Bridging the Project Information Chasm with CASim

Led by the vision of John Rapaport, Component Assembly Systems (CAS) developed its own software and process, which allows it to see in real time if production is being met and adjust.

By Kelley Chisholm

Imagine on Thursday being able to see into the future and know that you will run out of drywall by 3:00 p.m. the following Monday, giving you the ability to immediately adjust your labor and refocus skills where they are needed. You are probably wondering, "Where do I get this crystal ball that will ultimately save my company countless dollars?" One specialty contractor found a way to look into the future, and instead of using a crystal ball to see what may happen at various stages of a project, it developed a technology platform that does this.

In 1993 John A. Rapaport, director of operations and general counsel for Component Assembly Systems Inc., spearheaded the company's efforts to digitize and modernize its technology infrastructure. Through his vision, the company was able to develop its own proprietary software known as CASim, which tracks and updates progress on its projects using the latest web-based technologies. It allows users to access all information residing within the company, regardless of software application, from a web-based interface. It also tracks payroll, codes and

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adjusts budgets, with new information added into the system daily.

One of the drivers behind CASim was the desire for all estimators, project managers, executives, foremen, field supervisors and purchasing and accounting staff to be on the same page, able to see the same information that relates to their positions, from anywhere. CAS found that much of the information on budgets and estimates was not making it from estimating to project management to the field and then back to accounting and estimating. Rapaport and Systems Analyst John Lord linked estimating and other databases within their cost accounting data and insisted that the information input be accurate and reliable.

Another driver was the need to identify challenges early in the project, giving management a streamlined view of operations and the opportunity to take timely action. The program flags problems and highlights trends that often were missed in the past.

FMI interviewed John Rapaport to learn more about the cutting-edge technology at Component Assembly Systems.

FMI Quarterly: Please give our readers a general overview of what CASim is and how it works.

Rapaport: We purchased a job-cost accounting software package from C/F Data Systems in the summer of 1993. That November, John Lord, who we hired as a systems analyst, analyzed how we processed data, how we looked at our jobs, etc. When we first started looking at C/F Data Systems, we noticed that we could do a lot to analyze our labor codes. Historically, we took our labor codes and put them through our payroll system, whether we were doing framing, sheetrock installation, etc. We used these codes to process our payroll, but were not necessarily analyzing the actual hours of each labor code against budgets. I am talking about original budgets. We have 200 or 300 hours to frame a floor in the budget from the estimate, and we want to know how we are doing against actuals.

It is a pretty basic concept, but many subcontractors don't do this correctly, as I am finding out through industry forums. We challenged the company; my dad, CEO Lew Rapaport; and President Art Doerner. We simply asked, "Why are we calling in all of these labor codes if we're not analyzing them to the budget to see how we're doing at a certain percent complete?" To their credit, they recognized the need to move forward with this idea, and it set us off on our journey of the last 15 years. The concept was to get an accurate percent complete every month or so, depending on the length of the job, and to know at 15% complete where we stand on a project. Labor in our union contracting world in New York, for instance, is approximately 70% of the cost of the project. In another, less expensive, market, it may be 60% to 50% of the cost. It's a big moving target, and we wanted to analyze it at different project points to see if we were winning or losing on the various labor codes. While this sounds like a simple concept, in reality it is not that easy to take an estimate based on quantity and the quality of building elements, calculate the associated labor and build it into a budget, adjust the budget for changes and then analyze it along the way.

John Rapaport

Often, subcontractors do not know if they're winning or losing on a job until it is almost over, which is too late to adjust. We looked at the FMI Construction Cost Curve (see Exhibit 1) and designed ways to affect change at the beginning of and during the construction process. Since we were unaware of the impact the

Exhibit 1
Construction Cost Curve

Washington Nationals Stadium
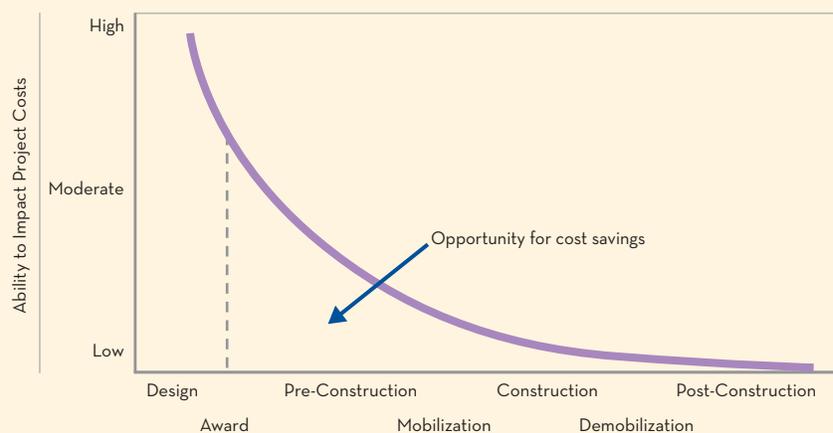
labor inefficiencies were having on the bottom line, some of these changes were brand new to us. FMI's curve is great, and we love it, but for our company, we wanted to make it a little less flat at the bottom. The acronym "CASim" stands for Component Assembly Systems Information Manager. With this tool and the other related work built around it, we have p roven that we can affect change during the project.

FMI Quarterly: Please explain the actual processes.

Rapaport: We implemented a software estimating tool that includes the quantity takeoff. We scan in the drawings, and they become tiff images. Then we color the drawings for the quantities of the walls and the ceilings. Often the estimators use two or three screens while they are working on this part. Next, we transfer takeoff data into Quick Bid, which performs the production analysis to estimate how long it will take to do the work. We can see what are the pricing and production rates for installing the various assemblies, all the way down to the screws. During the bidding stage, we present the color drawings to the client to help clarify our bid in a scope meeting. The architects like the color ed drawings since they are so clean and include a legend of all the different wall types and quantities. We've been doing this for 10 years or more, and it took a few years to implement this into the associated databases.

One of the keys with estimating and accounting software is to align the databases correctly. We recruited a graduate from Purdue's master's of engineering program, Beatriz Banchs, who rew orked our databases within the estimating environment. She eventually started our offshore office in Venezuela. It is so important to recruit smart people and high-level thinkers who can take your data and organize it into a coherent project budget. We are building templates within the estimating software and also libraries of information for ease of analysis both during the estimating and project set-up pr ocess. Once we get a job, we have a hand-off meeting from estimating to project management. This is a very important meeting. The estimator cleans up

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the bid to make it clear, including all labor codes and variables within the project. It is handed off to the project manager in a formal meeting in which others can sit and review the plans. Project personnel now understand what the bid entails so they can set up a budget. The data is then entered into a spreadsheet and is massaged to reflect that we will not be tracking 200 different codes in the field. We combine certain codes so the field is not focusing on tracking codes. For example, when we frame walls, we may have column framing near regular framing, with the same crew doing both. So even though we figure columns at a different production rate, we'll combine the rates for ease of tracking. We will note the difference in production rates and bring this up in the kick-off meeting.

FMI Quarterly: Tell us about the kick-off meeting.

Rapaport: Between the hand-off and kick-off meetings, we created another meeting called the budget set-up meeting, where we create labor codes in consultation with the field. This is the first time the field gets involved, and we ask the foremen and other key people who will be running the project to determine, with the project manager, the labor codes we will track. This step is critical because if foremen call in the codes incorrectly, then all the data and the analysis are wrong. We show the field how we are going to build the job, and how they are to use the codes to mirror the way the labor crews are working on the job. For instance, if we're caulking a wall and also putting the drywall boards up at the same time, we want to combine the two codes since the same crew is doing both. The field understands that by ensuring the cleanliness of the data, they will receive accurate feedback, critical to the outcome of their projects.

Once the codes are established, we hold the official kick-off meeting with the executives, field staff, assistant project manager, project manager, estimator and safety representative. We go through the whole job and scope of the work. We look at a rendering of the project, the floor plans, the size and type of project, the

Washington Nationals Stadium

schedule in terms of start and finish dates and the CASim labor codes that we'll be tracking. We also discuss issues that came up in the hand-off and pre-kickoff meetings. Usually this meeting lasts at least two hours, maybe longer, but it is very important since we are looking at constructability issues, quality, labor, etc. At that point, the job is kicked off, and the next meeting is a status meeting, somewhere between 10% to 15% complete because we have enough information to start analysis. We perform this analysis in hours, dollars and production rates, in terms of how we are doing on all of the labor codes. It really gives us a heads up on how we're doing overall; and by the next meeting, which is 25% complete, we really get a good idea of where we're going with the codes. If there is a problem, we'll change the labor. We'll look at why we're not getting the production. Was the estimate incorrect? Did we miss something? Is the field not producing as we thought it would? We've had jobs where we saw early on that we were not making the numbers, so we changed up some of the framing sequencing and labor and were able to get back on track with the budget, which has saved us millions of dollars over the past six years.

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FMI Quarterly: How long did it take to get CASim up and running?

Rapaport: In the late 1990s we did some "static" versions of CASim using software known as PowerBuilder and Crystal Reports that were built on top of C/F Data Systems job cost accounting and payroll systems. The current web version, which came out in 2002, took two years to design with more than 100 drill-down screens. Minimal training is involved, as the system is intuitive and user friendly. Different security levels allow a foreman to access hours and production rates while a project manager can see all the dollars, but only for his projects. Someone running an office would see all the jobs in that office. We were fortunate to win a 2006 Gold Vision Award from *Constructech* magazine for our efforts.

FMI Quarterly: How did employees initially react to the system? Has that changed over time?

Rapaport: Initially, the reaction was: "What is this, and how will it affect my job? Will it create unnecessary work or possibly uncover things that I'd rather have hidden?" Historically, in our industry, people have hidden things because they don't want to be the bearers of bad news. One of the reasons we developed and

Wynn Hotel, Las Vegas, N.V.

implemented this software is because of this lack of transparency in the subcontracting business. We were victims of this like many other companies. Bringing in the field was the key. The field was never before included in any system, and they are the ones who are watching the store every day. We've enabled a partnership between the field and the office that has galvanized our work force to produce better-performing projects and more confidence in our current and future work.

We built the status meetings around the system, and they create a centerpiece for discussion that just wasn't there before. The foremen have passwords and can get into CASim and see the hours and how we're doing, which is updated weekly. The percent complete is calculated at 15% on the labor codes, and then there's a total at the bottom for the whole job. The status meetings become a place, at every 15% to 20% interval, where we sit around and discuss all of this data. We look at pictures of the job and issues that have come up like schedule issues. We enhance project tracking and labor analysis through these discussions. The average job has five to six status meetings. We have a closeout meeting at the end where we discuss what was good, what was bad and what we learned. The estimators participate in the status meetings to review their own work. It is so valuable to take minutes of the meetings, share those and then follow up on decisions made in the meeting with the client.

A worker installs drywall in a suite at the new Wynn Encore.

Before using the system, we didn't make adjustments on a project, or if we did, it would either be too late or not based on anything factual or scientific, just emotional reasons. Now we have the data to explain to the field why we're doing something so they can understand why we need to adjust. They make the adjustments from the data or the status meeting.

I was recently on a job site where one of our foremen pulled up the job via the Internet on its secure, password-protected site. The foreman said he constantly looks at the framing hours to see how we are doing. He can see the hours by floor, who worked on the floors and drill down to the individual employee. We rate our employees on how they do on specific tasks. He brings in his framers and shows them, on the screen, when they are not meeting the hours, for instance, and therefore not making their expected production rates. They can see for themselves how they are doing. This is very exciting — sharing this information and showing the employees, who are physically doing the work. It is an immediate review and feedback system of when they are doing well and when they need to adjust and improve. This sharing of information has been very successful, and the field has taken to it. They expect the status meetings to occur at regular intervals, and they often push for the meetings to see exactly where they stand.

We have everyone learning the system, not just the technology but how to use the data to update budgets and to reflect an accurate picture of progress tied to labor costs.

FMI Quarterly: Tell us about the budgeting aspects of CASim.

Rapaport: Once we're in the job, our original budget becomes obsolete since additional work is being performed. The PM has to learn to adjust budgets for this additional work. "When do you adjust budgets?" was an issue for us, and we had to go through a learning curve. Do we wait until the change order comes in, or do we go ahead and perform the work? We had to work out many technical issues around how we adjust hours and quantities of work so we're not looking at actual hours against old budgets. This has been an ongoing learning process for our PMs. We have six offices in the United States, and we've held many conferences where we bring all of our PMs together in one location to go through the procedures. We have everyone learning the system, not just the technology but how to use the data to update budgets and to reflect an accurate picture of progress tied to labor costs. One note: It's a little tougher when you're doing proposal work because you're not using the same production rates as you do with contract rates. You're slower in a proposal environment because you are coming back to do a lot of that work often on a project. We don't want to corrupt our production rates that we figured originally with this slower proposal work. CASim breaks out the original productions from the proposal productions, and

we're able to see a blended rate and a rate that's broken out to show how we are doing based on our contract and on the additional work. This is very valuable, and it took years to develop.

At the end of a project, we can share the success of the project with various foremen and people in the field who are responsible for its success. The system enables us to see who made things happen — Was it the framers, the sheetrockers, the protection guys, the foremen? By having the system, we can see clearly where we did well and where we didn't and reward the team accordingly.

FMI Quarterly: How has CASim changed business at Component?

Rapaport: We are able to track items that we could not before. The percent complete is done accurately. Pending items are analyzed. We have many jobs where we have saved money for us and our customers since our clients also got the benefit of the knowledge and our ability to act on it. We have created a scoreboard where we can see what the score of the game is for the field to the office. The score is not just in dollars and gives us a way to adjust to the changing nature of the game and increase "our batting average." It is a powerful change that also has given us the ability to be comfortable bidding future work based on history. What it also does is make everyone more at ease with the idea of change and to actually model change in the software. So we are designing new screens to identify more opportunity say, for instance, in analyzing proposals and tickets related to change-order processing. This dynamic approach to subcontracting has energized our company to move forward with greater clarity and purpose. It has undoubtedly helped us grow, as we have a $500 million bonding line behind us now. We are executing on another offshore in a different country to do scheduling remotely to tie into this data. While it's in its infancy, we expect this effort to evolve similarly to our estimating offshore and be another link in the data chain that gives us power to act and be on the same page.

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FMI Quarterly: What advice would you give to others who want to create a similar system?

Rapaport: Know your workflow. Know how data is created and how it moves between the office and the field. We did a lot of workflow analysis to track a project from the estimate to project management to accounting and back to estimating. We created flowcharts of this information, and again, smart people were involved in this effort, including another of our Purdue graduates, Adil Cheema. The question is: How can you recreate that workflow in your systems? Computers and the Internet, especially, came into play in the 1990s, and it was a perfect time to analyze how we were going to do our work in the digital age. We tried to model best practices from our paper systems that were tried and true. Essentially, you need to know how you work. Look at all of your paper forms and redo them digitally, knowing where the data goes. Look at how you create your data. How does the material database work between accounting and estimating systems? There needs to be a link to all this data. As I mentioned, we're working on linking our scheduling into the system. All of the data needs to be analyzed to make sure that what we're calling it in estimating has some intelligence in our other systems and that it is consistent across platforms and applications.

Once we had this functionality, I knew our world had changed. We have developed a very close relationship with CF Data, and this program is going to be one of its offerings at some point. Some of the people at Component have invested in the future of CF Data, and it's great because we have an information company behind us and helping us to design these new screens. We also get new screen ideas from PMs, foremen, accounting and purchasing. It's a very dynamic

U.S. Federal Courthouse, White Plains, N.Y.

UBS Trading Floor, Stamford, Conn.

way to do business where you're getting new application ideas from a foreman, who then sees it come to fruition on the screen. Once they see that their ideas have been incorporated into the system, it feeds on itself, and they want to use the system more and make it better. It makes the company more dynamic rather than reactive — and that makes all the difference.

CAS has moved beyond commercial, off-the-shelf programming to create a proprietary system that very well may be the wave of the future in the construction industry. Since adjustments are the rule rather than the exception in construction, CAS has developed a process to see in real time if production is not being met and adjust as needed. Many contractors have to wait until the end of the job to see how they did and are not able to make adjustments along the way. CAS is able to keep its jobs on track, which makes happy and satisfied clients. ∎

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