

In Defense of Paper

By Daniel G. Frondorf, CPE, CDT

As the construction estimating world has progressed into the early 21st century, our methods and processes have evolved as well. Nothing seems to resemble “old school” technologies anymore.

Only yesterday, things we take for granted now, such as computer aided design, BIM, and on-screen takeoff, were still unfulfilled promises on the horizon, destined to make the lives of constructors easier and less stressful. But have they? Is it possible that we have become too dependent on these new advances, and that they have lured us into a false sense of security about our work?

Since I'm a civil construction cost estimator, I'll focus on these advances from my own point of view. We no longer draw cross sections in order to calculate earthwork cut and fill quantities. We don't plot pipeline alignments in profile views to determine clearances between new and existing utility lines. We don't even color in takeoff areas on site plans with different colored and strange smelling highlighters that have their own color coded meaning.

In the distant past, we found ourselves making material lists, and determining production rates and crew compositions by hand. We also calculated predecessor and successor activities in our heads and on paper to develop schedules and durations. Each of these functions can easily be done in this modern age by many of the highly functional software and hardware components that we've come to know and love ... or at least feel compelled to utilize in order to increase our speed of cranking out estimates and bids because there is so much work out there to bid, and such little time.

Nowadays, our tools (and toys) include implements like the following:

- on-screen takeoff software for one, two, and three dimensional quantities
- importable CAD
- vectored PDF files that we can bring right into our earthwork software to save us hours of time tracing contours and existing and proposed regions within the grading limits of any given project
- cost estimating software that allows us to create crew assemblies that we can use over and over again to estimate the cost of similar kinds of work

My architectural estimator pals have their own cool tools as well, such as BIM models and an ocular recognition feature in their on-screen takeoff software that allows symbols that repeat frequently to be counted at the click of a mouse. Even data resources, like the well-recognized and highly-utilized cost guides, are now available as searchable online directories. And how can I write about all these advances and not mention a new resource highly prized by me and so many others: *Google Earth*, allowing us to virtually visit a jobsite from the comfort of our offices?

Do all these modern tools make us better at our jobs, or do they simply make us faster or capable of producing more work in the same time frame? My respectful suggestion is that they have made us better in terms of speed and accuracy, but that doesn't necessarily mean we're better as intuitive analysts of the mountains of data that we need to process to accurately predict the cost of a building, infrastructure, or renovation project. Here's why:

I've been teaching construction estimating for several years, to college students, tradespersons, other estimators, and architects and engineers, and the one point I always hammer home is my definition of construction estimating: *“the combined art and science of the determination of the probable cost of any given construction project; this can include budgets, bids, proposal, and quotes; practiced by professionals called Estimators in collaboration with other professionals, including architects, engi-*

neers, project managers, superintendents, and skilled tradespersons”.

The two most important parts of that definition are the art/science combination and the collaboration with others. The science part is easy — it's the measuring, the calculating, and the math. The modern tools we use today have made us better in this part of the definition. We can produce more accurate quantity takeoffs faster and with fewer mistakes, because the software helps us visually see what we've measured and what we haven't. The software helps us calculate costs more accurately as well. These advances have made us better, but they cannot make us better at the “art” part of the equation.

Analyzing risk, assessing scope of work, determining constructability issues, visualizing the project, establishing production rates, and interpreting a pathway through the project while hitting milestone dates are all things that we do as estimators, separate and apart from performing quantity takeoffs. Dealing with subcontractors, vendors, suppliers, the design team, and the owner's team are human interaction tasks at which no software can make us better. Thinking logically and minimizing the opportunity for error are still largely self-disciplinary matters, and no software can force an improvement in those arenas. All these things are included in the “art” portion of the definition, so we must still rely on ourselves to get that part right.

As my own career has evolved, I've adopted many of the modern tools we all use, but I've taken the approach that “all this machinery making modern estimates can still be open hearted” (homage to Neil Peart intended). By that, I mean my heart, and mind, must still be open to performing that art part of the equation the old fashioned way — to bring my patience, maturity, experience, logic, and knowledge to bear in the preparation of any cost estimate for any purpose. I cannot simply rely on whatever my computer tells me the answer is.

One of the ways I do this is to use paper plans — not for takeoffs, but for scope review. For me, there's nothing quite like hovering over a full-size set of paper plans as I get the feel for the overall project. As a civil estimator, I want to understand the topography of a site, to see how the drainage is being designed, to visualize what will be removed and what will remain.

My peripheral vision has become a very useful tool for me over the years, and when I limit my field of vision to whatever size my screen is, I'm limiting the usefulness of that particular skill. For takeoffs, of course I use my computer and software tools because they allow me to go fast and be accurate, but that's the science part of the equation, to me as important but still less critical than the art part. Whenever possible, I'll call a human being to solicit material prices instead of just relying on what a cost guide, or even my own cost history, tells me. Not only do I get more current pricing, but it also allows me to develop human-based relationships with others in my circles who have an interest in what things cost. I've always been amazed at the information that can be obtained from others with whom I maintain a cooperative, friendly business relationship. That has to be a two-way street for this to work to its best advantage.

I also find it easier to teach takeoff techniques using paper. The same can be said for teaching the cost estimating part. If you can't perform a task manually, you'll never understand how the computer is doing it so quickly. I always caution my younger or inexperienced students to learn to do things the old-fashioned way. The new, more modern, methods will become more reliable once the underlying methods are understood.

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