decided that the Druckenmiller project would benefit. Besides the complexity of the systems, the science department wanted Druckenmiller ready to use as soon as possible to minimize disruption to the educational program. An aggressive construction program could add to the problems that might be encountered.

As a result, a line item for "commissioning" was added under "owner's costs." Although some institutions have their own staff do commissioning, Bowdoin decided that an outside agent would better serve their needs. Without a history of cost to use, the construction management department used the one percent figure in the initial budget that was approved by the building committee—a figure that turned out to be on target.

The Process

The commissioning process at Druckenmiller would begin as soon as the mechanical system was completed, but well before move-in. After reviewing proposals from qualified firms, Harriman Associates, a full-service architecture and engineering firm in nearby Auburn, Maine, was selected as the commissioning agent. The firm had provided neither architecture nor engineering services for the building, a factor that Bowdoin believed was essential to ensure an unbiased opinion.

Harriman Associates' task would be to put the HVAC system through a four-season "shakedown." Every part in the system would be physically checked to make certain that it operated as indicated on drawings and in the sequence specified. Since operation for some components would differ depending on the season, commissioning would make certain that Bowdoin would have no surprises in winter for a building that was completed in summer.

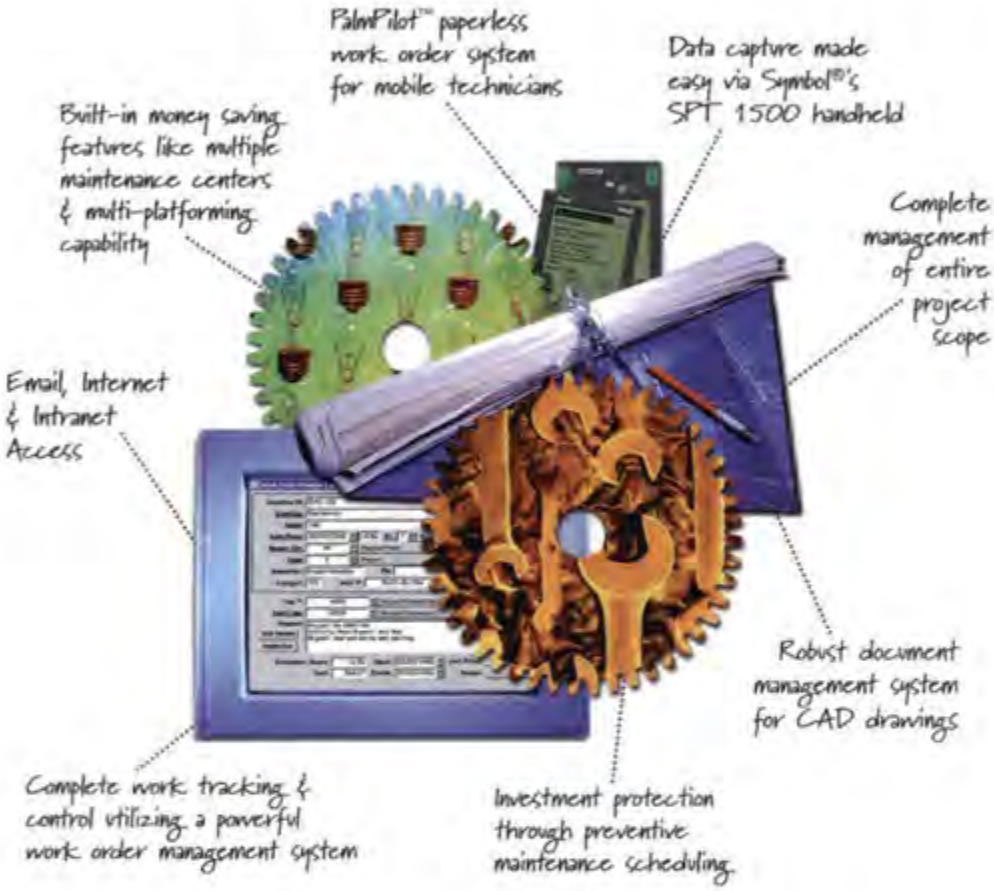
The first step was to study the design of the system and become familiar with its intent. Next, a schedule was set up to clarify when parts of the system would be commissioned. This required coordination among owner, contractor, subcontractors, and balancing technicians. Some parts of the building had to be ready before others so they were given priority. And before commissioning could begin, subcontractors had to complete their work.

Among systems given priority for commissioning were thermostatically controlled exhaust and supply fans, smoke evacuation systems, chiller, chilled water pumps, greenhouse supply and exhaust systems, fan coil units, air handling units, air terminal boxes, fume hoods, and pressure controls. Other systems commissioned were reheat coils, steam-to-water converters, finned-tube radiation units, cabinet unit heaters, hot-water pumps, heating coils, humidifiers, and radiant ceiling panels.

Some of the problems found during commissioning and corrected, saved the facilities department time, since their staff did not have to deal with fixing a problem in-house or

Continued on page 39

Equipped to manage any maintenance operation



Having the right tool is essential. Essential when you are speaking in terms of a facility's maintenance operation. That's precisely why TMA is in the business of developing technology that facilitates a cost-effective solution to streamlining productivity by means of our Computerized Maintenance Management System software.

For more information, call TMA Sales toll-free 800.862.1130 or visit our website at www.tmasys.com

TMA Systems

Continued from page 36
with getting a subcontractor back to do it. Some had the potential to save energy, since equipment was fine-tuned and ascertained to be functioning as it was designed. And some solved potential safety issues before they occurred, since they were related to life-safety codes.

Despite the fact that contractors and installers had done their jobs well, without a process to look at how the system functioned as a whole, some problems may have gone undetected for a long time and some might never have been found. Some undoubtedly were mistakes, as might be expected in a project as complex as this one. But many came about because of the interrelationships among system components and would have gone undetected without the verification of sequencing that occurs in commissioning.

Documentation is a critical part of the commissioning process. It defines the problem, indicates when it was found, and designates who is accountable for correcting it. Once notified that a problem has been corrected, the commissioning agent then checks again, re-testing the operation of the components. If everything checks out, the agent notes that in the report. If it doesn't, that too is noted and the re-checking continues until the problem is corrected.

Types of Problems

The time it takes to get a problem corrected can vary greatly. Some problems are relatively simple and the contractor or subcontractor responsible can correct them quickly. Others may require numerous follow-ups that stretch over a period of several months. The following illustrates the types of problems that commissioning can find and the process used to correct them.

• *Safety issues.* In educational facilities, life-safety codes require ducts to have sensors that trigger a series of actions should smoke be detected. Alarms are usually activated at the facilities department. Dampers close in return and supply-air ducts to keep smoke from dispersing throughout the building. Air-handling units are turned off and smoke-purge systems are turned on.

Testing procedures will be able to ascertain that the individual components function, but they won't be able to determine that they will function in the right sequences when it really matters—during a fire. Commissioning, however, can provide that assurance. To simulate what would happen in a fire, a smoke canister can be activated in the duct. As smoke is emitted, the commissioning agent can verify that alarms, dampers, and air-handling systems are functioning as they should, and if they are not, can start the corrective process to ensure that they will.

Areas in which hazardous materials are stored require special attention. Should a fire break out, a clean-agent suppressant gas is sprayed into the area from a remote mounted tank. The gas works by removing oxygen from the air and in essence smothering the fuel. But because the gas removes oxygen, it is especially important that it be kept from going to other parts of the building. Dampers in the ducts must close fast enough to keep the gas contained. Traditional inspections or walk-throughs will determine whether the damper will open and close, but without a test of the system, it won't be possible to know whether they will close fast enough in an emergency. Commissioning will provide that verification, giving assurances that the system will function properly.

• *Energy wasters.* Pre-occupancy inspections will indicate whether a piece of equipment is operating but they won't be able to verify that it's operating at top efficiency. And with energy costs high, that's especially important. And that's where commissioning can help, with its focus on proper system operation. A leak in duct work, for example, can cause the fan in the related air-handling unit to work harder and thus waste energy. Other examples include a fan that stays on too long and a damper on an outside-air duct that stays partially open when it should be completely closed. In a large facility with several air-handling units and numerous dampers, checking the physical operation of each is the only way to determine whether all components are operating in a way that creates top efficiency for the system.

• *Time wasters.* Commissioning can also save time for both facilities staff and users of the building. Staff members can devote time and energy to normal, reactive maintenance, especially advantageous during a building program involving many projects and an aggressive time schedule. If the building is no longer under warranty when a problem is discovered, the institution will have to spend time making repairs or getting them made. And even if the building is still under warranty, it is usually more difficult to have subcontractors come back, especially after they have received final payment, including the retainment fee.

Commissioning saves time for building users, too. By eliminating most post-occupancy complaints, users don't have to spend time explaining problems. And that is a side benefit to the facilities staff because positive feelings about the building tend to continue.

Bowdoin has found that the tangible and intangible benefits to commissioning more than outweigh the cost it adds to a project. As a result, the construction management staff will continue to make commissioning an integral part of its construction projects and the facilities staff can continue to count on fewer headaches.

FOUR NEW BOOKS PUBLISHED BY APPA

APPA: The Association of Higher Education Facilities Officers is pleased to announce the publication of four new resources in facilities management.

The Strategic Assessment Model

Developed by APPA as an evaluation and management tool, the Strategic Assessment Model enables facilities managers to track organizational performance along a continuum of key performance indicators. SAM also enables managers to compare their organization's performance to that of its peers, as well as establish improvement goals and plot progress toward those goals.

The new book, *The Strategic Assessment Model*, includes six chapters that introduce the SAM concepts and performance indicators, links them to a balanced scorecard framework and APPA's four core competencies, and explains how SAM connects with the Baldrige Award criteria. Appendix material includes valuable results of the recent SAM survey, a one-page matrix showing the 18 core metrics and their current ratios, definitions, resources for further reading, and step-by-step instructions for undertaking a formal benchmarking process.

Sponsored in part by Nalco Chemical Co. Softcover, 117 pages, ISBN 1-890956-08-2, Item #A728, $60 APPA member institutions; $80 others

The Metering Guide for Managers, by Mohammad H. Qayoumi

The lack of adequate utility metering is one of the key barriers for effective energy management for many organizations. As deregulation of electricity moves from concept to implementation, the need for better and more reliable metering has become more evident.

The *Metering Guide for Managers*, written by Mo Qayoumi of the University of Missouri/Rolla, provides a clear introduction to measurement and utility metering and explains why it is important to the campus facilities professional and his or her institution. Included are chapters on metering fundamentals, metering technologies and products, and management perspectives. The book also provides a discussion of basic statistics for managers, information on measurement reliability, and useful references for further reading.

Sponsored in part by the Electric Power Research Institute and the International Facility Management Association. Softcover, 84 pages, ISBN 1-890956-09-0, Item #A729, $35 APPA member institutions; $55 others

Proceedings of APPA's 1999 Educational Conference (Cincinnati, Ohio)

Includes 11 papers presented during APPA's 1999 Educational Conference and 86th Annual Meeting. Topics include:

- Financing of central utility plant maintenance and operations
- Preparing for Y2K
- Assessing capital equity/adequacy for a university system
- Changing the corporate culture within the physical plant department
- Benchmarking
- Planning for uncertainty
- Integrating operations and academics
- Performance improvement

Softcover, 144 pages, ISBN 1-890956-10-4, Item #A731, $28 APPA member institutions; $35 others

Charting a New Course for Campus Renewal, by Rod Rose

In April 1998 a powerful conference brought together representatives from the public universities of New Mexico to discuss the serious problem of capital renewal and deferred maintenance of the state's campus facilities. Speakers included Harvey Kaiser, Doug Christensen, Chris Christofferson, Ron Hicks, John Bruning, Wayne Leroy, and Val Peterson, as well as representatives of New Mexico's Commission on Higher Education and other organizations.

Author Rod Rose has summarized the valuable presentations and insights garnered at the symposium for *Charting a New Course for Campus Renewal*. These are the lessons learned from the New Mexico Higher Education Symposium on CRDM that are easily applicable to other states or systems.

The book first establishes the context which led to this gathering of experts, then provides a set of common vocabulary from which to speak. Several planning models are presented and various financing options discussed. Included are policy and funding implications, lessons learned, and approaches for future collaborations at the state and national levels. Softcover, 53 pages, ISBN 1-890956-11-2, Item #A730, $45 APPA member institutions; $65 others

To order: For shipping and handling, add $5 for orders under $80; add 10% of orders over $80. Send check or institutional purchase order to APPA Publications, 1643 Prince Street, Alexandria, VA 22314-2818. You may also order through APPANet at http://www.appa.org/resources/publications. For quantity orders or for more information, please contact APPA at 703-684-1446 ext. 235.

The Use of Utility Accounting Software at Miami University

by Paul Wenner

With 174 buildings, each using its share of water, electric, steam, chilled water, and natural gas, Miami University is a significant utility consumer. In the former utility accounting system at Miami University, utility bills were hand-processed. Record keeping in the Physical Facilities Department was sketchy at best. We had a good record of the utility totals, but very little information concerning individual building usage. The accounting system made detection of overcharging difficult, as both Physical Facilities and utility users were in the dark about how much energy was being used or wasted.

The Physical Facilities Department was also trying to get our energy conservation program going again, so when we asked questions about where we should start, we realized we did not even know where the energy was being used. If we could not account for energy use, we certainly could not attempt to save it in any rational way. It was at this point that efforts were initiated to investigate the options for tracking and recording campus utility usage.

Background

To shed some light on the circumstances four years ago surrounding the utility billing system, consider the size of Miami University: the main residential campus with 174 buildings on more than 2,000 acres is home to about 16,000 students; two regional campuses with five major buildings each provide educational opportunities to about 5,000 commuter students. Each campus is responsible for its own budget, including utility expenses.

Most, but not all, buildings on the main campus had separate utility meters. Water and sewer service is provided by the City of Oxford while natural gas, steam, and electricity are distributed mostly through university owned and maintained distribution systems. Most buildings on the main campus are served from a main 69 kV to 4.16 kV electrical substation and three switching stations. Each of the three stations house the meters by which our electric bills are calculated. Approximately 32 outlying buildings, served directly from the local utility's power grid, have individual meters as well.

For about 500 meters, Physical Facilities received separate bills monthly from each utility company, which meant that Physical Facilities and Accounts Payable were handling a lot of paper work. The local water company was sending Physical Facilities a multi-page printout with meter and account numbers, usage, and cost for every meter on campus. We also received multiple bills from the electric and gas companies for all of their meters as well. Just to enter all this data entailed a monumental task each month.

Physical Facilities reviewed a few of the bills for accuracy, and Accounts Payable issued checks for all of these bills. Very little attention was paid to the bills' accuracy. After a cursory look at our utility accounting system, it became evident that the same information was being entered into several different computer programs by different departments. More time and energy went into entering data than checking the numbers for accuracy. Analysis of the bills and data was just not being done the way it should have been.

Physical Facilities had no way to know where all the costs were going. The monthly budget reports showed the lump

Paul Wenner is university engineer at Miami University, Oxford, Ohio.

sum costs per account, but we had no way to determine usage trends in any individual buildings. Many of the submeters were not working correctly, or in some cases the meters were being read incorrectly, so the data was largely useless for determining where energy conservation measures were needed most. The initial reason for wanting good utility information was to identify where utilities were being used, utility usage trends, and for utility forecasting. In an attempt to gain a better understanding of utility usage in all utility categories, we installed chilled water meters for each of the 23 buildings on the central chilled water loop system. We also installed a number of steam meters in order to get more factual information on where our utilities were being used.

Finding incorrect or inappropriate bills was not an initial motivation because we really had no idea how many problems existed. As it turned out, there were more billing and accounting issues than we imagined.

Software Search

In 1995, Miami's Physical Facilities Department decided it was time to improve record keeping for the university's utility costs. The old ways of keeping track of the bills and cost allocations by hand clearly did not work and were too time consuming. We also needed to find a system that did not require redundant data entry by the various departments on campus. We looked through trade literature for names of companies that sell software to handle utilities records. One such company had a program that had been used for some time by the facilities department of a university local to us. An appointment was made to visit the company and talk to sales people and software developers about the product.

During the visit we were able to get a closer look at its current software package as well as a glimpse of the next generation (not yet on the market) of that product. The new version seemed to have all the features that we needed to keep accurate records of our utilities, but the initial costs were too high, the software was not very user friendly, and the recommended week-long training was an additional cost. A visit to the local university and some frank discussions with employees who had actually used the software for several years confirmed the sales pitch, but also cautioned about the difficulty of learning to use the system and the inflexibility of the software. Considering our small budget and the fact that we had only looked at one package, we decided to continue our search.

We found another company that offered more user-friendly software with many of the features we thought we needed, but it was not tailored to a university setting. More of a one-size-fits-all type, this software had some obvious shortcomings when applied to our university accounting structure. Fortunately, we were able to work with that company to develop a fully integrated system that would be applicable to our needs while providing the company

with a product that would be marketable to other universities. In exchange for our part in this development, the company sold the software to us at a considerable discount. Both parties benefited. We were able to incorporate the requirements of our accounting and budgeting departments as the software was developed.

Development of Utility Software

The university and the software company started with their basic utility accounting software. Then we determined the records needed by the Physical Facilities Department as well as the records required by the budgeting and accounting departments. Under the old system for processing a bill, each department repeated a number of data entry activities. Each department used the same information but in a different format. Therefore, each had to enter the data into their own system. We also discovered that, for internal accounting reasons, many of the bills were divided up into various accounts. As a result, the basic software program, which was not set up to handle this situation, had to be reworked to create reports that could satisfy all of our requirements.

Once the software was developed, we had to convince the accounting and budgeting departments that this program provided a more efficient way for handling bills and associated data. The departments began to accept the new utility accounting system, which they had a hand in developing, when they realized a savings of the time it took to process bills and enter data.

As we developed the utility accounting software, we also worked with the utility companies to simplify and aggregate the bills sent to the university. We were able to work with the local utility companies to combine their bills into fewer bills. The water company even agreed to send us the usage breakdown in an electronic format. We worked with the software company to develop a function to allow us to enter the water utility's digital information directly into our utility program, thus eliminating the need for manual entry.

Where We Are Now

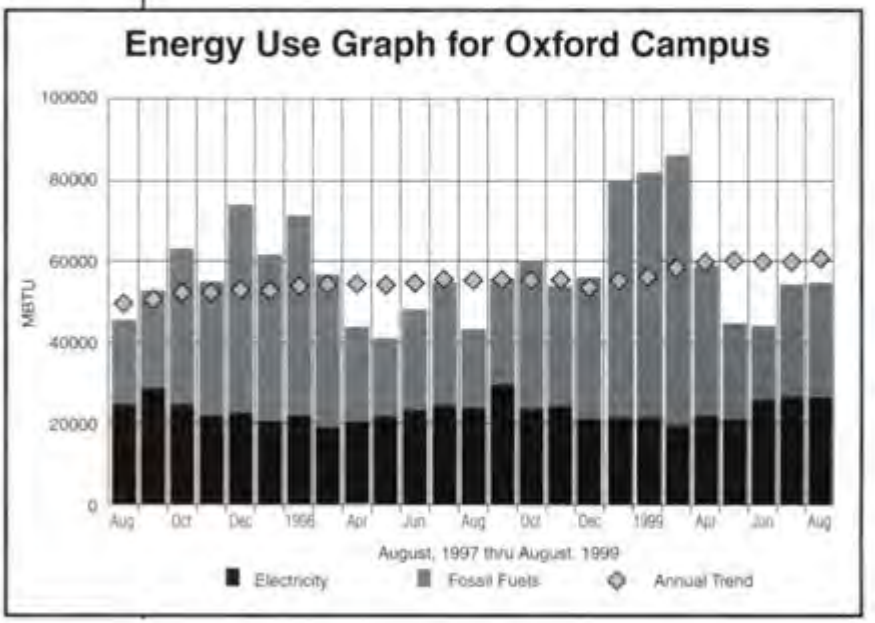
One of the things that we realized with our data in the utility program was that we needed to recreate as much usage history as possible. Location of old bills proved to be quite an undertaking and some of the bills were never located. This data served as a benchmark for the more recent utility information. Of course we could have simplified things by just starting with the most recent information, but any long-term trends would have taken that much longer to recognize.

In the process of locating old bills and comparing them to newer, more consolidated bills, we uncovered quite a few situations where we were being charged on meters that served a building that no longer existed. No one at the university had bothered to tell the utility company that we no longer intended to use their service at those locations any longer. As a result, the utility company kept sending us bills and unfortunately, the university kept paying the bills until we found and corrected the error.

We also discovered we were being billed a sewer charge based on water usage for several locations that were served by septic tanks and had no connection to the sanitary sewer system. Likewise, we were being billed sewer charges for water going to cooling towers, even though the blowdown from the tower was directed to a storm sewer. In some cases we were able to get credit from the utility company for such charges.

After some time the accounting and budgeting departments came to realize the benefits of our new utility accounting system, which has greatly decreased the time for data entry for them and Physical Facilities. Previously accounting and Physical Facilities spend about 54 hours entering billing data each month. Now the two departments only spend about 22 hours. The redundant entry of bill information has been virtually eliminated by the new software. Most of our bills have been consolidated so that we now process only 60 bills each month compared to 494 bills under the old system. We also have found, by looking at the bills and data, where meters were needed and identified those meters not properly working.

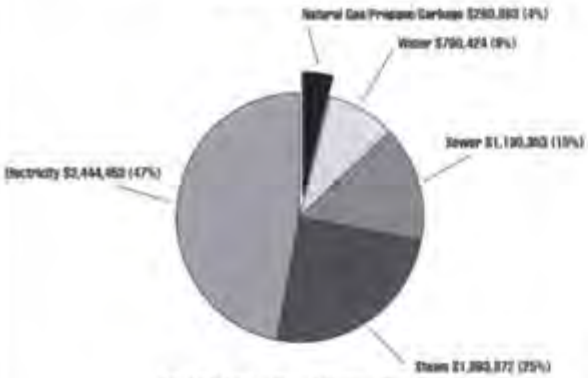
Our original interest in developing a utility accounting program was to better identify where our money was being spent and identify certain buildings for utility conservation efforts. As shown in the graph above, we are now able to look at trends in utility usage and to determine if our conservation projects are really paying off. Our budgeting department has direct access to all the data and has found the historical information allows them to better estimate future expenditures. In Physical Facilities the same data can be effectively used for estimating new or renovated building operating costs. We can easily compare utility costs for similar buildings. We then can look into the details of those utilities that seem to be out of proportion to determine if there are valid reasons for higher



Miami University, Oxford Campus
Site Comparison Report—kBtu/SqFt/Yr for Year Ending June, 1999

Site	Total Energy (MBtu)	% Chg	Heating deg days/Yr	% Chg	SqFt	kBtu/SqFt /Yr
Presser Hall	7,174	155.2	4,479	-1.9	25,920	276.8
Hiestand Hall	10,037	5.5	4,479	-1.9	45,900	218.7
Shideler Hall	11,063	30.9	4,479	-1.9	54,100	204.5
Irvin Hall	7,912	-8.7	4,479	-1.9	41,000	193
Gaskill Hall	9,898	4.7	4,479	-1.9	54,020	183.2
Kreger Hall	8,793	16	4,479	-1.9	50,220	175.1
Benton Hall	8,236	-8.9	4,479	-1.9	59,250	139
Culler Hall	6,164	-14.5	4,479	-1.9	51,700	119.2
Bachelor Hall	10,318	22.1	4,479	-1.9	107,260	96.2
Art Education	3,979	-5.3	4,479	-1.9	48,200	82.6
Laws Hall	3,714	14.4	4,479	-1.9	76,300	48.7
Havighurst Hall	2,600	12.6	4,479	-1.9	71,416	36.4
Totals:	**89,887**				**685,286**	**131.2**

Annual Total Utility Cost Breakdown
Oxford Campus



$7,400,084—Total Utility Bill for Year Ending June, 1999

than normal usage. The accompanying charts illustrate some of the different graphical outputs that are available for comparing utility usage and costs.

Since we began using the utility accounting program, we have been able to process a summary billing report (shown right) for all of the buildings on campus. We do not bill the individual academic or staff departments' budgets for the utilities they use, so our bills in those cases are for information purposes only. We alert the various users of utilities as to what it costs to operate their buildings. We hope that by knowing this information, the building occupants will be more interested in supporting our efforts to save energy and lower utility costs.

In the case of housing, dining, and auxiliary buildings, our data is actually used for payment processing. In some cases in the past, payments were prorated based on a particular building's floor area. The old method of billing certainly did not encourage energy conservation efforts. Now we are able to charge according to actual usage. We anticipate these departments will reduce their utility consumption and avoid wasteful practices since they now pay for what they use.

Continued Development

We are continuing to refine and add to our utility accounting capabilities. We are installing more meters and upgrading existing ones. We have also discovered some hidden benefits to the improved record keeping that has come with the new software. We are able to more accurately calculate costs for our steam and chilled water production. Since we have been able to see a truer picture of our production costs, we have investigated better ways to operate the equipment more efficiently with the goal of reducing our generation costs.

Accountability for our utility usage will become more important as deregulation of the electric market takes effect. The Ohio legislature recently passed a bill that will enable deregulation of the electric industry to begin in 2001. Other states already have experience with purchasing electricity in the unregulated market. With the use of our utility accounting software, we have a much better idea where our utilities are being used.

As we continue to improve our metering, we will be able to know our consumption patterns. This information will be needed in the future to obtain the best possible contracts in a deregulated electric market and to support the decisions necessary to continue to provide to campus customers outstanding service in the other utilities.

Miami University
Hughes Hall Summary Billing Report for 04/1999

Service	Utility company	Account #	Use	Unit S	Cost
Electricity	McGuffey Substation	C EME002 170011 450	405,720	kwh	$16,690.77
TOTAL ELECTRICITY			405,720	kwh	$16,690.77
Steam	Miami Steam Plant	C EME002 170131 450	2,842,412	lbs	$17,978.33
TOTAL STEAM			2,842,412	lbs	$17,978.33
Water	City of Oxford	19*900*1	2,117	ccf	$ 4,503.32
TOTAL WATER			2,117	ccf	$ 4,503.32
Sewer	City of Oxford	19*900*1	2,117	ccf	$ 7,878.10
TOTAL SEWER			2,117	ccf	$ 7,878.10
TOTAL COST					$47,050.52

ENERGY SUBMETERING:

The Key to Cost-Effective Conservation

by W.D. Turner and John R. McBride

Utility deregulation is revolutionizing the way both public and private colleges and universities purchase energy. Along with a heightened awareness of energy procurement resulting from deregulation an associated interest in energy metering has emerged. Interval-metered, load profile data is required for a utility to serve a large customer such as a university. Also the need for this interval-metered data often extends beyond the facility level metering typically found on a college campus, down to submetering at the individual building level. "Submetering" consists of additional metering on the customer's side of a utility revenue meter. Thus it can involve individual building level metering in a centrally metered campus environment or metering of individual loads within a building that already has one or more revenue meters installed.

The potential for achieving lower utility costs through deregulation has also increased market awareness of energy costs in general, and hence the potential for energy cost reductions that are related to efficiency improvements. Frequently, once a large energy user becomes aware of energy and metering issues through deregulation, they also become interested in additional submetering projects that can optimize energy usage and minimize energy cost.

It should be understood that submetering by itself does not save energy or money, but it may be the means through which significant energy savings can be achieved. Submetering supports a broad range of engineering services that can utilize the information generated by submetering and add value to an educational enterprise by reducing energy consumption and cost or by facilitating cost recovery. Some of these value-added engineering activities, in addition to energy cost allocation, include energy conservation measure identification, operation and maintenance problem identification, building or process commissioning and systems optimization, energy savings verification and power quality problem identification and remediation.

Submetering systems are often integrated into comprehensive energy information systems to optimize their usefulness. The components of an energy information system typically consist of permanently installed sensors, meters and submetering systems; data acquisition systems; integrated communications systems; a central station computer system or file server and energy information system software. Typical building measurement points include service entrance

W.D. Turner is director of the Energy Systems Laboratory at Texas A&M University, College Station, Texas. John McBride is president of New Horizons Technology, Butte, Montana.

electricity, service entrance natural gas and domestic water, service entrance/exit thermal energy, which could include steam, steam condensate, hot water, and chilled water. It could also include other fuels such as propane or fuel oil measured at the service entrance and critical systems submetering or end-use metering. Such systems are often deployed in campus environments where building-level service entrance metering previously did not exist.

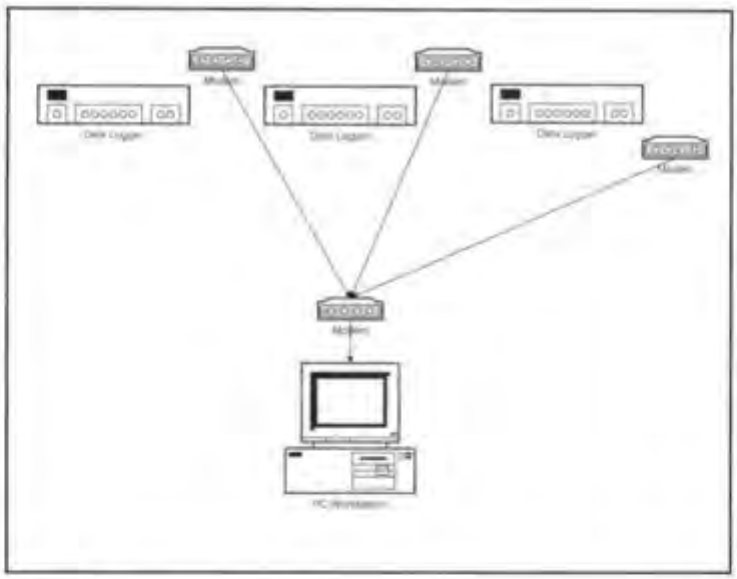


Figure 1

Communication technologies for such an energy information system could include direct serial communication, telephone modem, local network, wide area network, internet/intranet or virtual private network, wireless radio frequency or powerline carrier technology. Computer hardware and software for data acquisition, database management and data visualization provide the ability to turn data generated by the system into information and are the components that integrate meters and data acquisition systems into energy information systems.

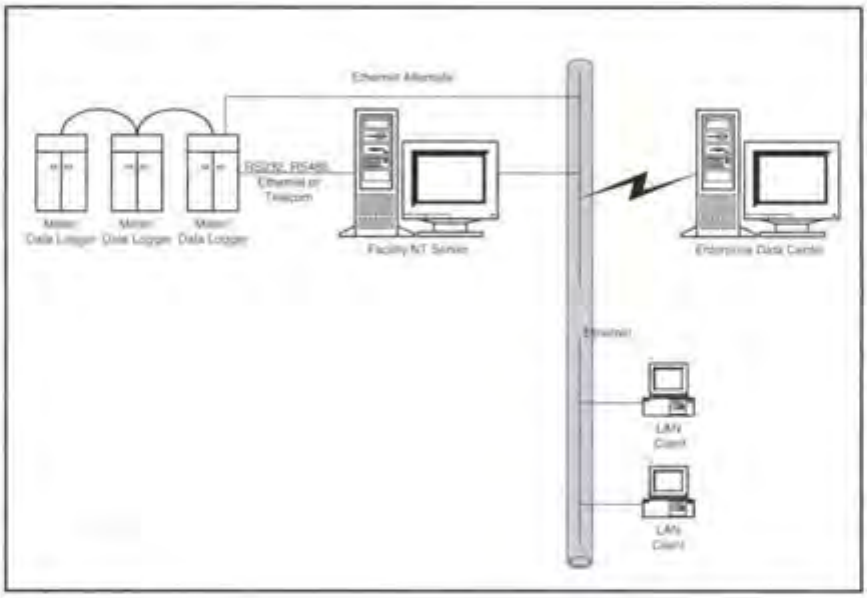


Figure 2

The traditional architecture of an energy information system is shown in Figure 1. Until recently such systems have been almost exclusively modem-based. However, systems installed today are often network-based with substantial internet-based data transmission. One example of emerging energy information system technology based on network communications is shown in Figure 2.

Examples of Large Scale Metering and Energy Information System Projects

Over the past several years there have been a number of large scale energy information systems installed in various locations throughout the United States. The performance of two projects in particular, the Texas LoanSTAR program and a campus-wide system installed at Texas A&M University have been extensively monitored. These monitoring results are reported here.

Texas LoanSTAR Program

The LoanSTAR (Loans to Save Taxes and Resources) was conceived in 1988 by the State of Texas Energy Efficiency Division of the Public Utility Commission. This office served as the equivalent of the state energy office and handled all the federal pass-through funds administered by the state. Texas had received large amounts of money from the Petroleum Violation Escrow (PVE) funds managed by the U.S. Department of Energy (DOE), and the energy office wanted to establish a program that would have a permanent and lasting impact for the citizens of Texas. LoanSTAR was established, with DOE approval, as a revolving loan fund for energy conservation retrofits. The recipients of the capital retrofit dollars were largely state agencies, school districts, local governments, institutions of higher education, and hospitals. A unique feature of LoanSTAR was the fact that it was to be a statewide demonstration program, and savings verification was required for each capital retrofit loan. For those projects that were large enough to be individually monitored, submetering was installed to isolate each retrofit. The Energy Systems Laboratory (ESL) at Texas A&M University was selected as the metering and monitoring subcontractor for the LoanSTAR program.

Since this monitoring program was to be one of the largest ever undertaken, particularly involving thermal as well as electrical and natural gas monitoring, the Energy Systems Laboratory formed a Monitoring and Analysis Review Committee (MARC) to provide guidance to the metering efforts. This committee, consisting of metering experts from DOE,

Oak Ridge National Laboratory, Lawrence Berkeley Labs, Battelle-Pacific Northwest Laboratory, electric utilities, and private consultants, provided invaluable advice and guidance during the early stages of the metering program. For example, in previous metering programs, one problem was the inability to calibrate sensors or troubleshoot problems, which arose in the field. As a result, the Energy Systems Lab, with funding through the Energy Office, established a calibration laboratory with the capability of testing and calibrating typical sensors used in building metering, such as: flow meters, current transformers, kW meters, temperature sensors, humidity sensors, solar radiation sensors, pressure gages, and rpm meters. NIST-traceable test facilities were established. This calibration facility has proven invaluable in providing support to the LoanSTAR program. Metering contractors were selected through a national RFP process, and the National Center for Appropriate Technology (NCAT) was selected as one of the metering contractors. NCAT and subsequently its for-profit subsidiary, New Horizon Technologies (NHT) installed metering equipment in approximately 80 percent of the LoanSTAR sites.

The software to poll, archive, and analyze a very large data base had to be developed by the ESL computer staff and graduate students. Software to automatically poll hundreds of data loggers, archive the data, analyze the data, and report on the results to hundreds of clients was developed. The analysis routines in particular were the creative products of graduate students and faculty and many of the software and analysis methods are currently being used in the Texas Performance Contracting Guidelines and in the DOE document, the International Performance Measurement and Verification Protocol (IPMVP).

A total of 1288 buildings have been metered in the LoanSTAR program. In the early years of the program, the retrofits had to have a cumulative payback of four years or less; therefore quite a number of the buildings in the early part of the program have already paid back their loans and are no longer being monitored. The current energy office policy is to allow loans up to eight years, which does not allow the revolving loan fund to "turn over" as fast; however, the new policy allows the program to fund longer payback items such as new chillers and high efficiency motors, which generally require paybacks longer than four years. Over 3.2 gigabytes (>2100 Channels) of primarily hourly data from over 1288 buildings have been collected to date. Most of the data are hourly, although some of the electrical data are collected in15-minute intervals.

Texas A&M Campus Project

Energy cost containment was a major issue on the campus of Texas A&M University. The success of the LoanSTAR metering and monitoring program encouraged campus officials to initiate a large scale metering program on their own campus. The Texas A&M Campus Monitoring Project began with the development of a monitoring scheme for each major building and plant. These site-metering plans identified the end use to be metered, the type of sensor to be installed, the location of the sensor, the cost of the metering

hardware, and the cost of the installation. The decision was made to meter every conditioned building 50,000 square feet or larger, the central power plant, and all thermal plants. Where there was existing metering in place, signals were to be shared with this independent energy information system (EIS). After the building monitoring plans were developed and approved, the hardware was ordered and installation commenced. The installation of the metering hardware spanned more than a year; however, individual buildings were monitored as soon as the installations were complete. One of the major project goals was to determine baseline energy consumption. ESL engineers could then accurately calculate the energy savings from various value-added engineering services provided by ESL including building re-commissioning, chilled water and hot water loop balancing, central plant re-commissioning, or energy conservation retrofits. Individual building baselines were determined, as well as baseline energy consumption for the entire main campus and the west campus.

In total, metering equipment was installed by New Horizon Technologies in 78 campus buildings. This also included the Texas A&M System Headquarters building located off campus. Approximately 62 buildings are located on the main campus, and 15 buildings are located on the west campus, adjacent to but across the railroad tracks from the main campus, plus the System headquarters building. In addition, the main campus power plant, the satellite thermal plants, and the west campus thermal plants are metered. Sufficient submetering exists in the power plant to calculate overall thermal and electrical efficiencies for the plant operation. Well over 600 individual meters were installed on the Texas A&M campus. The estimated cost for the installation of the energy information system on the Texas A&M campus was approximately $1.2 million dollars. Another $300,000 was spent in software, data management, and field verification costs to get the buildings/meters on line and the data stream verified.

Some very significant issues arose during the development of the metering system, largely centering on the need for interval-based building energy information as opposed to the data potentially available from existing building automation systems (BAS). The physical plant personnel and the campus energy office preferred not to have two independent systems to deal with. They were in the process of upgrading the campus building automation systems, and ideally wanted to have to deal with only one monitoring system. However, the implementation timeline for the upgrade of the BAS was significantly longer than the time required to install an independent energy information system, and the decision was made to move forward with the energy information system. The Texas A&M physical plant still plans to integrate the BAS and EIS functions at some time in the future, but at the present time, the BAS cannot provide the detailed data that is provided by the independent metering and monitoring system. The ESL relies mainly on the independent energy information system for energy analysis data. It is the position of the ESL that metering the energy data separately from the BAS is the preferred way to proceed, and that is the current approach.

The ESL, working with the TAMU Energy Office, power plant personnel, and physical plant personnel, began the re-commissioning process in the summer of 1996. Obvious building and plant problems were identified first from the metered data. A systematic program was developed focusing on the central power plant and campus hot water and chilled water loops as one main component. The other principal component was the re-commissioning of the campus buildings. The main results of the project to date are:

- Over 30 major buildings have been commissioned
- The campus chilled water loops and hot water loops have been balanced.
- New procedures for operating the chillers have been implemented

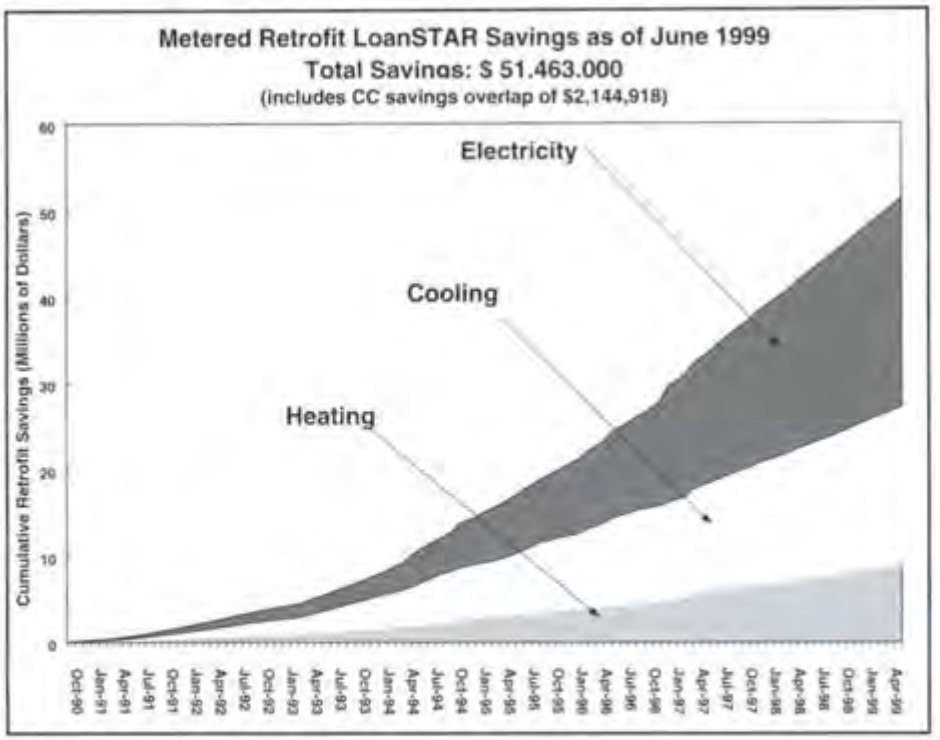


Figure 3

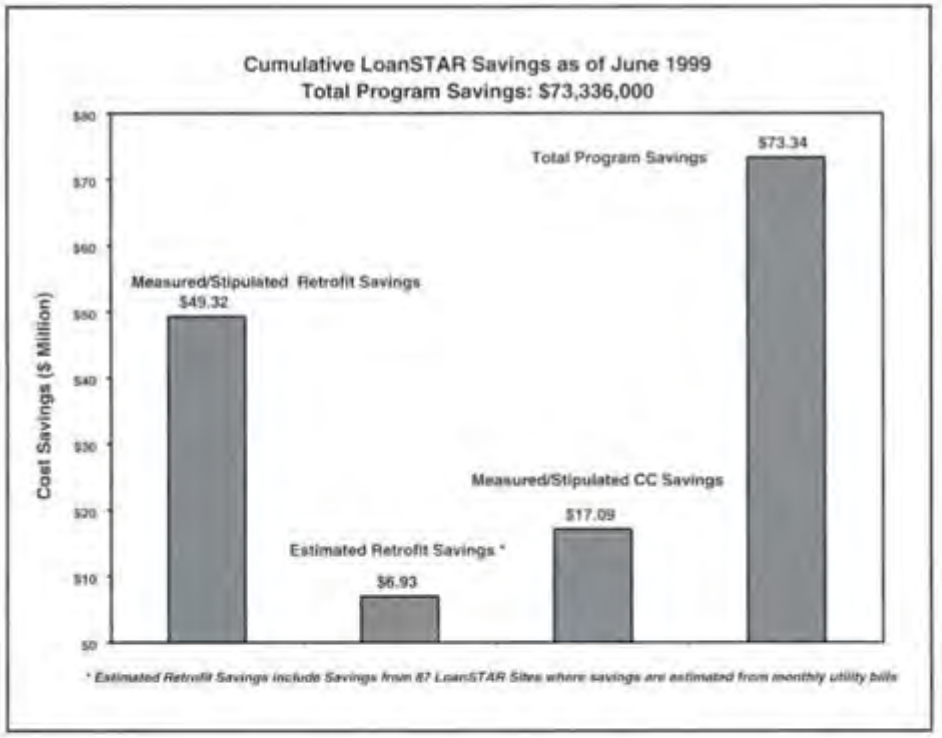


Figure 4

- Many of the building hot water pumps on the main campus have been turned off
- Hot water and chilled water loop pressures have been lowered

Texas A&M has limited staffing in the Energy Office and they are currently expanding the BAS to more campus buildings. With the current limited staffing and with the installation of a more sophisticated controls system, the role of the ESL engineers has been altered somewhat. ESL now answers many of the campus hot and cold building temperature calls and works more closely with the energy office in getting instrumentation installed in the buildings to help with the energy analysis and troubleshooting. ESL is also more involved with special projects within the power plant and energy office, providing technical support when needed.

Measured Results

Savings from the LoanSTAR program exceed $73 million to date. These savings are broken down into three components: measured retrofit savings, measured building re-commissioning savings, and estimated savings. The measured retrofit savings through June of 1999 are approximately $50 million, and the measured re-commissioning savings exceed $17 million. Thus more than 90 percent of the total reported program savings are measured savings. The estimated savings are for those facilities that were too small to meter, and the savings were determined by utility bill analysis. The building re-commissioning is the "engineering value-added" to the capital retrofit program and the metering program. LoanSTAR has achieved over $17 million in savings by careful monitoring of the data, an analysis of the potential savings, and then commissioning the retrofits and the buildings to improve their operation. Figure 3 shows the breakdown of the savings by type of energy. As one would expect, more savings are achieved from electricity and chilled water side than from gas or steam, since the buildings are in Texas. Figure 4 provides a breakdown of the measured retrofit, stipulated, and commissioning savings.

The savings resulting from building re-commissioning to date on the Texas A&M Campus indicate a cumulative avoided cost savings of around $10 million based on the energy baseline and energy costs established in the 1995-96. Costs to date since the initial $1.5 million expenditure include approximately $600,000 per year for building re-commissioning, data handling, reporting, and meter maintenance. Thus Texas A&M University has expended roughly $3 million in contracts to the ESL and New

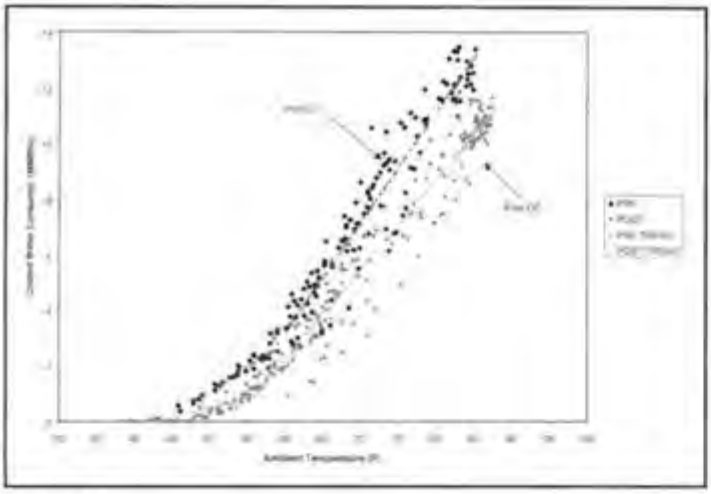


Figure 5

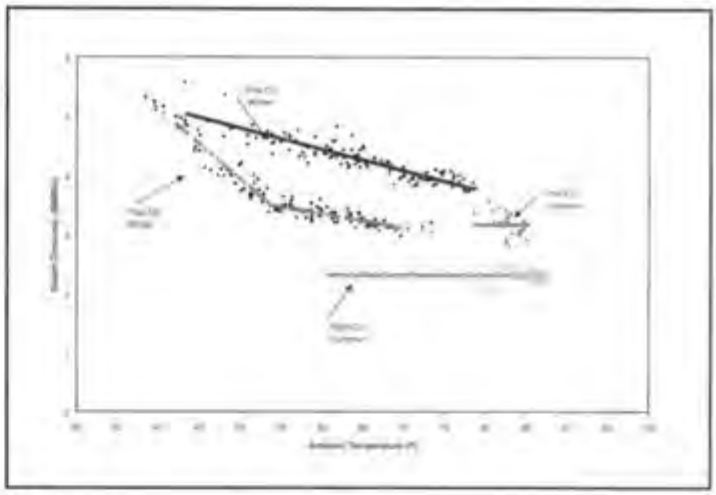


Figure 6

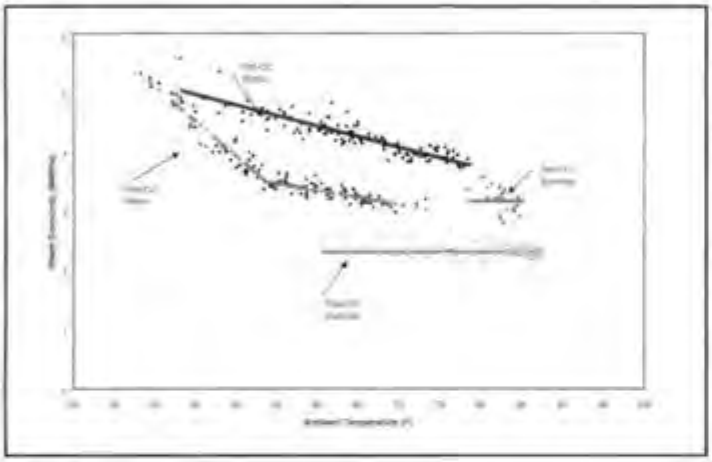


Figure 7

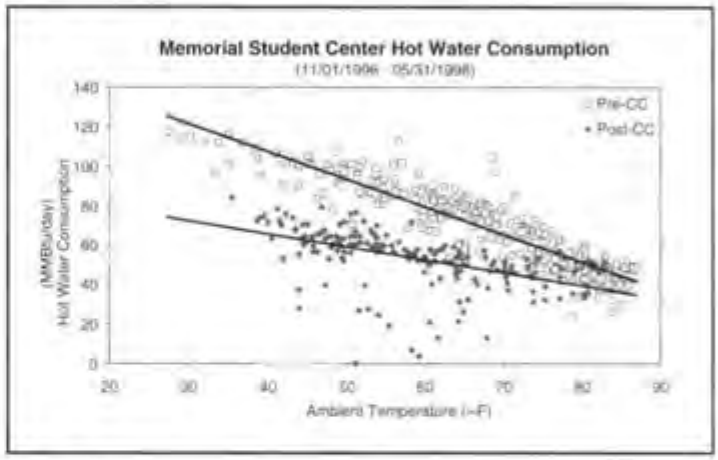


Figure 8

Horizon Technologies to date in achieving the $10 million in avoided energy costs.

Other Examples of Metering Cost-Effectiveness

The building re-commissioning savings in the LoanSTAR program represent 23 percent of the total program savings and only a fraction of the buildings participating in LoanSTAR were commissioned. The commissioning costs to the State of Texas were less than $1.0 million dollars. Coupled with the cost of the metering for these buildings, this indeed represents a very small investment. Specific examples from the LoanSTAR program and the Texas A&M campus project illustrate the re-commissioning or continuous commissioning concept, and the value-added from an effective energy information system.

Basic Science Building at University of Texas Medical Branch-Galveston

The Basic Science Building was one of the early buildings retrofitted in the Texas LoanSTAR program. It is a seven-story office, classroom, laboratory, and storage facility, which operates 24 hours a day. Seventy-five percent outside air is supplied by two 150-hp constant-volume, dual duct AHU's. The hourly data from the site revealed some potential commissioning measures. The steam consumption appeared to show little dependence on temperature with high consumption in the summer, which indicated there was some significant reheat occurring. If the HVAC system has simultaneous heating and cooling in the summer, there is an opportunity for saving energy. The commissioning opportunities primarily included an optimization of the cold deck temperature as a function of outside air temperature, which would eliminate much of the simultaneous heating and cooling. A model of the building's performance indicated a potential for reduction in chilled water energy consumption of nearly two million Btu's per hour, and a reduction in hot water energy consumption of over one million Btu's per hour. Figure 5 shows the chilled water consumption as a function of ambient temperature before and after the optimization. Figure 6 is a similar plot of steam usage. The four plots on the steam curves are necessary because there is both a temperature and a non-temperature dependence to the steam consumption. As is noted in the figures, significant reductions were achieved. The energy cost savings were $108,700 for chilled water and $47,300 for steam, or approximately 23 percent of the building's annual energy cost.

Texas A&M Memorial Student Center

The Memorial Student Center (MSC) is a 368,935 square feet, three story building with cafeterias, banquet facilities, a bookstore, a hotel, and multiple meeting rooms. There are 40 air-handling units, the majority of which have coupled control. After reviewing metered data the commissioning team made a thorough walk-through of the facility and identified a number of problems, including blocked reheat coils, coupled control not working properly, cold deck temperatures set too low, and a few thermostats out of calibration or broken. The major commissioning actions were: balancing both the air side and water side for each of the 40 AHUs; calibrating faulty thermostats; and readjusting the overlap of the spring ranges in the coupled control units.

Figures 7 and 8 show the hot and chilled water energy consumption before and after the commissioning measures were installed. Hot water energy consumption dropped over 35 million Btu's per day (about 1.5 million Btu's per hour) and chilled water consumption also dropped significantly. Based on Texas A&M University's energy prices, the measured energy savings are over $110,000 per year for this one building. The biggest savings were in hot water energy consumption, with savings of over $62,000 in the last 12 months. Electricity savings were also substantial, amounting to some $23,000 over the past year.

Summary and Conclusions

Interest and awareness in measuring and optimizing energy consumption and cost are growing. Customers with large energy bills such as colleges and universities are recognizing the importance of accurately measuring and controlling campus energy flows.

In the past, one major obstacle to the implementation of large-scale metering and energy information system projects has been concern over cost, and more significantly, cost-effectiveness. With deferred maintenance at often staggering levels it may seem difficult to justify spending hundreds of thousands or even millions of dollars for an energy metering system. However, results such as those reported here give cause for optimism.

Energy information systems can be extremely cost-effective. But, they are cost-effective only if they are used. A metering system by itself saves nothing and has an infinite pay-back. On the other hand a metering system, coupled with skilled engineering applications such as energy cost allocation and building re-commissioning can be extraordinarily cost-effective. So cost-effective, in fact, that the installation of an energy information system and the application of some sound engineering can be one of the smartest investments a college or university campus can make.

Effective Cooperation with the Human Resource Department

by Matt Adams, P.E.

Plant maintenance is a people business. In fact, more than sixty percent of any maintenance operation's budget is related to the cost of labor. Service centers like custodial, utilize as much as 85 percent labor. When budget cuts are made, funded positions are one of the first reductions. From every perspective, the utilization of the labor resource is perhaps the most important element of a maintenance operation. Given this fact, it is surprising how many opportunities are lost to enhance the utilization of the labor resource. Many are using computerized work management to tract and improve productivity. Many preach, but seldom practice the virtues of staff professional development through training. In fact, the potential benefits of a functional relationship with the human resource department are largely ignored. The dysfunction of this relationship has almost reached a level of cliché. The managers and especially supervisors of the plant operations are convinced that the human resources department is too forgiving and unwilling to support "hard" plant decisions. Any human resources professional will emphatically reply that physical plant staff rarely request assistance and often fail to collect meaningful documentation. In many cases, this stand-off has rendered the departmental relationship less than productive.

Professional and personal development of the plant staff is recognized by most plant management as important. Even more important is the need to administer effective and consistent discipline. Discipline is as much a part of the professional and personal development of the total staff as any other component. When some employees are allowed to abuse the system, it negatively effects the rest of the immediate staff. The human resource department is a required part of any disciplinary policy or action. Without them, the disciplinary function breaks down. In the cases where the departmental partnership has broken down, the reasons given are often old, emotional and even dogmatic. The perspective of each department is often 180 degrees out of sink. It is a "blame-game" serves no purpose.

From the perspective of the human resources professional, the staff of the physical plant is one of the largest within the institution. In many cases, this staff is the largest or only "represented" staff at the institution. Despite some commons misconceptions, the sheer magnitude of the physical plant staff demands that the human resource department be concerned. From the H.R. perspective, the interest is there, but often the initiative is lacking. Policies, procedures, and processes are a burden to all, especially the line supervisors. Nevertheless, procedures are required for proper disciplinary action.

It may surprise some, but many H.R. departments feel underutilized by the physical plant. They understand that disciplinary actions are required, and that more communications and training are needed for the line supervisors in order for the system to work. Here, the disconnect is caused by a lack of first contact. Most H.R. departments see themselves as support centers, and as such, they feel uncomfortable launching initiatives with the physical plant. They recognize that many of the managers and supervisors lack a current understanding of the disciplinary procedures of the institution. At a minimum, they see the need to discuss the issues surrounding discipline. But, once again, who initiates these activities?

One solution is to make training and support of the disciplinary activities a continually scheduled process. In other words, schedule consistent and repeated training and support that does not require any one department to initiate the event.

The plant staff is often disappointed when discipline is not carried out or supported by the H.R. department. This perception is often caused by an experience with an employee that esulted in a corrective action that seemed too soft. Clearly the perceptions of the plant manager and the H.R. staff member are quite different

Matt Adams is president of The Adams Consulting Group, a management/ engineering consulting firm located in Atlanta, Georgia, specializing in the facility maintenance and management within higher education, school districts, and other institutions. He can be reached at matt@adams-grp.com.

in these cases. Can it be bridged? Better understanding of both the big picture and events leading up to the requested discipline would clearly help. For the plant supervisor, it is difficult to consistently record each infraction or reportable offense committed by an employee. First of all, it is against human nature to take a confrontational stance with someone with whom you work each day. In addition, many supervisors look at the paperwork as a unnecessary burden that stalls the disciplinary process. Some don't fully learn or at least understand the specific procedures or the reasons for the records. From this perspective, it is east to see why records are often imperfect. In fact, without a clear understanding of the "end game," many supervisors fail to keep records that adequately support the H.R. function of discipline. This is particularly true when represented employees have both stewards and Union Presidents that will not allow any discrepancies in the paperwork. The records rarely represent in real terms the facts surrounding unacceptable behavior.

For example, a supervisor may wait until several infractions have previously occurred before formally recording them. As mentioned, it is human nature to avoid a difficult situation. Once it is recorded for the first time, the gap between the supervisor and the H.R. department is already significant. The supervisor sees this employee in the light of all previous infractions whereas the H.R. staff only sees the recent documented infraction. By the time that the issue reaches potential disciplinary stage, the supervisor is fuming and the H.R. department enters the picture with a clear head and a more even approach. In many cases, the action taken by the H.R. department at this point will be perceived as soft by the supervisor. More frequent and open communication between the H.R. staff and supervisors will reduce the disconnect in expectations.

The H.R. professional has a far different perspective than that of the plant staff. First of all, H.R. does not deal with the line employees each and every day. As such, there is not the emotional baggage present that screams out for stiff punishment. On the other hand, H.R. does not always see the difficulty in confronting employees with issues on a continual basis. It is always harder to act than it appears to be in the policies and procedures. Compounding this is the fact that the plant staff and supervisors rarely request support or training in the use of disciplinary forms and procedures. This can be viewed as a lack of concern on the part of H.R.

Until recent years, the Labor Relations Manager at Brookhaven Labs, Bill Hempling had not been asked to train or regularly meet with the plant staff for over ten years. It is understandable that in ten years the detailed disciplinary processes had become fuzzy in the eyes of the plant staff. As Hempling recognized at Brookhaven Labs, regular meetings for training and open discussions of current issues was the only way to bridge the communication gap. The institution does not want to discharge employees and the disciplinary process is the beginning of that process. For human resources, even the disciplinary actions must be both fair and accurate. The test is to look at the records as if you had just visited the institution. If the infraction records meet the test of convincing a lay person that there is a problem then the records are likely appropriate. Otherwise, the H.R. staff is called upon to take action that is difficult to support if it moves beyond the "fish bowl" of the physical plant environment. A judge, lawyer, or arbitrator will see the records for the first time with no previous understanding of the situation. Any record that is not fair, accurate, and reasonable will not withstand this examination.

No institution promotes the firing of employees. It is a lose-lose proposition. On the other hand, the relatively large number of employees in the physical plant demands the use of disciplinary procedures. The frequent disconnect between the human resources department and plant management is unproductive and usually avoidable. When the frequency and form of communication is lacking, formalized and systematic meetings will help. The disconnect with expectations of outcomes is bridged only by thinking in "the other persons shoes." The papertrail may not seem productive to a supervisor, but it is to human resources. On the other hand, human resources must also make an effort to recognize that frustration occurs easily and more communication and support on their part will warm the partnership with the plant staff.

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

This is the final

Bookshelf column for the twentieth century. It seems appropriate to reflect on APPA's past, clean up some unfinished business, and look to the future of higher education facilities.

Since its founding in 1914, APPA has promoted information exchange, and its publications have always featured current topics in our profession. The group's oldest literature covers the 1926 annual meeting held at the University of Michigan, and the proceedings review programs for improving higher education facilities. APPA has continued this initiative, and its body of literature is extensive. All members are encouraged to take advantage of these resources for professional development. From personal experience, I can assure you that you will be much better informed about your profession if you remain current through APPA publications.

Because of this strong commitment by APPA to improve facilities management through an aggressive publication program, I indicated in a recent issue of *Facilities Manager* that some APPA books would be reviewed in this column. Two such recent works are the subject of minireviews. Vinny Patel helps with the latest Mo Qayoumi book on electric metering, and I look at the latest information on deferred maintenance planning from Don Mackel and other experts concerning the situation at the University of New Mexico.

Finally, the future of higher education facilities, and indeed the entire academy, may be largely dependent on how well we handle information technology. I.T. has become a buzzword as we enter the new millenium, and Tom Bowen reviews the latest assessment of this electronic revolution.

—JMC

* * *

The Metering Guide for Managers, by Mohammad H. Qayoumi, Alexandria, VA: APPA: The Association of Higher Education Facilities Officers, 1999. 84 pages, softcover.

APPA, in collaboration with the Electric Power Research Institute (EPRI) and the International Facility Management Association (IFMA), has published this book about collecting and utilizing electricity consumption data. Since electrical deregulation is, or will be, a fact of life for higher education institutions, schools with more than just a few buildings in their inventory must have power usage information to implement effective energy management programs. The sponsors of this book wisely chose Mohammad Qayoumi to be the author, and, as usual, he responded with an excellent discussion on how to find the linkages between metering data and organizational needs.

The book is well written, technically precise, and based on years of experience with electric utility systems. The author includes a primer on basic statistics and measurement reliability in the appendixes to allow all readers to become comfortable with the procedures recommended in the book. The highlight of the book is the chapter on the management aspects of electric energy consumption, the area where institutions spend approximately five percent of their total budget. In this section, we learn about strategies to reduce electrical energy costs and how to implement an energy management plan. This book should be in everyone's library.

Dr. John M. Casey P.E.
Manager, Engineering Department
Vinod Patel, P.E. Head Design Engineer
The University of Georgia
Athens, Georgia

* * *

Charting a New Course for Campus Renewal, by Rod Rose. Alexandria, VA: APPA: The Association of Higher Education Facilities Officers, 1999. 53 pages, softcover.

This is a book about capital renewal and deferred maintenance (CRDM). But this is not just another book about what might

---

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.

happen; this is a book about what did happen, and the lessons learned from that event.

Former APPA President Don Mackel from the University of New Mexico chaired a symposium on "Successful Planning for Capital Renewal and Deferred Maintenance." The results and conclusions reached at this meeting were reported by author Rod Rose. Rose is the current executive editor of *Planning for Higher Education*, the journal of the Society for College and University Planning (SCUP). The symposium was organized as a result of a prolonged utility disruption that closed the institution for several days; the failure was a direct result of the deferred maintenance dilemma which is pandemic in the academy. The object of the meeting, which involved experts in both facilities management and higher education administration, was to improve the way the state of New Mexico managed the growing backlog of deferred maintenance. The book describes how the results of the symposium formed the foundation for proposing a successful CRDM plan, and suggests that the lessons learned in the New Mexico incident are appropriate for all members of the academy.

This is an excellent book which examines the very latest thinking on CRDM planning. It features discussions on the establishment of a common vocabulary for facilities terms, the value of a facilities audit, various planning models, methods of financing projects, and the need for collaboration to address the challenge of stewardship which is the essence of any CRDM planning model. The information presented in *Charting* is so important that all facilities managers should have a copy of this publication.

Dr. John M. Casey, P.E.
Manager, Engineering Department
The University of Georgia
Athens, Georgia

* * *

Information Technology in Higher Education: Assessing Its Impact and Planning for the Future, by Richard N. Katz and Julia A. Rudy, Editors. San Francisco: Jossey-Bass, 1999. (In collaboration with EDUCAUSE.)

Information technology is the schoolyard bully that eats higher education's lunch every day. Annually, colleges and universities pour millions into technology's feeding frenzy with little knowledge of either long-term direction or short-term benefits. Faculty and administrators know intuitively whatever is spent on technology will

benefit the institution and the student, but few definitive measures actually document the benefits of technology. However, a new monograph from Jossey-Bass's series on *New Directions for Institutional Research* provides information that may improve the situation.

Editors Richard Katz and Julia Rudy have compiled a set of essays in their monograph, *Information Technology in Higher Education: Assessing Its Impact and Planning for the Future*, that provides helpful guidance and illustrations of how institutions can account for and determine the value added by their investments in information technology (I.T.). They argue that, like it or not, higher education is evolving into an on-demand delivery mode like 24-hour banking and other service industries. As a result, colleges and universities must transform themselves to deliver "anytime, any place" instruction using information technology in a variety of teaching modes, from traditional lectures carried into distant classrooms to web-based classes that require little or no face-to-face interaction between student and instructor.

Institutions have responded rapidly to develop technology applications throughout each campus that improves administrative efficiency, enhances teaching methodologies, and expands research capabilities. Few colleges, however, have objectively evaluated the performance or effectiveness of their technology applications.

As an institution's main instrument of internal evaluation, institutional research offices must adapt their methods to analyze and report institutional resources according to new information technology modes of curriculum, faculty information, and financial analyses. This monograph offers the five chapter essays of case examples and prescriptions for institutions to assess, manage, and plan information technology resources effectively.

Authors Susan Foster and David Hollowell lead the discussion, asserting the importance of integrating I.T. planning into the broad context of institutional planning according to its mission, role, and goals. They stress the inclusion of technology—like water, electricity or any other utility—into every building construction or renovation project plan. They contend that information technology serves three levels in an institution: the physical—cable and network infrastructure; the logical—networks of servers and software; and the application resources—information management and support.

Foster and Hollowell draw an important distinction between I.T. governance and implementation, stating "I.T. without a governance structure is like government without

sunshine laws." They assign implementation responsibilities to work groups that are stakeholders in its success, not to governance agencies who establish policy and procedure. Foster and Hollowell identify three planning and budgeting themes for information technology, (1) leadership, (2) quality of resources and, (3) quantity of resources. They perceive I.T. planning as more tactical than strategic because emerging technologies create a need for unpredictable and immediate changes in institutional strategy. They view technology as "an enabler for achieving the institution's strategic objectives."

Foster and Hollowell end their contribution with a thorough discussion about financing information technology as an institutional investment. They insist funding must be a "direct and recurring infusion," allocated tactically much like capital maintenance funds are allocated annually. They suggest funds can be derived from redirection of existing revenue sources (such as savings on telecommunications license negotiations), from efficiency enhancements performed across campus, and from technology fee assessments.

The next three chapters describe assessment strategies and techniques employed in a variety of settings. In "Assessing the Academic Networked Environment," Joan Lippincott describes a project conducted by the Coalition for Networked Information (CNI) that evaluates campus network infrastructures. Following a brief review of CNI's history and philosophy, Lippincott explains the difficulty of accurately portraying an institution's investment in technology. Little information exists in consolidated form. Campus wiring projects receive funding enhancements in stages that stretch over several years, and specific technology features get included in a variety of equipment fund sources to help share the burden of the total cost. Thus, cost efficiency for assessment purposes becomes a trade-off for expediency and resourcefulness.

Lippincott provides a brief overview of current assessment projects taking place before explaining CNI's assessment project. She describes the technology network infrastructure environment as experimental and consistently changing and warns that because of the "risky" nature of the networked environment, network assessment projects should clearly state from the outset the purpose and intended use of results of the assessment to garner the full cooperation from network employees.

The CNI assessment project surveyed network operations at seven of nine institutions that responded to a call for participation. It focused on teaching and learning outcomes of technology applications, effectiveness of help desk and support services, and library and information resources. From this analysis, Lippincott prescribes a set of guidelines that institutions can use to examine the impact of campus networks on a college campus.

From the broad network perspective, discussion moves in the third and fourth chapters to specific measures taken at Indiana University and Virginia Polytechnic Institute and State University (Virginia Tech) to assess information technology at a major university. Indiana's assessment efforts focused on the quality of student computing services, while Virginia Tech examined the impact of technology on teaching and learning processes across campus. Both studies offered interesting insights into the attitudes and views of students and faculty on the use of technology, and results consistent with reasonable expectations.

Gerald Bernbom concludes the monograph, returning the reader to the macro-level perspective of information technology with his views about assessing information management at the institution level. He evaluates the campus information technology based on its consistency and reliability in multiple applications, its adherence to institutional rules and policies, and its support of "practices and priorities" within the institution. He finishes with a useful 12-item questionnaire to assess institutional information management practices.

Each chapter can stand alone as a strong position paper for information technology assessment. As a monograph, the work suffers from lack of continuity in writing styles despite good efforts of the editors in the opening notes. However, each section is filled with so much sound practical advice that any one connected to information technology will find it useful and helpful.

Dr. J. Thomas Bowen
Assistant Vice President for
Academic Affairs
The University of Georgia
Athens, Georgia

New Products

New Products listings are provided by the manufacturers and suppliers and are selected by the editors for variety and innovation. For more information or to submit a New Products listing, contact Gerry Van Treeck, Achieve Communications, 3221 Prestwick Lane, Northbrook, IL 60062; phone 847-562-8633; e-mail gerryvt@concentric.net.

Advanced Adhesive Technology presents AAT-372 Spray Grade Thin Spread Tile Adhesive. This fast grabbing adhesive is ideal for installing vinyl composition tile, asphalt tile and polyurethane-backed carpet tile. It can also be used to install most types of carpet padding. For more information call Advanced Adhesive Technology, 800-AAT-GLUE.

Sound Seal Signature Ceiling Clouds are suspended horizontally with an eye-hook attachment mounted to the cloud at the time of shipment. Clouds are highly effective treatment for the reduction of sound reflection. The face and edges of the glass fiber core are wrapped in fabric or perforated vinyl to match or accentuate the room design. For additional information contact Sound Seal Division at 800-569-1294.

Kee Industrial Products, Inc. announces the introduction of its new, easy to install KeeGuard roof edge protection system. Designed to ensure safe and efficient rooftop maintenance and construction activity, the modular guardrail system is completely freestanding, eliminating the need for drilling and penetration of the roof membrane. For complete details call Kee Industrial Products, Inc., 800-851-5181.

Panduit Corp. is pleased to offer its 100 page communications products catalog offering complete system solutions for managing, terminating, routing and identifying network cabling. For a free copy of the catalog contact Panduit Corp. at 888-506-5400.

Corbin Russwin introduces its new quick reversible mortise lock, the ML2000. The handing of this lock can be changed without removing the lockcase cover. The simple procedure takes less than one minute to accomplish, and the security of this lock is unparalleled. Additional information can be obtained at 800-543-3658.

Parabond introduces Detach, a fast acting, economical new flooring and adhesive remover. Detach solves one of commercial carpet installationís most difficult jobs - stripping out old flooring adhesive. Detach eliminates back-breaking work and costly heavy equipment when removing glued-down carpet and vinyl flooring without leaving any residue. Call Parabond for detailed information 800-763-7272.

BUILDINGTEAM.COM – THE CHOICE FOR PROFESSIONAL DEVELOPMENT INFORMATION

online

NEWS
CODES
PRODUCTS
CASE STUDIES
PROJECTS
COST DATA
RISK MGMT
A/E MGMT
CAREERS
C-CAMPUS
LINKS
EVENTS
VENDOR VIEWS
REGISTER NOW

Contact Us

C-CAMPUS
(ONLINE TRAINING)

- Delivering a cost effective way to master new skills or gain additional knowledge for building and construction professionals
- Stays current with issues and events that are reshaping the building and construction industry and provides you a breadth of course offerings to meet current and future professionals goals
- Continue your personal development when it is convenient for you by logging in and working at your pace 24 hours a day 7 days a week

CAREER CENTER
(UP TO DATE JOB LISTINGS)

- Focused on Architectural, Engineering and Construction firms in the building and construction industry
- Updated job listings are retrieved daily from over 100 sites
- Salary profile provides salary estimates based on title and experience
- Links to articles from leading building industry publications

www.buildingteam.com

IT'S FAST...IT'S FREE...IT SAVES YOU TIME!

Cahners. CMDGROUP DPIC Management Services Corporation

Coming Events

APPA Events

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

Jan. 23-27, 2000—*Institute for Facilities Management.* San Antonio, TX.

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

July 22-24, 2001—*Educational Conference & 88th Annual Meeting.* Montreal, Canada.

APPA Chapter Meetings

May 17-19, 2000—*TNAPPA: Tennessee APPA Meeting.* Paris Landing State Park, TN. Contact Mike Davis, The University of Tennessee at Martin.

May 28-31, 2000—*GAPPA: Georgia APPA Meeting.* Jekyll Island, GA. Contact Wayne Dill, University of Georgia.

Other Events

Dec. 15-17—*Improving America's Schools.* Chicago, IL. Contact U.S. Dept of Education, 1-800-203-5494.

Jan. 7—*Innovations in Facilities Management, Custodial/Housekeeping Services and Grounds and Landscape Services educational seminars.* Long Beach, CA. Contact Suzanne Wallace, California State University, Long Beach, 562-985-2286 or swallace@csulb.edu.

Feb. 6-8—*Alliance 2000: Security Industry Forum.* Amelia Island, FL. Contact the Security Industry Association, 703-683-2075.

Feb. 20-26—*National Engineers Week.* Contact the National Engineers Week Headquarters, 703-684-2852.

Feb. 23-25—*13th Annual IDEA College/University Conference.* Vancouver, British Columbia, Canada. For more information, contact IDEA at 202-429-5111 or idea@dc.sba.com.

March 2-4—*2nd Annual CSI Project Representative Academy.* San Diego, CA. Contact CSI Customer Service, 800-689-2900.

March 7-8—*Roof Inspection, Diagnosis & Repair.* San Francisco, CA. Contact The Roofing Industry Education Institute, 303-790-7200.

March 26-29—*ACCED-I 20th Annual Conference.* San Diego, CA. Contact The Association of Collegiate Conference and Events Directors International, 970-491-5151.

April 24-28—*ThermoSense XXII: Applications in thermal imaging.* Orlando, FL. Contact, Ralph Dinwiddie, 423-574-7599.

April 27-28—*Roof Assessment Management.* Chicago, IL. Contact The Roofing Industry Education Institute, 303-790-7200.

May 22-25—*Roof Repair & Maintenance.* Denver, CO. Contact The Roofing Industry Education Institute, 303-790-7200.

Index of Advertisers

THE FAMIS ASSET ENTERPRISE

What Do You Want In A Facility Management System?

Maintenance Management

Space Management

Calibration Management

Inventory Control

Tool Control

Key Control

Event Management

AutoCAD Interface

Web Site

How about everything?

You could buy a maintenance management system from vendor X and a space management system from vendor Y and try to force the two to talk to each other. Or you can take a look at Prism Computer Corporation.

Prism's FAMIS Asset Enterprise is a suite of integrated software modules for managing facilities. Since each module is designed to work together, you can easily create the ideal facility management solution for your organization.

And with our advanced technology, you can also easily expand the FAMIS Asset Enterprise to people outside of your organization to create a true enterprise-wide system. For example, you can electronically communicate with your customers using the World Wide Web. You can also integrate it with Oracle Financials, SCT BANNER and just about any other financial system using our FAMIS Open Financial Interface.

The FAMIS Asset Enterprise is based on pure Oracle technology and supports Windows, Windows95/NT, Macintosh and Power Macintosh.

To find out a better way to manage your facilities, call us today at 800-774-7622 or visit our web site at www.prismcc.com.

on ORACLE

PRISM

PRISM COMPUTER CORPORATION
TELEPHONE 800-774-7622 / FAX 714-553-6559
E-MAIL: famis@prismcc.com http://www.prismcc.com