

Yale Streamlines Construction and Renovation Process

New System Saves University Millions

Published August 2006

More than two years ago, longtime Procter and Gamble facilities engineering manager Jerry Warren joined Yale University as associate vice president for Construction and Renovation. His task: revamp the institution's construction and renovation program. Since then, he has introduced significant cost savings measures into the planned \$400-million-a-year program, streamlined the construction and renovation process, and put the 300-year-old school on the cutting edge in the world of university facilities construction.

Prior to Warren's arrival, Yale's construction and renovation program lacked an organizational structure that would support a workload growing from \$250 million to \$400 million annually, while significantly improving results. Specific staff were assigned to oversee large projects, but no one was specifically accountable for small to medium-sized projects (defined as those costing \$4 million or less), which, incidentally, make up 80 percent of all construction and renovation projects on campus. The result: the small projects were a source of dissatisfaction to the user groups, and some key staff members were bogged down with the small projects, leaving them unavailable to manage the large ones. Initially, Warren only had two groups—University Planning and Major Projects/Project Management. University Planning was responsible for planning through most of the design phase, while Major Projects led the projects through the construction phase. Several key pieces were missing, says Warren—perhaps most notably professional construction expertise.

"The organization already had a significant workload, and was grossly understaffed to effectively manage the planned increase," says Warren. "We didn't have the structure, enough people, work processes, or the technical mastery to make the move to \$400 million in projects per year."

Four significant changes instigated by Warren now enable the organization to deliver the increased workload while meeting the University's expectation to save 10 to 15 percent in construction costs:

- Assign a leader and two staff members to improve the management of the small and medium projects.
- Promote three of the best planners to program manager to lead the largest projects through the early stages of design and assure their success.
- Hire a veteran Construction Management Director from Turner Construction Company, one of the nation's largest construction management firms, to lead the improvement program in the construction process.
- Start a hiring process to add five new veteran staff

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Biography

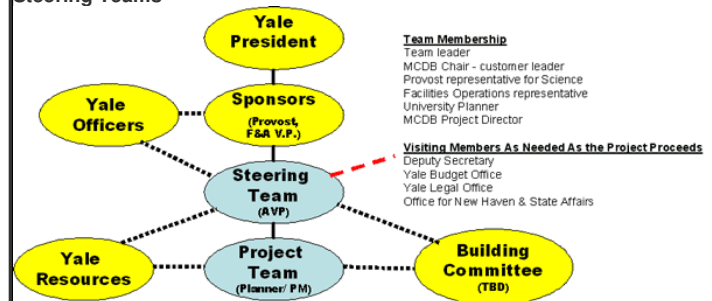
Jerry Warren, Yale University's associate vice president for Construction and Renovation, has worked in engineering and facilities management for more than 30 years. With a bachelor's degree in civil engineering from the Georgia Institute of Technology, Warren joined Procter & Gamble in 1974. He held a series of positions throughout his long tenure with the company, including Corporate Facilities Engineering Manager. In this position, he supervised design and construction of all major office and laboratory building projects worldwide, and was instrumental in reducing the company's capital spending by \$400 million per year. He joined Yale in 2004, where he oversees all campus construction and renovation projects.

This report is based on a presentation Warren gave at the Tradeline *Leading-edge Management Models for Capital Projects and Facilities Management* conference in March 2006.

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Steering Teams



Steering teams help Yale's construction and renovation department resolve conflict and communicate effectively with University leaders. (Image courtesy of Yale University.)

planners and project managers.

Now, five distinct, yet cooperative groups, Construction Management, Program Managers, and Small and Medium Projects, plus the existing University Planning and Major Projects divisions, oversee the workload.

In addition to enhancing the organization structure, the process also enlists the involvement of steering teams on large projects. Steering teams consist of various campus representatives who have a vested interest in the projects, such as faculty, provosts, and sometimes even donors. Project managers hear team members' thoughts on the project first-hand and then take any questions or concerns directly to the appropriate university leader. Warren personally leads all the steering teams to make sure he has a real time understanding of the scope, issues, and budget on the largest projects. Steering teams typically meet once a month during the planning and design phases of their respective projects.

"This expedites the project process and stops us from churning," says Warren, adding that it provides an effective means for resolving scope or cost conflicts before they get out of hand.

Putting it in Writing

When Warren began working at Yale the department did not have a written work process.

"I felt very strongly that it was fundamentally important to have a work process for all projects that truly defined deliverables and all the steps involved," Warren explains.

To formalize and document the projects work process Warren developed a Yale Capital Projects Handbook. Unveiled in early 2005, the handbook outlines all five phases of Yale's construction process (identification, planning, design, construction, and closeout), and allows everyone involved and/or concerned to receive a succinct overview of the process each and every project follows. Essentially an in-depth "how-to" guide, the handbook is written in a scholarly, rather than technical, voice (in order to be useful to Yale's academic constituency).

"I think this helped me sell it to top management," he says, adding that every Yale leader has enthusiastically embraced the work processes and project controls set forth in the handbook.

Drawing Comparisons, Making Decisions

The introduction of formal project benchmarking further enhanced the overall design and construction process. Benchmarking, Warren explains, is simply the act of comparing a potential project to similar completed projects at other institutions (they only formally benchmark on projects with a cost of \$25 million or more). This allows Yale to see what other institutions and corporations are constructing compared to Yale's proposals, adding assurance that spending is minimized. For some key projects, the team benchmarks for Yale by visiting completed buildings in person, as well as talking with the parties involved in constructing those buildings. The team

Forestry Building



Yale's new Forestry and Environmental Services building serves as model of sustainable building practices to the academic community and beyond. (Photo courtesy of Yale University.)

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Notes:

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also refers to Stanford University's benchmarking database for the Ivy Plus Group to gather more tangible information. The database contains details such as cost per square foot, materials used, and project duration for every participating Ivy League school (any institution that uses the database is required to submit their own information).

"This database is very helpful," says Warren. "It always gives you more credibility when you can benchmark outside of your own organization."

Every Dollar Counts

Two new cost-related concepts are helping the University get the most bang for its buck. The first, cost risk analysis, determines how much contingency funds should be set aside for "known" and "unknown" risks.

"There are "known" and "unknown" risks on every project" says Warren.

A "known" risk could be the need to use overtime for part of a project due to a very tight schedule, or for a design coordination miss between two trades that was not resolved at the time of the estimate. An "unknown" risk is defined as anything unexpected that is revealed after the project starts, such as finding contaminated soil during groundbreaking (money set aside would cover the cost of hauling the dirt away to a controlled land fill). The percentage of "known" risks at any point in the design process defines the percentage of expected "unknown" risks based on an algorithm Warren used while at Procter & Gamble. Procter & Gamble bases their algorithm on a very large projects database comparing project results for "known" and "unknown" contingency spending.

Yale uses a 70-30 cost risk analysis, which means that 70 percent of the time, they will have a little more than enough contingency set aside to pay for unknown risks. As a result, they expect to slightly under spend on these projects. The other 30 percent of the time, some overspending is likely for "unknown" contingency items. Warren says this is good for the school's bottom line, because it doesn't tie up money by budgeting for contingencies that might not be needed. In comparison, Warren says Procter & Gamble uses an 80-20 cost risk analysis process which is somewhat more conservative than Yale's.

The second cost-related concept is a cost-plus-fee method of construction management contracting. With this method the owner pays the Construction Manager (CM) the actual cost of construction based on competitive bids for each trade subcontract plus negotiated reimbursable expenses (e.g., staff cost). The CM is also paid a negotiated fixed fee for the services provided. Prior to Warren arriving at Yale, the CM Guaranteed Maximum Price (CM GMP) contracting methodology had been used. This method is very similar to CM cost-plus-fee except that the CM charges an additional fee to "guarantee" that the costs will not exceed the GMP. With the GMP method the CM is assigned three to five percent of construction cost for contingency to manage for the owner to assure the GMP is met. Warren's experience is that the GMP method will cost 0.5 to 1.0 percent of construction costs more than cost-plus-fee and the owner loses some control over contingency spending. A significant advantage to the cost-

plus-fee method vs. the GMP method is that the University can "fast track" a project if necessary, something that won't work under the GMP model.

The Final Results

The changes have been effective. In the past 18 months alone, expected project costs have been reduced by 12 percent, or about \$50 million, according to Warren. The major sources of the savings are increased value management savings from benchmarking and steering teams, reduced contingency spending during construction, and reduced spending on CM fees and general conditions.

Job site construction safety has also improved and is part of the overall drive to minimize cost.

"If you walk onto a job site where everything is neat and orderly, there will be less wasted effort and it will be safer and cheaper than one where everything is messy," he says.

Other benefits include more accountability and recognition for the staff (because they have set procedures to follow), which has led to an improvement in attitude among most of the staff members.

What's on Deck?

Currently Warren and his team are completing design development for a new Forestry and Environmental Services building, which will serve as Yale's model for sustainability. They also have recently started construction on the Sculpture building, gallery, and parking garage, and will start the construction of a major addition to the Art and Architecture building for the History of Art program in July 2006. A new Social Science building is starting the design phase, and a new Biology building is in preliminary design. Several renovations to three different performing arts department buildings are in the preliminary design phase. Significant renovations to Yale's many residential colleges will continue for the next five years or so, says Warren.

By Dawn Weinberger

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ISSN: 1096-4894