



THE ACADEMY OF ELECTRICAL CONTRACTING

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The Evolution of Technology
in the Electrical Construction Industry

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We all have felt the impact of technology, particularly in the last decade or so since the iPhone was first released. From the way we communicate with our families to the way we move through the entire cycle of electrical contract work from estimating to management to installation, technology has reshaped how we live and work. In our professional realms, these changes mean not only greater connectivity but greater speed and precision which leads to a more robust bottom-line.

In this paper, I'll offer my perspective of the then-and-now of the evolution of technology in the electrical contracting field, seen through the lens of the 50 years of my career.

The first real technological advances came in the 1980s in the form of DOS, those first computer systems where we had to learn the computers' language because we hadn't yet figured out how to teach it ours. That was also the decade that brought us fax machines and, between the two, we got our first real glimpse of how technology could impact our industry.

Still, we never could have guessed then the efficiencies we've so quickly and easily come to take for granted. It makes me wonder what technological surprises wait for us in the years to come.

ESTIMATING

In 1967, when I joined the construction industry as an apprentice, everything was paper. Ledgers, journal entries, sketches, orders - everything was done on paper by hand, leaving plenty of space for errors of the most basic sort, like hard-to-read handwriting and numbers that were transposed incorrectly. Even smudged pencil could lead to significant issues in a project.

We manually transferred the estimate to the accounting and management teams. We literally cut and pasted changes - we're talking scissors and glue here, not CTRL+X and CTRL+V.

In estimating, we measured twice before cutting and sometimes made errors both times. The documentation process was arduous, time consuming, and prone to mistakes. Hallway carpets were worn down from information being hand-carried from person to person, department to department.

Five decades and stunning technological innovation later, all data is electronically gathered and managed, eliminating most of the errors due to transcription and poor handwriting. Estimating is done by computer, eliminating most counting and measuring. Changes are sent automatically via email and, with estimates digitally linked to all departments of a company, accounting, scheduling, and other cost controls have all project information instantly and in identical formats.

We did feel cutting-edge when we introduced fax machines to the estimating and quoting stage of a project in the 1980s. It was in 1983 that I began Zenith Systems (though it is a 95-year-old company due to various mergers and acquisitions over the years) and being on the cutting edge was a priority for me. It still is.

Fax machines were soon adopted widely, allowing us to quote and receive quotes through the phone lines. I'm not sure that we could imagine greater complexity at that point but the 90s brought us the internet and there we were, unknowingly witnessing the advent of "real time" - real-time estimate sharing through email, real-time collaboration on project plans and schedules, and even real-time updating of our internal records.

That last part - the real-time updating of internal records - was where our estimating systems became more sophisticated by a long shot. Suddenly, computers were handling our estimates, eliminating most counting and measuring. We could tie directly into scheduling, accounting, and other cost controls.

Everyone has the same numbers and we could discover greater efficiencies of labor hours both on the job sites and back in the main office.

PROJECT MANAGEMENT

That wasn't even the most exciting or progressive use of the internet, not by a long shot. The impact of technology on project management between my earliest days in the industry couldn't have been cooked up by Ray Bradbury. Or maybe they were.

As I learned the trade, project scheduling and cost controls were not linked to each other beyond what could be held in the minds of those on the team. Inefficiencies were so much the norm that we didn't even think of them as inefficiencies. They simply were.

Still tied firmly to paper, we mapped our three-dimensional projects using two-dimensional methods, imagining that spatial difference as best as we could. All project documents were updated by hand, bringing us back to the issues of transcription errors, inconsistencies, handwriting, and even pencil smudges. We would then communicate those changes by walking or driving paper documents to one another or, once the fax machines were in every office, sending them through the wire.

Finally, every last inch of a project was assembled on site, down to the smallest switch and last inch of wire.

These days, we have technologically-driven systems that coordinate every aspect of a project, keeping all relevant information, items, and documents linked, coordinated, and organized.

About a decade ago, things got even better as the latest modeling technology spring-boarded us from two-dimensional drawings to three-dimensional modeling. Banish from your mind thoughts of the balsa wood flyers you made as a kid; these models are so accurate that they can and do become living documents that can guide an entire build, being passed from vendor

to vendor and kept in the hands of the owner as the template for the project.

With this, we eliminated many of the more costly mistakes that come about when errors are found on the project itself rather than in the wildly less expensive and more flexible scale model. The technology didn't stop with the third dimension, though. Coordination is now four dimensional as aspects of time management are incorporated into the physical planning of a project.

Strapped to everyone's hips and tucked under the arms of most are those ubiquitous smart phones and tablets, replacing the reams of paper and rolls of design that so recently guided our every move on a worksite. With these digital plans has come the ability to update documents in real time and send them to each member of the project simultaneously. Whether the document is related to fabrication, punch lists, or schedule updates, there is no lag and no opportunity for an outdated document to make its way into that day's activities.

As a result of an accurately coordinated Building Model we are adding greater efficiency through the normalization of pre-fabrication and the use of assemblies. Off-site, companies are creating components that we once labored over onsite; where once we had the opportunity for additional error and slow-down, we now have reliable plug-and-play components that lead to less time on the job site and greater accuracy and speed.

FIELD INSTALLATION

It would be all too easy to share this last bit with the tone of "I walked uphill to school both ways in the snow every day;" perhaps waving a fist while muttering, "Kids today!"

Instead, I'll share with no little wonder the working conditions as I recall them from the start of my career. Labor truly lived up to its name. It was arduous, difficult, and dangerous. Safety simply was not a priority on most worksites, and tools were primarily manual,

requiring muscle and sweat to serve their purpose. Hot work was the norm at a time when we used bravado as our primary insulator.

From the coordination standpoint, members of various trades was done in the field, all too often with egos well represented. Without cell phones, communication between the field and management was tedious at best.

For all of the truly impressive features computers have to offer - and offering more by the month - it has been the development of effective batteries that has had one of the more profound impacts on our industry. Every tool that we use is now available in a cordless, battery-powered option, critical for efficiency on projects in which we cannot have a cord on the ground. Where once battery technology wasn't fit for 15 minutes of labor, they can now see us through intensive days of installation before needing a night of recharging.

Batteries and innovation in tool development have led to the need for less intensive labor all around. It's brains, not brawn, that truly see our industry through thanks to these developments.

Communication has been improved on this front as well. Foremen are able to understand and then communicate the design easily thanks to the project model. GPS systems attached to the model ensure accuracy along every step of installation while smart pads track and document installation progress.

Most importantly, safety has become the #1 guiding priority of every worksite, up and down the chain, and from project start to project finish.

INTO THE FUTURE

As technology evolves with ever-increasing speed, the question arises: How to decide when and in what to invest?

Not too long ago, we purchased a machine called a Tremble for \$50,000. It's tied to the project model and can install 400 anchors with absolute precision in the time it would have previously taken us to install 50 anchors with far less accuracy. We can even run a report and locate every single one of those 400 anchors.

With efficiency and accuracy like that, the machine - a large investment by price tag alone - is paid for in half a job.

If the technology can save labor, if it can do it more accurately, if it can help us provide a higher quality product to our customers in less time, we're going to invest in it. And I encourage you to do the same.

ABOUT MICHAEL JOYCE

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