Cyon Research™

Keys to Success in Web-based Project Management:

**Lessons Learned from the
Chicago Transit Authority Capital Improvement Program**

**Keys to Success in Web-based Project Management:
Lessons Learned from the
Chicago Transit Authority Capital Improvement Program**

A Cyon Research White Paper

Executive Summary

Cyon Research has noted with perplexity that the evident benefits of Web-based project management technology have not brought about universal adoption of such systems in the construction industry—and in particular, not in large projects.

The Chicago Transit Authority (CTA) has successfully implemented such a system, and is benefiting from it on several large projects that are part of its five-year $2.1 billion Capital Improvement Program.

In the opinion of Cyon Research, CTA succeeded where so many others have failed, for several reasons:

- The CTA and the Program Management team have an accurate grasp of the complexities of their projects.

- The technology is being implemented by the owner, who can make use of the system a requirement for project participation.

- Training is compulsory, and of high quality.

- The principles of "accountability, accessibility, and auditability" have been applied throughout.

- A supportive vendor with good technology was chosen.

The project team makes the following recommendations for successful Web-based project management implementation:

1. The choice of Web-based project management tool vendor is "crucial in the short term, but not in the long term," said Sharif Abou-Sabh, P.E., Program Manager for the CTA's Capital Improvement Program. "*Any* system will require customization and ongoing support—from the vendor or a consultant."

2. When possible, introduce the system to the participants before construction planning begins. It is much harder to switch to a new system than to begin with one.

3. Do everything possible to focus training on how to perform the attendees' job functions using the tool. Nobody wants to take time away from work to learn something that is not relevant to his or her job.

4. ASPs (Application Service Providers) are the preferred form of product/service delivery in the construction industry. But they must be very thoroughly qualified.

Introduction

As construction automation applications go, Web-based project management seems like a "no-brainer"; the benefits it promises are great, and the risks of failure low.

So why is it not universally used in construction?

And why can't any of the technology vendors point to use of their products and services on large projects?

This "white paper" explores possible answers to these questions through the examination of a counterexample—an organization that is successfully using Web-based project management on several of the largest projects in the world. It is a highly professional enterprise, with hundreds of people who were technologically unsophisticated before the technology was introduced to them: The Chicago Transit Authority.

While some of its infrastructure is over 100 years old, the current CTA was established in 1947. The CTA provides bus and rapid-transit rail service to the city of Chicago and 40 neighboring suburbs. It is the nation's second-largest transportation system, and it serves more than 1.5 million riders each day.

In 2000, federal and state funds for capital projects became available. CTA President Frank Kruesi and Executive Vice President of Construction, Engineering and Facilities Jack Hartman faced a gargantuan task. With an initial capital budget of $2.1 billion for the next five years, the CTA would have to manage a staggering amount of design and construction. It wasn't clear that traditional project planning and management approaches were up to the volume.

In-house professional construction and management services were already overloaded, so the organization sought outside help. Working through a careful selection process, the CTA sifted through proposals and presentations to find the best-qualified firms.

The URS Construction Services team was selected as the most qualified, and was awarded the contract for program management of the five-year Capital Improvement Program (CIP). This included implementation of a Web-based project management system for the CTA's capital projects.

Under Hartman's direction, the CTA decided to explore new uses of information technology to take hold of the anticipated complexity as early as possible.

However, CTA executive management understood that the role of technology is subordinate to the larger issues of workflow. Hartman made a commitment to do "whatever it would take" to institute the management controls and systems that would ensure the continued success of all the capital improvement projects and firmly establish its credibility with its funding partners and the contracting community.

The Chicago Transit Authority Board established four goals for the public/private-sector Capital Improvement Program Management (CIPM) team:

- 80% of the funds committed within five years
- Majority of benefits realized within five years
- Progress toward bringing the system to a state of good repair
- Equitable distribution of benefits throughout the service area.

Setting an example of accountability, the private-sector Program Manager has put his fee at risk contingent upon achieving predetermined performance marks. For its part, CTA—"the Agency"—agreed to institute the controls, metrics, and systems required to meet the goals set by CTA leadership.

As Program Manager, URS translated the program goals into a series of rigorous methods and metrics. In keeping with ISO 9001, a certification the CTA is currently pursuing, the Program Manager established the following processes and policies:

- CIPM developed a "20-year needs assessment," which standardizes condition ratings of all assets' conditions and proposes investment paces for all asset categories.
- Project "master planning" early in design, to heighten the reliability of early cost estimates and increase credibility with funding agencies.
- Shifting the Agency's philosophy of project "users" to include the rail and bus operating departments as intermediate "clients" of the engineering and construction departments, thereby aligning the mission of the engineering and construction department with the ultimate end user – the CTA customer.
- Adoption of the "design-to-budget" concept—the cornerstone of cost control.
- Establishment of a dedicated estimating and schedule-analysis department.
- Setting up a performance-driven quality assurance program.
- Establishing an Exception Reporting system for early warning of potential major management issues.

Among the greatest challenges were the cultural shifts required to implement these innovations. With the wholehearted commitment of CTA and its management, and a well-planned education and deployment effort, the Program Manager has succeeded in creating the necessary conditions for the new processes and policies to take root, and become part of the standard way of doing business.

This program has entailed numerous innovations and changes for CTA and its contractors. It is setting new standards for the successful management of multiple projects in public-/private-sector cooperative environments.

This "white paper" focuses on one technology that has played a small but important role in the program: Web-based project management. As an integral component of a comprehensive package of program management services, Web-based project management has been applied here at a unprecedented scale—with impressive results.

This is the story of the CTA's successful pioneering effort in implementing Web-based project management to support the CTA Capital Improvement Program's goals. We also speculate on why the technology has succeeded here, while it has not done so on other large projects.

The CTA and its Five-Year Program

"Money had been tight. CTA worked hard for federal and state capital funds. When they received the funding in 2000, CTA knew they would need help to plan and manage their enormous five-year Capital Improvement Program," said Kristine K. Fallon, FAIA, president of Kristine Fallon Associates, Inc. (KFA), a sub-consultant to URS with responsibility for Web-technology selection, implementation, training and support.

Among the many projects planned as part of the CIP, the rehabilitation of the Douglas Branch of the Blue Line stands out because of its size and complexity. It requires the rebuilding of elevated track structures and transit stations without disrupting service. As Pamela Dittmer McKuen reports in *Midwest Construction*:

> *Long besieged by a crumbling infrastructure and slow-moving trains, the 100-year-old Douglas Branch of the Chicago Transit Authority's Blue Line - much of it elevated - is undergoing a major transformation. With a price tag of nearly $500 million and a four-year construction schedule, it is the largest capital project ever undertaken by the authority.*

> *"If we didn't do this, within a year or two we'd have to shut the whole line down," said Jack Hartman, the CTA's executive vice president of construction, engineering and facilities maintenance. "As it is, trains start running so slowly that instead of 20 minutes to get downtown, it takes 35 or 40 minutes, and eventually we would have to stop running."*

> *The trains may be creeping along but at least they are running, and will continue to do so during the construction. The CTA is not repeating a past misstep when it closed down the Green Line for renovation in the 1990s. Customers found other modes of transportation and it took three years to get the traffic back.*

> *"We could do it in half the time if we shut it down--but the tradeoffs aren't worth it," said Hartman.*

> *The Douglas Branch, also known as the Cermak Branch, travels east and west on the city's West Side. About 5 mi. of track are elevated, up to 30 ft. above ground. The project entails all-new footwork, rails and ties; eight new station houses; replacement*

of 350 structural spans, 175 column foundations and 720 caissons; two new electrical substations and three rehabbed ones for improved power supply; and an upgraded signal system.

While the Blue Line Cermak (Douglas) Branch is the largest construction project started to date, there are more than 50 other projects in the CIP. Their overall goal is to provide CTA customers with new facilities and extend the life of the transit system by four decades. Bus stations, passenger facilities, bus garages, train stations, communications systems, train tracks and supporting structures are part of the far-reaching rehabilitation and extension project.

Another large rail project involves increasing the Brown Line's capacity by 33%, through the reconstruction of platforms and infrastructure. Order of magnitude: about $476 million.

Why Web-based Project Management?

What benefits are promised by Web-based project management? Here are just a few:

- Simplification of communications. Having a centralized "store-and-forward" messaging system—the most basic feature of any Web-based project management system—greatly reduces the number of possible communication paths among the participants on a project, and thus reduces the likelihood of miscommunication. All communications are archived and searchable.

- Comprehensive tracking of time-sensitive items, such as Requests for Information (RFIs) and Submittals. This makes team members accountable for content and timely response. Automated tracking and reporting of this type, available in the higher-end solutions, are indispensable tools for managing large capital programs with dozens of projects and thousands of participants.

- Common document storage and reference. Everyone knows they are working from the appropriate version of any given document.

- Document management. All documents are in a single logical repository (which may be physically centralized or distributed), and are thus accessible in an orderly fashion.

- Audit trail. It is possible to verify that a communication was sent or received, by whom and when.

- Document delivery. Much faster than overnight courier, and more secure.

- Knowledge management. Controlled documents can be stored, distributed, and updated quickly, with no reprinting. Workflows and procedures can be enforced by the software.

- Access. Being Web-based, such systems can be accessed from any Web browser, anywhere.

- Faster cycle time. Eliminating lag time as information moves from one organization to another can dramatically shorten project schedules.

- Standardization. Standard appearance of documents, forms, logs, and reports makes for easy comprehension and comparison.

Consultant Selection

Jack Hartman, CTA's Executive Vice President of Construction, Engineering and Facilities, had an ambitious and strategic view of how to manage the CIP: "I wanted everything under a single umbrella. I knew we'd have to see the entire array of projects if we were to manage them properly."

The CTA required each team proposing to provide program management services to discuss its approach to Web-based project management. "Kristine presented on Web-based project management on behalf of the URS team," Hartman recalled. "Her presentation showed that she really understood the issues; it was crisper, clearer than any of the others."

"I was very impressed with the CTA's enlightened approach to the consultant selection process," said Fallon. "It was clear from the beginning that the CTA knew that it needed professional help to implement the Capital Improvement Program, and was determined to find the right kind of help. The selection process focused on qualifications and experience, before any pricing was discussed."

KFA teamed with URS Construction Services—one of the world's leading engineering design firms for the transportation industry. The URS program manager for the CTA Capital Improvement Program is Sharif Abou-Sabh, P.E.

"Sharif was experienced on large transportation projects, in New York City and elsewhere," said Fallon. "He knows mass transit, he knows how to manage large capital programs, he's a great leader, and he recognized the potential for Web-based project management tools right away."

"We saw Kristine give a presentation at a professional trade show, and we were very impressed," said Abou-Sabh. We could see that she understood both the technology and the work processes."

Selecting a Vendor

"Once we were selected as consultants, we quickly set about defining the requirements for a vendor," says Fallon. "One of our first decisions was to pursue an application service provider (ASP) implementation, in the interest of both time and cost. (ASPs specialize in providing access to software that runs on their own computers. Users thus have no installation or update burdens; they pay only for the use of the software.)

"Beyond that, we needed to determine what features would best support the Capital Improvement Program. Jack Hartman's expectations were demanding but clear. In addition to the usual set of project-management features it had to support, the technology had to be commercially available, and the vendor had to be established."

"What I was looking for were the 'three A's': accountability, accessibility, and auditability. I need to be able to find out who is responsible for any particular project or detail; to access any information about the project, at any time; and to have a record of what happened, when, and with whom," said Hartman.

Part of the vendor-selection challenge was that the system had to meet the needs of design, as well as those of construction. Some Web-based project-management tools are capable in one area, but not both.

When KFA researched the rapidly changing and shrinking field of providers, they found to their surprise that few vendors actually had customers with very large projects. "Even the vendors whose products are used by the largest engineering firms turned out to be managing only relatively small projects for them," said Fallon.

The field was thus rapidly narrowed; Citadon, of San Francisco, emerged as the clear choice. "They were the only ones who could demonstrate strong support for both design and construction activities, plus experience with large projects," said Fallon.

Citadon is an ASP—an application services provider. Rather than acquire software for use on their own computers, Citadon customers put their data on Citadon servers. "Since Citadon uses Exodus, the same ISP (Internet service provider) as MasterCard, Sun Microsystems, MSN, and American Airlines, it wasn't hard for me to convince our staff about the reliability and security of such a service. And our IT people loved the idea," said Hartman.

Web-based project management is an application that is well-suited to delivery through an ASP. Its data management, security, reliability, and performance demands are such that the IT management aspect of the service is specialized and complex, and thus best handled by a company that concentrates on this area. With an ASP, all software updating is done on the server; there is no need to deal with the users at all.

Moreover, Web-based applications provide a measure of platform independence that is a welcome change to IT managers. In the past, each application required users to use a certain computer type, with a certain operating system; Web-based systems work with any computer that has a standard Web browser.

Putting It All Together

"One of our challenges was that the CIP was already under way when we came on board," said Fallon. "Nonetheless, once the vendor was selected, the KFA staff was able to get the site up and running in four months."

8

"With the ASP model, the customer has little control over the application environment," said Fallon. "A relationship of trust with the vendor is especially important. Citadon vindicated our selection of them. They included the CTA CIP in their Customer Council – a group of large customers that works very closely with Citadon to ensure that the software works well for their business processes. Citadon has been very responsive to our needs."

As part of a commitment to achieve ISO 9001 quality certification for CTA's engineering processes, the Program Management team had developed diagrams of the major project management processes. The KFA Web Support group adapted these diagrams to indicate how ProjectNet—the name of Citadon's software—should be used to support these processes. They solicited comments from CTA and construction managers already under contract. The Web Support group then wrote detailed work instructions on exactly how to use ProjectNet to perform work tasks. These materials became part of a manual, used to train new users.

"We require each new user to take two training classes. Nobody can access the system unless they have undergone training," said Fallon.

"In terms of propagation of system use, having the owner in control is very helpful. We can and do require everyone—construction managers, general contractors and designers—to use the system. Without access, you are off the project," said Fallon. "At the same time, we implemented in such a way that each of the participants gained immediate benefits from using the system."

ProjectNet is also being used on the Brown Line project, which is currently in the design phase. Eight separate design teams are using ProjectNet to coordinate all of the elements of the project's complex design. Jack Hartman comments, "We believe strongly that Web-based communications are indispensable to speeding the design and construction processes while at the same time improving quality. ProjectNet provides a collaborative medium for the design and construction teams that has proven efficacious in dealing with project challenges in a fraction of the time that it used to take with conventional methods. In addition, it provides the auditability, accountability, and accessibility that we need."

The CTA program management staff consists of more than 50 people. They and the hundreds of users from consultants, construction managers, general contractors and subcontractors are trained and supported by a Web Support staff of four. KFA's Mike Poynton is in charge of the Web support operation.

Poynton, with Greg Bush and Peter Urban, other KFA consultants assigned to the CTA CIP, developed a curriculum to provide a half-day general training course to all users, and additional training classes focused on each user's role in the project.

In the first year of implementation, KFA trained 560 team members from 57 organizations to use ProjectNet on CIP projects.

Hartman elected not to run the new system in parallel with the old for a time. His faith in the new system was borne out.

Results

"We are meeting or exceeding our own expectations," says Hartman. "For example, we are processing more than 2.5 times as many RFI's (requests for information) on the Blue Line project as we did on the Green Line project. I'm expecting to do much better—perhaps six times as many. And since RFI's are the key to getting the job done quicker, that means we can expect to save a great deal of money." The RFIs are also being closed 18% faster than on a baseline manual project recommended by CTA for comparison.

Lessons Learned

"The key success factor in this project is leadership," said Fallon. "Jack Hartman understood the problem from the beginning, and selected top-notch people to come in and help. Sharif Abou-Sabh's extensive experience and attention to detail made him the ideal choice for URS program manager. KFA is extremely fortunate to have the opportunity to work with such talented and competent management."

"The system shines a light on what everyone is doing," says Hartman. "That's one reason some people resist it initially—especially older people in the field. But they learn to like it, once they realize it's a requirement."

When asked what he might have done differently, Jack Hartman replied, "Nothing—although I didn't realize how much training would be involved. And the truth is that I didn't realize we were as pioneering; I thought others were doing more. I'm glad things worked out the way they did."

"Hiring a consultant to help us implement was a very important decision – someone who understands the business as well as the technology" says Hartman.

Plans for the Future

"Citadon has a major software upgrade coming, which we are considering using in pilot form on a couple of projects," says Hartman. "It's more flexible and customizable than ProjectNet. Now that we have established confidence in the vendor, in the consultants, and in our own ability to take advantage of the technology, we are looking forward to the additional benefits we expect the new features to bring us."

Recommendations

To summarize the advice of the team:

1. The choice of Web-based project management tool vendor is "crucial in the short term, but not in the long term," said Abou-Sabh. "*Any* system will require customization and ongoing support—from the vendor or a consultant."

2. When possible, introduce the system to the participants before construction planning begins. It is much harder to switch to a new system than to begin with one.

3. Do everything possible to focus training on how to perform the attendees' job functions using the tool. Nobody wants to take time away from work to learn something that is not relevant to his or her job.

4. ASPs are the preferred form of product/service delivery in the construction industry. But they must be very thoroughly qualified.

Why has CTA succeeded?

Stephen Hagan, FAIA, who is responsible for collaborative systems at the "largest owner in the world"—the GSA (federal General Services Administration)—has commented:

> *In the preparation of our Strategic Plan and Framework for Project Information for the Public Buildings Service, we searched the marketplace of over 350 vendors to find a suitable, off-the-shelf solution for enterprise needs. Whether it was enterprise reporting of executive information on capital construction programs, or enterprise-wide deployment of extranets for collaboration and increased project-level productivity, there were very few success stories.*

Moreover, Cyon Research has searched extensively for documentation of actual productivity gains resulting from the implementation of Web-based project management systems, and has been unsuccessful in locating any.

Some vendors—notably, Constructware—have published user surveys, in which the vendor's users tell their (invariably favorable) experiences. But to date, no research firm has undertaken a study that explores the thorny issues of productivity improvement.

We believe there are several reasons for this:

- To speak of "productivity increases" requires careful measurement of productivity prior to implementation of the new technology. This is difficult to do in the project-oriented world of construction, and companies do not seem motivated to do it.

- Some issues are self-evident, and construction professionals do not want to invest time in proving them—for example, the fact that electronic transmission of

documents, especially engineering drawings, is much faster and cheaper, and more auditable, than using courier services. In fact, it is common for customers implementing Web-based project-management systems to justify them on the basis of savings in courier costs alone.

- For many of the parties to a construction project, productivity is not a clearly defined concept. To put it bluntly, if one is being paid by the hour, reducing the number of hours required to get the job done is not an attractive proposition— unless there are balancing considerations, such as competitive pressures. Only the owner is clearly motivated to do more with less. And only a fraction of Web-based project-management systems are bought by owners.

- Most Web-based project-management vendors underestimate the extent of computer-illiteracy in the construction community, and thus underestimate the amount of training required for successful project implementation.

- Construction projects are not highly disciplined affairs. Unless the use of a new tool can be tied to payment, subcontractors will tend to do things "the old familiar way," despite any benefits they might gain from the new tool.

We speculate that the success of the CTA in the implementation of Web-based project management is due to the following factors:

- The CTA and the Program Management team have an accurate grasp of the complexities of their projects.

- The technology is being implemented by the owner, who can make use of the system a requirement for project participation.

- Training is compulsory, and of high quality.

- The principles of "accountability, accessibility, and auditability" have been applied throughout.

- A supportive vendor with good technology was chosen.

In sum: Success in the application of Web-based project management is achievable, as the CTA has demonstrated. But it requires excellent management and good technology—and project discipline that is most easily driven by an owner.

About URS

URS Corporation is a publicly owned company listed on the New York Stock Exchange (NYSE:URS). URS offers a broad range of planning, design, and program and construction management services for transportation, hazardous waste, industrial processing and petrochemical, general building, and water/wastewater projects. Headquartered in San Francisco, the company operates in 38 countries with approximately 16,000 employees providing services for federal, state and local governmental agencies as well as private clients in the chemical, manufacturing, pharmaceutical, forest products, mining, oil and gas, and utilities industries.

About KFA

Kristine Fallon Associates, Inc. (KFA) provides computer consulting services to design firms, businesses that use computers for design, construction, facility management or manufacturing and software vendors who serve these markets. KFA combines incomparable credentials in Computer-Aided Design (CAD) and Internet technologies with information technology vision to help clients position their products, services and work processes for competitive advantage. KFA also assists clients in planning, budgeting and implementing IT projects. For more information on KFA, go to www.kfa-inc.com, or call 312-641-9339.

About Cyon Research…

Cyon Research Corporation was formed by CAD industry consultants Brad Holtz, Joel Orr, and Evan Yares to foster clarity and provide vision to users and vendors of CAD and PLM tools. Current products include: CADwire.net, a leading provider of online news and analysis; COFES: The Congress on the Future of Engineering Software; Engineering Automation Report, and The CAD Rating Guide™. More information can be found at: www.cyonresearch.com, 301-365-9085.

Cyon Research Corporation
8220 Stone Trail Drive
Bethesda, MD 20817-4556 USA

phone: 301-365-9085
fax: 301-365-4586
Web: www.cyonresearch.com