Project Costs & Investments

Institute for Facilities Management

Why does it cost so much??

High Compared to What?

Frame of reference

High Compared to What?

Compared to residential construction

High Compared to What?

Compared to commercial construction

Comparisons Are Not Valid

- **Residential** – Designed and built for light traffic and medium life, high importance placed on aesthetics
- **Commercial** – Designed and built for medium traffic and short life, high importance placed on function
- **Institutional** – Designed and built for heavy traffic and long life, high importance placed on aesthetics and function

Bottom Line…

Costs for campus projects rank among the highest in the market…

Bottom Line…

Costs for campus projects rank among the highest in the market…

…and would we want it any other way?

Bottom Line…

These higher costs are by and large a reflection of sound total-cost-of-ownership decisions being made.

Total-Cost-of-Ownership

What do we mean by total-cost-of-ownership?

Total-Cost-of-Ownership

What do we mean by total-cost-of-ownership?

TOC = Total Project Cost (D+C+F) + Operating Costs + Capital Renewal or Deferred Maintenance + Decomissioning

Cost vs. Investment

Higher capital investments can lower the total-cost-of-ownership.

Many incremental investments we make in a capital project yield attractive savings.

Therefore a higher project investment may be in the best interest of the institution's bottom line.

Why the High Cost?

How do you fit these marbles into this jar without increasing the size of the jar, reducing the number of marbles, or breaking the marbles.

Why the High Cost?

- Sense of Place
- Codes, Regulations & Standards
- Complexity
- Institutional and Statutory Requirements
- Time Pressures
- Maintainability, Sustainability & Longevity

Sense of Place

Institutional Vision

Our institutions choose to build above the baseline

Institutional Vision

The physical environment creates the visual and tangible image of our institutions

Institutional Vision

In short, the facilities we construct reflect the vision and aspirations of the institution

Image Comes at a Price

Institutions are competing for national and international recognition

Noel-Levitz and Carnegie Foundation studies reveal the impact the physical environment has on prospective students

Marketing

As students increasingly select colleges based on what they can see, colleges will spend more money on that which can be seen.

Rigor in the classroom and intellect in the faculty cannot easily be seen – certainly not as easily as a fitness center or a three story granite fireplace.

Architectural Character

Building designs make statements

Both exteriors and interiors

Quality is in the Details

Prominent entrances
Hidden downspouts
Buried utilities
Screened trash receptacles
Underground/screened cooling towers
Discrete service access
Site amenities/Art
Extensive and intensive landscaping

Preservation of Land

Importance of green space

Optimizing building footprints

Cost of building upward

Quality Comes at a Price

We are not just building structures…
…we are creating a "sense of place"

Codes, Regulations & Standards

Gathering Places

Large assemblies drive our facilities into a higher level of life safety design

Code requires rated corridors, stair towers, fireproofing, fire alarm systems, sprinklers and smoke evacuation systems

Legislative Mandates

Federal, state and local regulations add cost burdens to our facilities

- Asbestos abatement
- Hazardous waste removal
- Storm water runoff
- Air quality control
- Dust, noise & vibration controls

Universal Design

Universities facilities must not only be compliant with ADA, but are increasingly expected to go well beyond the minimum requirements.

HVAC Standards

Labs are intensive energy consumers

Classroom and assemblies are also intensive

Ventilation requirements drive up the size and cost of mechanical systems.

- Complexity

Complex Facilities

Sophisticated research facilities

High occupancy and specialized venues

Intensive technological environments

Complex Mechanical Systems

Designed for extreme conditions
Hottest and coldest temperatures
Humidity extremes
Strictest controls
Highest occupancy
Fault detection
Measurement and verification

Structural Loading

Heavy floor loadings

Column-free spans

Access & Security

Mixed Use Facilities

Combine classrooms, laboratories, meeting rooms and offices under one roof

- Institutional & Statutory Requirements

Statutory Requirements

Procurement Statutes
Prevailing Wages
Project Labor Agreements
MBE/DBE/TSB Programs
Insurance
Bonding

Institutional Constraints

"Protected environment" of the campus

Minimize campus disruptions

Restricted building sites

Limited access & staging space

Challenging Logistics

Restricted construction traffic

Complex phasing schemes

And…

Additional Requirements

Noise restrictions
Fencing and protection
No Parking
No Smoking
Litter-free, weed-free work site
Full time supervision
Elevated safety expectations

Time Pressures

Time Constraints

Immovable completion dates

Compressed construction windows

- Maintainability, Sustainability & Longevity

Stewardship

Designing for low life cycle cost requires higher initial investments:

- Energy efficiency
- Maintainability
- Long life
- Adaptability

Adaptability

Overbuilt utilities and utilities pathways necessary for flexibility and growth

Adaptability

Increased floor to ceiling heights lower future renovations costs

Durability

Campus facilities subjected to frequent cycles of use

Durability

Durability important component of doors, hardware, carpeting, restrooms, furniture, etc.

Durability

Much of our deferred maintenance backlog is due to short-sighted life cycle decisions

Reliability

Reliable electrical and mechanical systems are essential to our institutional missions

Reliability

Higher cost for providing emergency power, redundancy, generators, UPS systems, and centralized utility systems

Sustainability

Higher education is "LEED"ing sustainable design efforts

- Managing construction waste
- Renewable-sourced building products
- Porous pavements
- Green roofs
- Gray water systems
- Other

A Postscript

What About Renovations?

Renovations

Often modifying existing conditions is more expensive than starting new

Renovations

Buildings built just a generation ago may not have the infrastructure for today's renovations

Renovations

Investments in renovations must often be made to correct the "sins of the past"

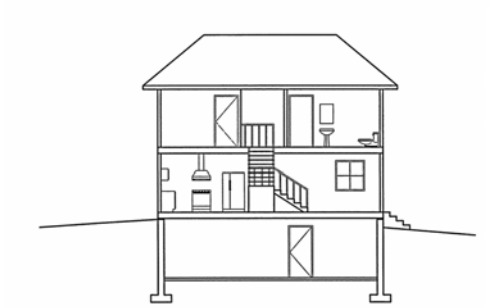
Renovations

Renovations magnify the perception of high cost because they commonly fall in the realm of personal expenditures… thus heightening the "sticker shock" experience

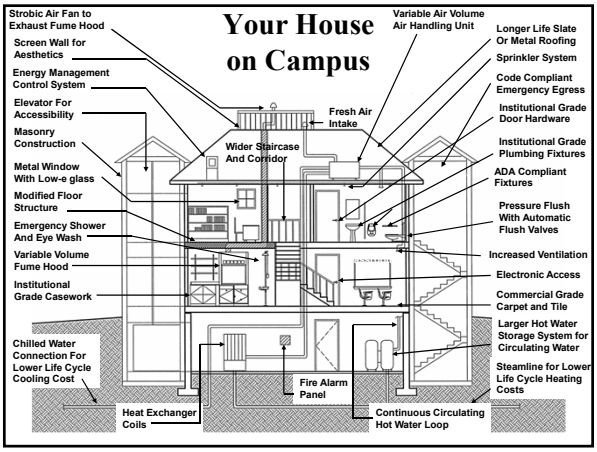
Renovations

Inevitably, comparing institutional renovation costs to residential housing investments…

Your House



Your House on Campus



Why the High Cost?

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- Sense of Place
- Codes, Regulations & Standards
- Complexity
- Institutional and Statutory Requirements
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- Maintainability, Sustainability & Longevity

In Summary…

- Stewardship demands a long term view of project investment decisions
- Investments are made with total-cost-of-ownership as our compass
- Excellence is in the details - thousands of cost additive details
- Construction costs mirror institutional values, demands and aspirations

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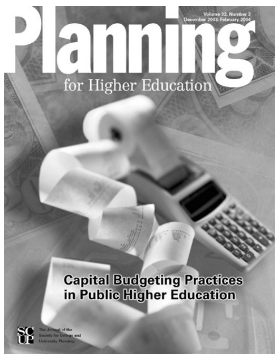

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Planning
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Editorial Review Board

The High Cost of Building a Better University

Higher education facilities seem to come at premium cost, even taking into account that educational facilities tend to cost more. The authors argue that this is due to appropriate and strategic high aspirations.

by Donald J. Guckert and Jeri Ripley King

Don Guckert recently joined The University of Iowa as the associate vice president for facilities. Previously, he was the director of planning, design, and construction at the University of Missouri-Columbia. He serves as dean of planning, design, and construction for The Association of Higher Education Facilities' (APPA's) Institute for Facilities Management and sits on the Construction Specifications Institute (CSI) editorial advisory board for *The Construction Specifier*. He has authored several articles for APPA's *Facilities Manager* and CSI's *The Construction Specifier* and served as editor for APPA's publication *From Concept to Commissioning: Planning, Design, and Construction of Campus Facilities* (2002). He has been a member of SCUP since 1993.

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Coauthors Don Guckert and Jeri King received APPA's 2003 Rex Dillow Award for Outstanding Article for "The High Cost of Building a Better University."

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Higher education design and construction project managers perform their work on the forward-edge of an ever-changing world. We face increasingly complex facilities, shortening time lines, proliferating code and regulatory requirements, emerging technologies, and growing concerns for indoor air quality and environmental sustainability. As we strive to keep abreast of these changes, we continue to hear one question from governing boards, administrators, and customers: Why does it cost so much?

We cannot deny that educational facilities cost more to build than many other types of construction. Even in the realm of education, there is a hierarchy ranging from sophisticated research facilities to parking structures. Yet, all our facilities seem to come at a premium cost. Lower cost alternatives are always available, but our institutions choose, instead, to build to a quality level that is above the baseline. These choices flow from the institution's vision and strategic plan. The facilities we construct reflect the values and aspirations of our institutions.

A Sense of Place

Many universities are vying for national and international recognition. To do this, they compete for students, faculty, and research funding. More than ever before, university building designs are viewed as enhancing and preserving our institutional heritage while creating an attractive environment in which to learn, discover, and live. We do not just build or renovate structures; we create a "sense of place."

Clearly, this sense of place plays an important role in marketing the institution. In a 2001 study of college-bound high school seniors by Noel-Levitz, a market research firm, the most notable experiences seniors encountered on their best college visit had to do with the appearance of the campus and its facilities (Noel-Levitz 2002). This study confirmed the 1986 report by the Carnegie Foundation for the Advancement of Teaching that found that for 62 percent of prospective students, the most influential factor during a campus visit was the appearance of the buildings and grounds (Carnegie Foundation for the Advancement of Teaching 1986).

We do not just build or renovate structures; we create a 'sense of place.'

The attractive appearance of the grounds and buildings comes at a cost. In constructing a new building for a campus environment, we seek elaborate designs that convey emotions and reactions that range from stimulating debates over architecture to communicating notions of continuity and timelessness. Often the little extras add a lot to the quality of the built campus environment: prominent building entrances, buried utilities in tunnels and chases, hidden downspouts in interior walls, screened waste receptacles, underground cooling towers, discrete access for service vehicles, and extensive landscaping and courtyards.

Land must be used carefully, with attention to gathering places and circulation. The need for green space must balance the need for building space. This drives us to optimize building footprints by building skyward and below grade to conserve precious campus real estate. Multiple stories require more costly foundations and structures designed to withstand seismic and wind loading standards. Stair towers and elevators consume project resources and decrease the percentage of assignable space. All these factors lead to a higher cost per square foot.

Codes, Regulations, and Standards

The type of occupancy determines the applicable building code requirements. The large assemblies found in most university facilities dictate the highest level of life safety design. These code requirements have a tremendous impact on cost by requiring stair towers, fire-rated corridors, fireproofing on structural members, fire alarm systems, sprinklers, and smoke evacuation systems. Even the grade of carpeting in a university facility is selected to minimize concerns about flame spread.

In addition to codes, building design and construction must meet a myriad of legislative mandates and regulations. The list reads like alphabet soup: ADA, EPA, OSHA, and more. These laws and agencies govern building accessibility, removal of hazardous waste, asbestos, light ballasts, lead paint, storm water runoff, construction dust control, noise control, and more. Then, there are the state permits, local permits, contracts, agreements, and requirements by donors and funding agencies that must be managed.

The type of facility and occupancy also drives ventilation requirements. Labs require more ventilation than classrooms; classrooms require more ventilation than offices. Increased ventilation leads to upsizing HVAC systems, because outside air must be heated or cooled before it is delivered to the finished space. In a trend toward thwarting indoor air quality problems, building mechanical codes have increased ventilation requirements far beyond the infrastructure capacities in many buildings built before the 1990s. The impact is profound on renovation projects where HVAC costs alone can consume the majority of the project budget.

Institutional and Statutory Requirements

Institutional and statutory requirements can drive up costs too. Contractors must provide the highest industry coverage for insurance and bonding and construct in accordance with the highest industry standards. Architects may be required to furnish professional liability insurance. Public owners must follow state procurement statutes, which increase design and bidding costs and constrain the use of more cost-effective delivery approaches. Many institutions require contractors to pay prevailing wages to their workers, equating to union-scale.

An often overlooked impact on cost is the expectation that construction activities will be conducted with minimal disruption to campus life. The campus is a protected environment that accommodates learning, social interaction, discovery, living, dining, recreation, and public service. As invited guests into this haven, contractors are required to conduct their activities in a manner that minimizes the impact on the institution's primary missions. This is not a typical construction site. Project costs go up dramatically when universities restrict access to building sites; limit space for staging; require off-campus parking; enforce

jobsite cleanliness; add fencing and protection; route construction vehicles around, rather than through, the campus; limit noise and hours of operation; and impose complex phasing schemes to accommodate academic calendars.

Time Is Money

Demanding schedules are an inherent part of higher education design and construction efforts. In general, shortening the time line will drive up costs, lengthening the schedule will drive them down. An aggressive three-month renovation will be unaffordable if we only allow six weeks for completion of the work. Conversely, easing the schedule to six months will yield savings.

Contractors, when bidding a shortened schedule, will increase their bids to reflect overtime payments to workers, incentive payments to vendors, reduced worker productivity, and contingencies to cover the risks of falling behind schedule or completing late. On the other hand, extra time in the schedule reduces the contractor's risk, facilitates effective coordination among subcontractors, and provides sufficient time for fabrication and delivery of materials and equipment and other accommodations that result in a more cost-effective project delivery.

More often than not, we aggressively work toward inflexible milestones, such as semester starts and athletic event schedules. In research environments, the need to be up-and-running is paramount. When the higher education environment demands design and construction projects delivered on increasingly shorter time lines, this drives up the cost of university projects.

Complexity

The facilities we build are among the most challenging in the building construction industry. We build state-of-the-art research facilities, high-occupancy performance and athletic venues, heavily trafficked and technological learning environments, and living and social environments that must appeal to a new generation. In short, we are constructing complex communities.

Program activities often dictate the need for a combination of classrooms, laboratories, meeting rooms, and offices. Although grouping one type of activity in a facility would reduce costs, our buildings rarely house only one type of activity. In addition, they must meet the functional requirements of the campus environment.

For example, classrooms and auditoriums are usually on the lower levels of a building and demand larger, column-free spans. The lower levels may then have to support upper floors designed to accommodate floor loadings for bookshelves and lab equipment. Inverting these spaces, by placing the column-free classrooms on the upper floors and the heavy load-bearing spaces on the lower floors, would be more cost-effective but less functional in a campus setting.

Our facilities must accommodate a mix of functions and heavy traffic. To manage this, we install complex building systems. Mechanical systems are designed for extreme conditions: hottest and coldest temperatures, humidity extremes, strictest climate control, and highest occupancy. We recognize that the design of a mechanical system represents the greatest opportunity for energy conservation in the future. Investments in energy-efficient mechanical systems will yield a lower stream of future utility costs.

Maintainability, Sustainability, and Longevity

Good stewardship involves constructing buildings that will last, buildings that can be easily maintained, and buildings that can be converted to other programmatic or technologic uses in the future.

With many people using university facilities in frequent cycles throughout the course of a day, not only do the structures need to be able to handle this, but also the components of these facilities must be of a quality to withstand constant heavy use and abuse. Because of the campus building boom in the 1960s, we know all too well the consequences of cheaper designed and constructed

> Environmental sustainability is another factor having an increasing impact on construction costs within higher education.

facilities that were not built to survive the test of time. Our requirement for durability raises the price of doors, door hardware, carpeting, entrance mats, floor tile, and restroom fixtures, but it lowers the future costs of maintaining and replacing the lower quality products. We are resolved not

Your House on Campus

by Donald J. Guckert and Jeri Ripley King

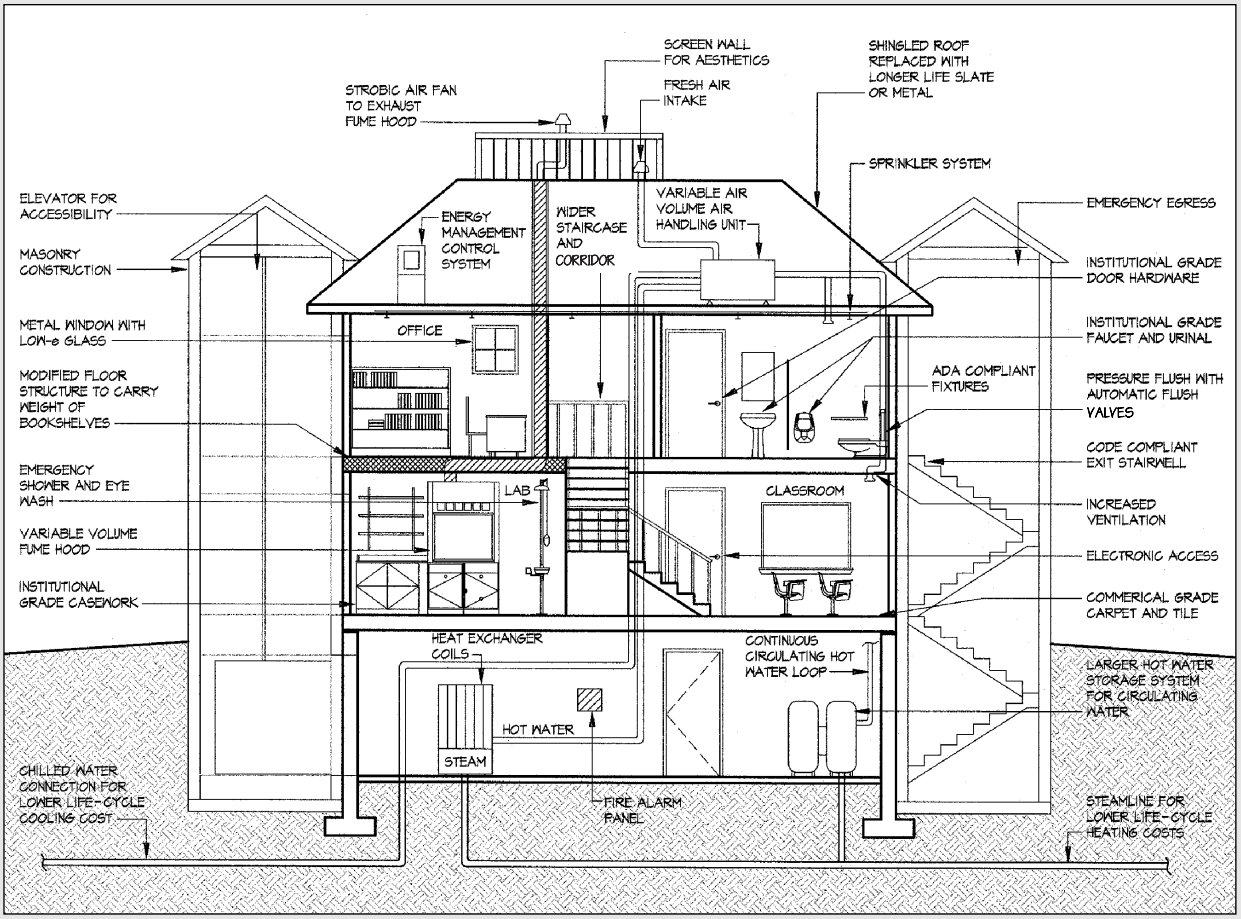
"You've got to be kidding! I could build a nice house for that amount!"

How many times have we heard that the cost of a "simple" renovation would buy a high-end home in a nice neighborhood? Customers typically react with sticker shock over the cost of a campus renovation when they receive the initial project estimate. This is the point at which worlds collide; where the institutional construction world of the project manager meets the customer's residential construction frame of reference.

Trying to justify the costs of institutional construction within a residential frame of reference is not easy. These two types of construction are a world apart. However, just for the fun of it, we wondered, what would it take to renovate your house into a campus facility? Suppose you request that we renovate the living room into a classroom, the kitchen into a lab, and the bedroom into an office. In addition, you request that this facility is located on campus. Let's take a walk through your house (figure 1) to see what we will need to do.

To begin with, we'll need to make the facility safe and accessible. We'll add an elevator to the second floor, and an exit stair tower connecting all floors to the outside. To make this building look like it belongs

Figure 1 **Your House on Campus**



on our campus, we'll arrange for matching towers and give the building an identifiable look. Unfortunately, this will add considerable cost and space to the building while not adding any space for program needs. After we widen the interior hallways and stairways for increased traffic and install a utility chase from the basement to the attic, we will actually reduce the amount of assignable space.

As a university facility, the house will fall under a different classification as far as building codes are concerned. This means we'll need to replace the $15 battery-operated smoke detectors with a $15,000 fire protection system. This system, which includes a fire alarm panel, wired sensors, and sprinkler system, meets all of the requirements of the local fire marshal. To inhibit the spread of flames and smoke from one room to another, we will have to reconstruct the walls that separate the rooms from the hallway and make them "fire-rated walls." This is not cheap! The solid doors mounted to the metal doorframes that we'll use to replace the house's hollow doors and wooden frames are also not cheap.

We know the budget for this renovation is limited. Before the money runs out, we need to look at the mechanical systems. By code, our lab, classroom, office, and restroom require outside ventilation that your house doesn't have. The small air-conditioning unit and gas furnace will have to go. With the big increase in airflow, it wouldn't keep up after the first five minutes. We'll connect to chilled water and steam from our central plant. Our campus building will need redundant, dependable, code-compliant, and cost-effective mechanical systems.

Finally, we move to the kitchen. To convert it to a lab, we'll take out the $600 kitchen stove and hood and replace it with a $25,000 variable flow fume hood. Let's hope we won't need a strobic air fan for that hood; you don't even want to think about that cost. Those kitchen cabinets will come out to allow for the built-in lab casework. The refrigerator will have to go, too. In its place will be a $10,000 environmental chamber. We'll open up the walls when we install the lab gases, electrical conduits, and corrosion-resistant plumbing. While we are in the walls, let's replace the wooden studs with metal studs. Then, to complete this "kitchen remodeling," we'll replace the linoleum with an $8,000 epoxy floor, and the Formica counters with epoxy resin.

We're going to need to remove the ceiling above the kitchen to increase the structural support necessary to handle the small library in the office above. The anticipated weight of books will stress the existing floor joists. While the ceiling is open, we'll install the circulating hot water system, designed to serve the lab and restroom, and we'll upsize the mechanical ductwork to meet the new airflow requirements. Speaking of airflow, that "whooshing" sound will be distracting in the classroom next door, so we will need to put in sound attenuation devices.

To meet institutional standards, the wooden windows will need to be replaced with metal, commercial-grade windows that have energy-efficient glazing. Similarly, the roof shingles will need to be replaced with slate, due to concerns about life-cycle maintenance and architectural consistency. While we're on the roof, let's screen the unsightly mechanical systems. Oh yeah, we can't forget to do something about the pigeons.

Let's look at the outside again, just for a minute. Only the front facade was bricked when your house was originally constructed, so we'll need to install bricks on three sides. After all, our university is trying to project a certain image, and your house is now on campus.

At this point, we have more scope than budget. Money is running out, and there are more things we need to do to bring your house into compliance with our institutional standards.

What happened here? In trying to meet the more stringent codes, efforts to reduce future operating costs, aesthetic requirements, and programmatic needs, we exceeded the funds available for this renovation. For the money this renovation will cost, you really could build a nice house. But not on our campus!

to repeat the shortsighted mistakes that were made by a previous generation of campus administrators and facilities managers.

The way we use our facilities demands that we construct utility systems within the building to high reliability standards. This often results in paying for system redundancies, generators, uninterruptible power supply systems, harmonics reduction, and central utility systems. In addition, telecommunication/computer wiring and pathways are often overbuilt to enable user flexibility and save the expense of rewiring and reconstructing walls or ceilings in the near future. We have learned that planning for tomorrow can cut down on the costs of retrofitting existing buildings.

Higher education constructs buildings to last beyond our lifetimes.

Environmental sustainability is another factor having an increasing impact on construction costs within higher education. Facilities are being constructed with recyclable materials, materials that are certified as manufactured from renewable sources, and building and system designs that use progressive methods and technologies to conserve energy and reduce the waste stream. Pursuing Leadership in Energy and Environmental Design (LEED™) certification, developed by the U.S. Green Building Council, brings the prestige and positive publicity sought by many institutions seeking a progressive and environmentally sensitive image. However, this comes at a higher cost.

Making these long-term, sound, investment choices is what separates higher education from the vast array of other building environments. Higher education, more than any other built community and commercial environment, constructs buildings to last beyond our lifetimes. Every institution with an active building program envisions itself in existence into perpetuity. We make the choice to invest in higher quality construction of our campus, in part, because we have so many years ahead of us to reap the benefits on these initial investments.

Why Does It Cost So Much?

It is said that excellence is in the details. Thousands of details go into the construction of a university building. Rarely can we point to one item as driving the high project cost. The high cost of university construction is caused by the accumulation of investments in all of the details that go into building a quality facility. If we are to compete with the best institutions, we must meet the demands for higher quality facilities.

Construction costs mirror the values and aspirations of the institution. Our universities choose to provide stimulating, enriching environments that will serve our students, faculty, and researchers well into the future. We are building a better university, one that is built on the traditions of the past and constructed to compete for faculty and students into the next century.

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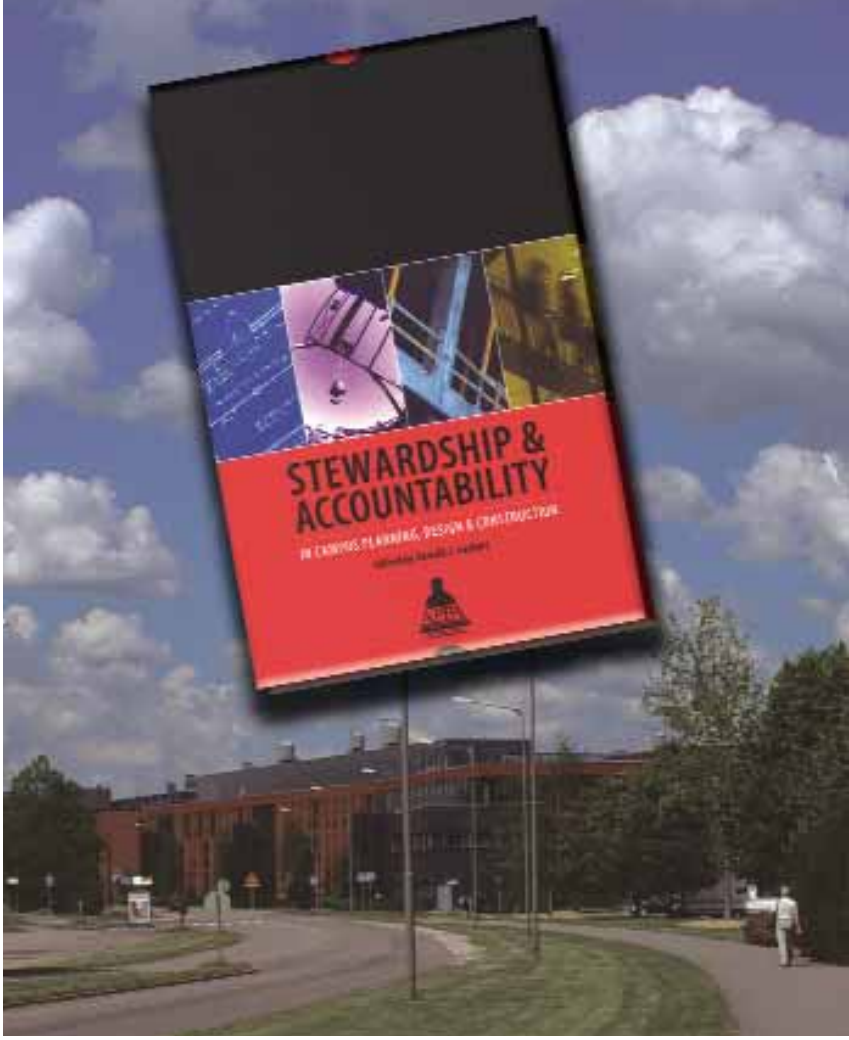
Designing for Stewardship:

Aligning Project Decisions with the Total Cost of Ownership



By Donald J. Guckert, P.E. and Jeri Ripley King

As the dust begins to settle after the building boom of the past decade, campus administrators and governing boards have developed a heightened sensitivity and awareness of the commitment necessary to support their expanded facilities portfolios. Many are discovering that their facilities require financial obligations of an unexpected magnitude. Others, however, are celebrating the completion of projects that employed commissioning and sustainable design and are therefore touting the institutional successes attained by serving as good stewards of limited resources. Nevertheless, all are learning that the decisions they make about projects have long-term implications for future budgets.

Project budgets have long been the responsibility of facilities project managers, who balance the scope of the project and the time it demands against the budget for the project. However, institutional budgets include costs required for operating and capital renewal for the completed project, and these budgets have been the responsibilities of others. Thus, administrators now recognize the impact that early decisions have on the operation and renewal of a building and are therefore starting to hold project managers accountable for ensuring that the decisions that are made and the scope of the project that has been determined take into account the optimal return on the institution's investment in the project. To meet this requirement, project managers will need to align their craft—creating physical assets—with the long-term stewardship of the facilities for which they are responsible.

A stewardship approach to the planning, design, and construction of campus facilities is based on a comprehensive perspective of the total financial and operational impacts that a facility will have on the institution. Moreover, the planning horizon for a facility that is yet to be built is extended through its complete life cycle and into the far reaches of the university's resources—both financial and human—that will be affected. Because of the long-term impact that project de-

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cisions will have on the institution, decision making needs to be increasingly institution-based rather than customer-based. Meeting this demand is particularly challenging because of the forces that push against making the best long-term financial decision.

Competing Perspectives

Project managers have long been expected to serve a myriad of often competing needs and interests in order to serve multiple institutional customers and stakeholders. There is undeniable tension in negotiating the scope of trade-offs, which must be made to fit the needs and desires of the customers within a project budget that never seems quite large enough. Predictable clashes occur at points when the customer-driven program and architectural design meet the institutionally driven concerns for cost-effective operations and maintainability. A classic example of this problem is the case of a customer who wants to move dollars earmarked for the mechanical room to the atrium at the same time that a facilities manager wants to move dollars from the atrium to the mechanical room. Compounding the issue is the disjointed higher education financial model created by separate funding sources for capital costs and the long-term operation and eventual capital renewal of the facility. This creates a disjointed financial model that logically leads to competing perspectives.

After successfully raising funds for the planning, design, and construction of a building, deans, department chairs, faculty members, and development officers frequently turn to the campus administration to ante up the finances needed to support the operational demands of the facility. Over the years, faced with rising costs and budget constraints, institutions have tended to either underfund or fail to fund the operating costs of new facilities. Even when adequate operational monies are dedicated initially, in future budget cycles the funding is at risk of being reduced when budgets are tight. This situation has a tremendous impact on operational staff's ability to serve users' needs. Project managers can help by making decisions that assume that the operating money will never be proportionately more than the amount that has been allocated the day the building opens.

Similarly, campus administrators and budget officers, faced with the challenge of funding the operation of the new building, have not been focused on annually investing 1 to 2 percent of the building's replacement value in order to address capital renewal needs that will occur 20 or 30 years down the road. To plan, design, and construct facilities that will mitigate these costs, project managers should have an understanding of how operations staff care for the facility, what resources the facility will consume over its life cycle, how and when building systems and components will be renewed, and how and when the building will be decommissioned when it reaches the end of its useful life. By looking at the total life cycle of the asset, rather than at the life of the project, the project manager can guide the planning and decision making involved in the project according to the total cost of ownership.

Total Cost of Ownership

The total cost of ownership is a composite of building costs from concept for the original design through decommissioning or demolition. The amount includes design and construction costs, operating costs, and the costs associated with plant renewal. Thus,

Total Cost of Ownership = Total Project Cost + Operating Costs + Capital Renewal or Deferred Maintenance + Decommissioning

From the perspective of total cost of ownership, the capital cost for a new building represents less than half of the total cost of ownership during the life of the facility. The costs associated with renewal and operations (maintenance, custodial care, and utilities) are just as important as the cost of designing and constructing a building.

Project managers are well aware of the "first costs"—the project costs related to the design and construction of both new buildings and renewal or renovation costs. But to understand the total cost of ownership of a building, project managers also need to understand operating costs: the annually budgeted expenses for all activities necessary for the routine, day-to-day use, support, and maintenance of a building or physical asset. This budget item includes the costs required for routine maintenance, minor repairs, preventive maintenance, custodial services, snow removal, groundskeeping, waste management, energy, and utilities. Within the myriad of operating costs, energy consumption is generally the highest and often commands the most attention in the design of the facility. However, the cumulative effect of all the other operational needs can also have a profound impact on annual operating budgets.

Decisions made in the design phase of a project frequently pit programmatic needs and desires against institutional financial interests. Project managers generally are not in a position to make this decision unilaterally. Instead, campus policies and standards can set minimum institutional requirements for the decision making involved in the project.

Standards

Having an institutional baseline for standards of design and construction can help to ensure a total cost of ownership approach to decision making. Just as state and local building codes, fire and life safety codes, and the Americans with Disabilities Act (ADA) establish minimum standards that protect the public interest while using a facility, campus design standards should be developed, implemented, and enforced to protect the institutional operational and financial interests in the project. No one would debate whether a building's design should comply with fire and life safety codes; similarly, there should be no debate about whether to invest in money-saving

energy-conserving systems, or whether equipment that requires servicing should be designed for safe access by maintenance workers.

Over the last two decades, an increasing number of campuses have developed institutional design standards. Recognizing the value of such standards, the project management staff usually has taken the initiative to develop and revise the institution's design standards manual. These design standards generally apply to materials, equipment, building components, design guidelines, and design details that campus stakeholders and service providers have found to facilitate the facility's serviceability and cost effectiveness. However, the initial standards were often based more on preferences than on sound life cycle cost principles. In these cases, there may be a perception that the standard has been "gold plated," leading project managers and customers to become critical of design standards that were determined primarily by stakeholders. To avoid this perception, standards should seek to be based on the best life-cycle value.

Standards should take into account that the best life-cycle value does not mean always specifying the building component that has the lowest cost of maintenance. Instead, the best life-cycle value should be a balance between the initial cost and the operating cost of a component. Generally the higher quality, higher cost item will yield a longer service life—but often only to a certain point. Sometimes, the total cost of ownership can be lower when a component that has a lower cost and lower quality is used.

Design standards should also incorporate qualitative decisions that are not based solely on the total cost of ownership. A prime example is the debate between users and custodians about classrooms that have a hard surface versus carpeting. When viewed from the total cost of ownership only, hard surfaces will win every time. However, the quality of the acoustics in the classroom, which cannot be measured in dollars, generally points toward carpeting for the better classroom learning experience. Project managers should still facilitate this discussion with users and custodians, and all should recognize that decisions involve more than just the bottom line.

Developing campus design standards that reflect both institutional qualitative and quantitative priorities demands hard work and commitment. Effective standards are those that involve all invested parties in a collaborative effort.

Collaboration

The most successful project managers in educational facilities are those who have discovered the richness of the body of institutional knowledge that lies within the operations, maintenance, and utilities staffs. Institutions achieving the highest level of success with a total cost of ownership approach are those that have developed enabling procedures and processes that tap into operating staffs as resources for reviewing plans, developing standards, and commissioning buildings.

Commissioning, in particular, has served the needs of users and operating staff by ensuring that facilities are built systematically to comply with standards of quality and serviceability. The days of "working the bugs out" of new facilities for the first four seasons of operation are quickly disappearing, as operations staff members work side-by-side with project managers to design, inspect, test, and accept building components and systems prior to occupancy. Customers are now enjoying their new and renovated facilities with fewer needs to call back facilities management staff or contractors to correct deficiencies. The integration of the skills and knowledge of the project manager and the operating staff—coupled with the enormous benefit this

collaboration provides to users and operating budgets—is the reason why the concept of commissioning is changing from that of a best practice to a standard practice.

Another example of the power of collaboration is found in the increasing popularity of sustainable design. The interests of customers, project managers, and operations staff are converging through efforts to reduce energy costs and resource consumption involved in new and renovated facilities. Sustainable design generally is a customer-based initiative that builds on the tools of commissioning and design standards and drives better institutional decision making that is aligned with total cost of ownership principles.

The reason why collaboration is so effective for sustainable design projects is that the customer, project manager, and facilities operator align their various perspectives to reach a common goal. The customer wants the image and reputation that sustainable design brings; the project manager enjoys the challenge of thinking creatively about meeting the goals for sustainable design; and the facilities manager achieves an outcome that requires fewer resources to be consumed. As a result, the institution gets a physical asset that is designed for effective stewardship and for the lowest cost of ownership.

If the goal of good stewardship represents the destination for project managers, understanding expectations is the road map that gets them there. The challenge for the project manager is to understand the expectations of the customer, the institution, and stakeholders before making the trade-offs and sacrifices that will accomplish the goal of facilities stewardship.

Whether the project manager is faced with competing perspectives, the need to develop standards, or the requirement to take into account the demands of many stakeholders whose interests are represented by the total cost of ownership, the key to effective project management is alignment with facilities stewardship. By using the compilation of institutional understanding of building systems, operations, and construction, the project manager can produce a life-cycle approach to facilities operations that goes well beyond the design and construction of a building. Collaborating with others enables project managers to solve complex problems and formulate a comprehensive facilities strategy for long-term stewardship.

Conclusion

As project managers accept responsibility for decisions that will affect long-term institutional needs, they are transforming their accountability to capital projects from first cost to total cost. This transformation needs to be built on a solid foundation that takes into account competing perspectives, develops defensible standards, and provides collaborative compilation of knowledge that can help align decisions to facilities stewardship. Overall, the decisions made today will have an impact on creating, providing, and caring for the physical facilities that provide a place for current and future generations of individuals involved in academic pursuits.

Adopting a long-term stewardship approach accepts the fact that individuals come and go, but our institutions live on. For generations to come, the institution will live with consequences of the decisions made during a relatively brief design period. As project managers wrestle with the day-to-day challenges posed by new projects, using facilities stewardship as their compass will guide them toward the right choices and decisions to make when considering the design and construction of a facility.