




# Using Artificial Intelligence to Streamline and Simplify Project Takeoffs



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A critical part of the construction estimating process, project takeoffs generally require a lot of manual input and oversight to get it right. Gathering project documents, identifying the right materials, quantifying those materials and then recording/reviewing the takeoff data are both complex and time-consuming. There's also much potential for error and interpretation, both of which can expose a contractor to margin risk.

Like many other aspects of engineering and construction (E&C), takeoffs can be made easier, faster and more accurate through the use of technology. When some or all of the process is automated, for example, the benefits range from more accurate estimates and better planning to significant cost savings and a project that stands a better chance of being completed on time and within budget.

Rewind the clock about 20 years, and companies like ConstructConnect and Bluebeam were among the first to introduce software that helped manage takeoffs. ConstructConnect offers a suite of solutions that helps digitize the preconstruction process, and Bluebeam gives construction professionals tools (e.g., Revu, PlanSwift and Speckle) for collaboration, communication and project management.


Of course, technology has come a long way over the last 20 years, and veteran construction professional Patrick E. Murphy is harnessing artificial intelligence (AI) to help E&C streamline and simplify project takeoffs. His future vision also includes regenerative AI, which develops systems that can learn and adapt in new situations—similar to how biological systems self-heal, self-reconfigure and self-improve.

## An Inside Track

Having grown up in his family's business, Coastal Construction, Murphy knows full well the pains that go into developing, reviewing and sticking to preconstruction project estimates. "I learned estimating from my grandfather 25 years ago," says Murphy, founder and CEO at Togonal.AI. "We did it the traditional way using a scale ruler, roller and paper-printed plans; we did all of the takeoffs manually."



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After graduating from college, working for Deloitte and then serving two terms in the House of Representatives, Murphy rejoined the family business and realized that not much had changed during the prior 12 years. “We’d been blessed to grow the business into one of the largest contractors in the Southeast, but we were still using the same processes.”

A certified public accountant (CPA), Murphy spent some time reviewing Coastal Construction’s financials and quickly pinpointed preconstruction and estimating as the organization’s largest overhead expenses. The square-foot analysis or “takeoff” was actually the costliest aspect of the company’s operations: About 30 estimators spent half their time manually clicking, dragging and drawing polygons and lines, identifying objects and handling an endless cycle of revisions and changes. Then those plans had to be priced out, based on bids obtained from suppliers and subcontractors.

Seeing an opportunity to help his own family’s business and the broader E&C market, Murphy began thinking about how to infuse AI into the estimating process to make takeoffs more efficient and allowing the preconstruction teams to focus on higher value tasks like value engineering, scoping and bid leveling. In 2019 those efforts were parlayed into a new construction tech company known as Togonal.AI (which means “builder” in the Irish language Gaelic). Used by construction companies of all sizes, the company’s software applies machine learning, a form of artificial intelligence, to analyze blueprints and automatically quantify the areas, walls, objects and materials for a project.

This saves construction companies hours of time and helps them to submit more accurate bids. And while estimating software has been around for

decades, Murphy says Togonal.AI is the only company that’s successfully using AI for takeoffs. “We’ve read about some companies trying AI, experimenting with it and wanting to launch a related product, but we haven’t really seen anyone enter the market in any significant way yet,” he says.

## Focusing on Higher-Value Activities

Knowing that it could be first-to-market, Togonal.AI made its debut in 2022. It currently has roughly 1,000 users in 10 different countries and has already been issued three patents for its innovations. For its initial release, the company focused on architectural floor plans. Togonal.AI is now working on its next release, which will include electrical, mechanical and plumbing plans. Structural plans and elevations will be next. “We’re chipping away at all of the various plans that go into a complete construction project,” says Murphy. “Along the way, we’re automating all of the various tasks required to finish those projects.”

With Togonal.AI’s proprietary AI algorithms and machine learning, the same estimators can now automatically detect, label and measure project spaces, walls and objects within seconds. That translates into hours or days saved per plan set (larger jobs are significantly more savings). That time savings translated into about a million dollars in savings for Coastal Construction within 12 months of implementing Togonal.AI. By automating these repetitive tasks, the company has also been able to bid on more projects and win more work, to the tune of about 10 more bids per month per office.

Employees can now simultaneously work and collaborate on a single project through Togonal.AI’s web-based platform, effectively boosting their overall

productivity in an industry whose overall productivity has stagnated over the last 50 years. This also saved hours once spent uploading large plan sets. The application also compares drawing versions and provides instant quantitative analysis of all changes or modifications.

With its value clearly demonstrated at Coastal Construction, Togonal.AI was offered up to a broader audience of global E&C firms. Today the company counts Haskell, Total Flooring and Clark Construction among its clients. One of the top general contractors nationwide, Clark Construction quickly recognized the value of applying machine learning as part of a more automated takeoff process.

“Clark Construction is one of our biggest users and does not want the company’s college-educated estimators spending their time tracking and counting objects,” recounts Murphy. “It wants them to focus on higher-value activities.”

## Tired of Doing Everything the Old-Fashioned Way

In terms of how eager construction firms are to inquire about and/or adopt Togonal.AI’s innovative software application, Murphy says that in most cases, people are curious about it. They’re tired of doing things the old-fashioned way, he says, and know that paying estimators six figures annually to manually quantify plans is not the best use of those professionals’ time.

“Construction CEOs know that there are higher-value tasks that estimators could be focusing on, so they’re generally curious and want to try something new,” says Murphy. Of course, he also knows firsthand how difficult it can be to switch up processes and cultures in an industry not necessarily known for making these types of quick shifts. However, once people spend an hour or two using the AI-enabled software platform, they’re usually captivated.





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“Those users have become some of our best supporters,” says Murphy, who also understands that the value of blending AI, software and takeoffs isn’t always readily apparent—and particularly not for someone who has been doing things the old-fashioned way for decades. To help boil things down for these potential customers, Murphy talks about how the software can handle in less than a minute a task that may take a human two or three days to complete.

That’s not to say humans will ever be eliminated from the estimating and takeoff process, but rather the AI-enabled software handles the mundane, monotonous tasks while freeing up employees to focus on more important projects. Murphy does not believe that AI will replace humans, but humans who use AI will replace those who do not adapt. The software also removes the guesswork from takeoffs and—as Coastal Construction learned—also improves accuracy by full percentage points.

“We’re just trying to speed up the monotonous, laborious and boring part of the job,” says Murphy, whose team is signing up dozens of new customers weekly online. “People are finding us on their own, exploring the web, watching our YouTube videos, doing their own self-guided tours of the software, and then signing up on their own. To me, that speaks louder than anything else.”

## Making More Room for Growth and Change

Togal.AI is now taking construction tech to the next level by using generative artificial intelligence. The company is blending its application with ChatGPT and other similar large language models (LLM’s) to create “Togal.GPT.” That product enables all of the large language model capabilities that have been released and applies them to schedules, plans, contracts, budgets and all other construction documents.

For example, if a foreman has a question about a job schedule, budget or job assignment (e.g., Who is responsible for caulking the windows in the building? What are the liquidated damages if the job is 25 days late?), he no longer has to dig through

files, spreadsheets or lengthy contracts to get those answers. Instead, the foreman will ask a question and get a response—much like a ChatGPT user would. Murphy says the generative AI application is tailored specifically for construction documents and is uploaded by the user, which prevents “hallucinations” or incorrect answers, and with their integration, all customer data is kept completely private and inaccessible by OpenAI.

Murphy believes GPT is just the beginning and we’re entering an era when developers will have three main inputs when thinking of their new job: 1) the address, 2) the budget and 3) the style. The technology is now affordable and accessible enough to interpret local code requirements and understand design, structural limits, MEP layout and optimal architectural floorplans. While this may take some time to come to market, Togonal.AI is already working on predictive change orders, scheduling and overall MEP design.

“We’re all human and we forget things. Generative AI helps us tap into the history of all previous construction jobs, bring that knowledge forward and apply it. No human can remember the layout or a schedule of 100,000 previous jobs, but a computer can,” Murphy explains. In fact, a computer can quickly analyze millions of previous jobs and reveal—with ever increasing accuracy—what is needed in the plans and what the job schedule and budget should be for any current projects.

## There’s More to Come

In 2022 Togonal.AI won The Big 5 Global Construction Pitch Competition in Dubai, the AGC Innovation of the Year Award in Las Vegas and Miami’s eMerge Americas Startup competition, which was judged by Shark Tank’s Kevin O’Leary. The company was also featured on the Entrepreneur TV show “Elevator Pitch,” selected for Venture Atlanta, and has made BuiltWorlds’ Pre-Construction 50 List two years in a row.

Later this year, Togonal.AI plans to roll out CodeComply.AI for fire, ADA and other code compliance requirements. Companies will be able to scan plans through the application to learn whether those plans meet the criteria for the local fire department, life safety and ADA requirements (i.e., Are the exits situated properly? Are there enough exit stairs? Do you need more fire sprinklers?).

“We’ve processed all the rules and thousands of pages of code and then created the algorithms that will automate code compliance,” says Murphy. “We’re really excited about this because trying to get a job approved takes months—if not a full year—of work. CodeComply.AI will substantially expedite that process.”

Looking ahead, Murphy sees more technology and automation coming to a job site near you and says the field as a whole is becoming increasingly comfortable with investing in and using technology for project management. “Generative AI, ChatGPT and Google’s Bard are changing the world, and construction is no exception to the rule,” he points out.

“If anything, I would argue that construction will experience even more change because it’s starting from a lower basis than many other industries,” Murphy concludes. “There’s been so little tech innovation to date that we have even more room to grow and change.”

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– Patrick Erin Murphy  
Founder and CEO  
Togal.AI



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