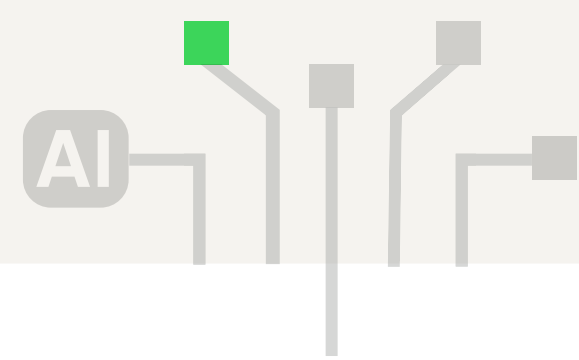


How can **AI** help you drive Lean Construction performance?

Enhancing Lean Construction with AI, featuring industry voices from Skanska, Layton Construction, Hensel Phelps and others



INTRODUCTION

Is data the key that can unlock Lean's full potential?

Over 75% of construction projects are delivered behind schedule. The most common cause? Operational problems like resource use and trade partner sync issues. This eye-watering figure, compounded by the current talent shortage, means more people are realizing that 'working harder' alone isn't enough to turn the tide on lagging efficiency and effectiveness. Amid these challenges, Lean Construction has emerged as a logical alternative to following the status quo.

Lean Construction has been around since the 90s, though it's now quickly gaining popularity. How Lean Principles are applied is also evolving as new technologies emerge, like artificial intelligence (AI) and computer vision. As AI moves into the construction mainstream, many are recognizing its potential to enhance Lean Principles.

The construction industry can now use AI to improve project efficiency, safety and decision-making. In the planning and design phase, potential applications include BIM enhancement and generative design. Meanwhile, onsite construction management can be transformed by AI progress management, which is the focus of this whitepaper.

At its core, AI progress management helps project teams get the most out of Lean Principles by addressing a longstanding pain point – a lack of data and actionable insights. The truth is that Lean can only deliver continuous improvement and efficiency gains if teams have timely, accurate and reliable data to work from. AI platforms create, process and present this data, giving projects a much-needed boost.

Understandably, there's a lot of hype around AI, and it can be hard to see the wood for the trees. In this whitepaper, we'll take a more down-to-earth approach and explore how AI progress management enhances the six tenets of Lean Construction (as defined by the Lean Construction Institute).

Thank you



SKANSKA

Jeremy Cortesio
Project Executive



Layton

Kyle Nitchen
Senior Project Manager



HENSEL PHELPS
Plan. Build. Manage.

Chris Vine
Project Superintendent

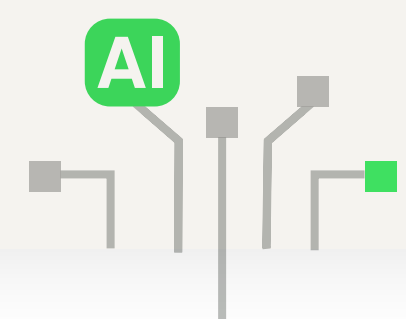


BUILDOTS

Andy Steele
Chief Strategy Officer



This whitepaper is based on a webinar (Optimizing Lean with AI and performance driven techniques) hosted by Builddots and the Lean Construction Institute (LCI) in June 2024. Thank you to these participants for their insights.



LCI Lean Principles

Before we start, here's a reminder of the Lean Principles.

Lean Construction aims to create a healthy and thriving industry that delivers outstanding project outcomes for all. Its tenets – shown in the diagram on the right – are designed to support these goals. Respect for people is at the heart of the Lean tenets, forming the bedrock of this philosophy.



01 Generate value

In Lean Construction, generating value is about prioritizing clients' wants and needs across all parts of a project. Anything that doesn't contribute to these is considered waste (more on this later). This mentality helps ensure that projects align with clients' requirements and expectations – but it can be easier said than done.

One reason is that many clients view the entire construction process as an inconvenience. This may sound harsh, but think of it this way: If they could wave a magic wand and have the finished building appear immediately, they would! By contrast, project teams are deeply involved in the nitty-gritty. They live and breathe every tiny success and failure on a project in a way that clients struggle to relate to. These different viewpoints can make it hard for clients and teams to understand each other's concerns and priorities.

How does AI progress management help close this gap?

In the context of Lean Construction, AI generates value by offering deep insights into the metrics clients care about. It does this by collecting and analyzing vast amounts of real-time data. But, as we all know, it's not just about having data. Offering clients value depends on your ability to translate complex data into accessible insights. Doing so means that all stakeholders – regardless of their level of construction knowledge or technological prowess – can see how decisions impact overall value delivery.



"As a whole, I think clients are mostly interested in how our decisions affect them and also how they can do better as clients. At the end of the day, everyone wants the project to succeed. But for people who don't do construction day in and day out, it can be hard to understand how their actions affect what happens onsite."

JEREMY CORTESIO, Project Executive | Skanska



"AI helps take all the information from our job sites, process it, organize it and put it into easy-to-understand dashboards. That's the fundamental benefit of AI in Lean right now."

KYLE NITCHEN, Senior Project Manager | Layton Construction

02 Eliminate waste

Eliminating waste is crucial to increasing productivity and profits. But we're not just talking about squandered time or resources. In Lean Construction, the concept of waste is much broader and is explained through an idea borrowed from manufacturing – 'The Eight Deadly Wastes.' The acronym **DOWNTIME** is sometimes used to explain these wastes. Here's a brief overview:

Defects

Materials that have been damaged or made incorrectly, which means they need to be reworked or scrapped.

Overproduction

Building something too soon or finishing earlier than needed. People often mistake overproduction for overachieving, but it can lead to wasted materials.

Waiting

This waste happens any time teams can't complete work due to the knock-on effects of the other wastes.

Non-utilized talent

The all-too-common practice of tradespeople being assigned tasks that don't utilize their skills.

Transportation

The unnecessary movement of materials to and from or around a jobsite.

Inventory

Again, this waste can look like a blessing. But it's not. Having too much of something on a site can kill your workflow by preventing trades from working in certain areas.

Motion

This involves any unnecessary movement by tradespeople. Moving excess materials around a site is a classic example of non-utilized talent and motion waste!

Excess

This is also known as overprocessing and refers to anything that needs to be reworked, rebuilt or redesigned, contributing to the other wastes.

How does AI progress management help address the deadly wastes?

Understanding productivity, production and pace is fundamental to avoiding waste. To do this, you need real-time data – precisely what AI provides. AI progress management platforms offer early error detection and progress verification so teams can catch mistakes that would otherwise go unnoticed. This allows them to address complications before they become catastrophes that cause costly rework.

In addition, AI progress management can help teams dynamically adjust schedules and mitigate risks, proactively lowering the likelihood of rushed work and errors. They also help optimize resource allocation by accurately forecasting material needs and managing labor.

Consider this scenario...

Without AI

You're working on a large office fit-out project that includes installing partitions, HVAC systems, electrical wiring and custom interiors. It's a complex project, with multiple trade partners working simultaneously on different floors.

Due to the project's scale and the lack of precise tracking, some partitions are installed in slightly incorrect positions, which later conflict with the planned electrical and HVAC routes. You only discover these errors after a significant amount of work has been completed, so walls must be torn down and rebuilt, and electrical and HVAC systems must be rerouted. This rework leads to wasted materials, additional labor costs and project delays.

With AI

Now, imagine the same office fit-out project with AI progress management. Cameras regularly capture progress and compare the ongoing work to your BIM model. As partitions are installed, the algorithm detects that certain walls don't align with the plans and immediately alerts the superintendent, so they can ask the trade partner to correct this before the work moves forward.

AI also tracks the installation of HVAC and electrical systems, ensuring all components are installed according to the design. It also predicts potential conflicts between trade partners so you can adjust schedules. All in all, catching and correcting errors early has prevented a lot of waste on this project.

The bottom line?

Fewer costly deviations, return visits and rework = **Less waste**



"As a large general contractor, we've always thought about performance, but we've just done it manually. With technology, I don't need to have engineers out in the field anymore counting things. Instead, I can capture footage of my job site with a 360 camera and tomorrow morning, I'll have a full report on my desk. I haven't wasted any resources, and all my people get to go home on time."

CHRIS VINE, Project Superintendent | Hensel Phelps



"Huge fluctuations in trades' productivity rates are among the most common things we see in Builddots' data. This often raises a huge amount of questions for our clients. Seeing and addressing these inconsistencies in the data is a huge thing they can do to eliminate waste and boost efficiency."

ANDY STEELE, Chief Strategy Officer | Builddots



03 Focus on flow

In Lean Construction, focusing on flow means optimizing the movement of materials, information and work throughout a construction project. The idea is to avoid conflicts and unnecessary 'stops and starts.' By concentrating on flow, Lean Construction creates a more efficient, predictable and productive work environment. Consider these examples:

AI progress management unlocks a new way for project teams to think about flow

Stay ahead of the week:

Weekly lookahead plans are crucial to Lean Construction. AI progress management improves them by providing a foundation of accurate data, so they're not just based on subjective input from trade partners. This adds a new level of accuracy and accountability that benefits everyone.



To flex or not to flex?

Data shows that getting project flow right is about balancing a strict schedule and flexibility. Projects with no deviations from the planned schedule tend to experience more delays than those with up to three, while those with over four deviations see the most delays. So, there's a sweet spot in the middle. AI progress management allows teams to implement the 'right' amount of flex and maintain a smooth flow across complex task chains.



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"In construction, we often find ourselves in very stressful situations. As a management team, we can help people avoid this by incentivizing them to plan and track things in a way that focuses on the front end of projects."

JEREMY CORTESIO, Project Executive | Skanska



"I often compare complex construction projects to rolling a snowball down a mountain. You can make adjustments quite easily when you're at the top of a mountain with a small snowball. That's almost impossible when you get closer to the bottom of the mountain – i.e. the end of the project. When you have a steady stream of data at your fingertips, you can spot problems early and make those smaller adjustments further up the mountain before they escalate."

KYLE NITCHEN, Senior Project Manager | Layton Construction

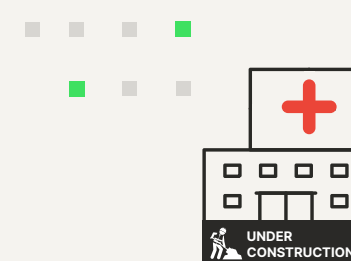
04 Continuous improvement

The continuous improvement tenet says that we should constantly look to improve our projects by addressing constraints. However, figuring out the root causes of constraints is often easier said than done when using manual methods.

How can AI progress management help?

AI provides precise, real-time feedback on project performance. This unlocks both immediate and long-term improvements.

Consider these real-world examples from a GC specializing in healthcare construction



Immediate

AI is excellent at analyzing pace and spotting potential delays early. **On one project**, the GC in question used AI progress management to ensure trade partners worked at a pace matching its project schedule. When some trades fell behind, it flagged this issue proactively and worked with them to reduce delays by 75%.

Long-term

By implementing learnings uncovered by its AI progress management platform, the GC ensures schedules become increasingly achievable over time. On large initiatives, such as multi-hospital builds, it can share lessons between projects to amend future designs and schedules and feed them back into pre-construction activities.



"AI and machine vision provide accurate, unbiased data presented in actionable metrics. It's the only way teams can make informed decisions and unlock continuous improvement. This is completely complementary to Lean Principles. Before the advent of this technology, the ability to capture data at the granular level we're now seeing simply didn't exist. The human eye isn't capable of it."

ANDY STEELE, Chief Strategy Officer | Builddots



HENSEL PHELPS
Plan. Build. Manage.

"We track variances. In my experience, this is one of the top two metrics that prevent you from hitting commitments. But to get real value, you need variance data over time, not just a single snapshot. This lets you understand which variance types are really impacting your project. Not the one-offs, but those responsible for 10, 20, 30% of the trouble."

CHRIS VINE, Project Superintendent | Hensel Phelps

CASE STUDY

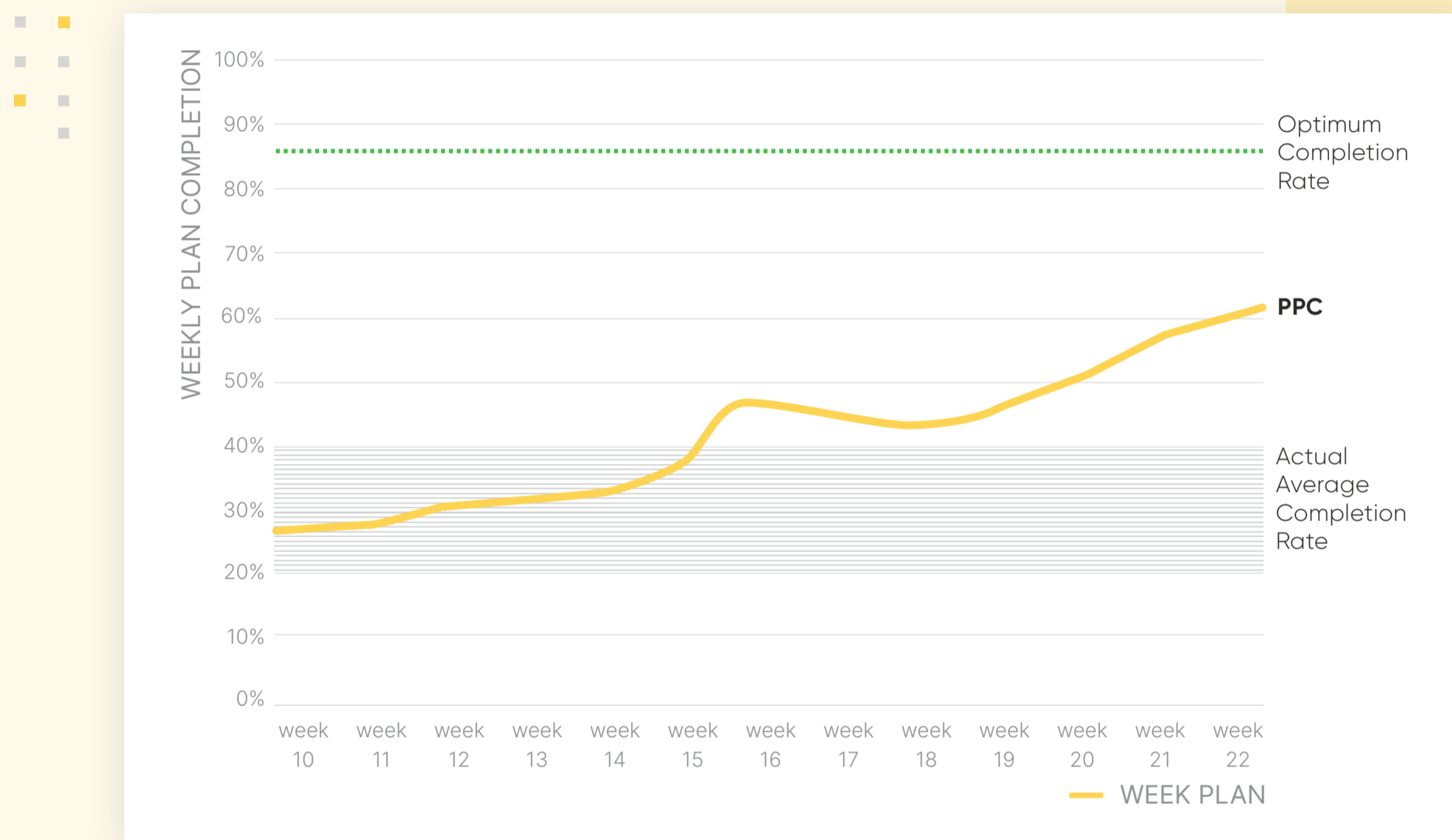
AI progress management and the Last Planner System



Lean methods like the Last Planner System (LPS) have enormous potential to enhance project delivery. However, they're not universally adopted, partly due to the lack of readily available data to support them. Here are two examples from an actual GC that show how effective integrating LPS and AI progress management data can be.

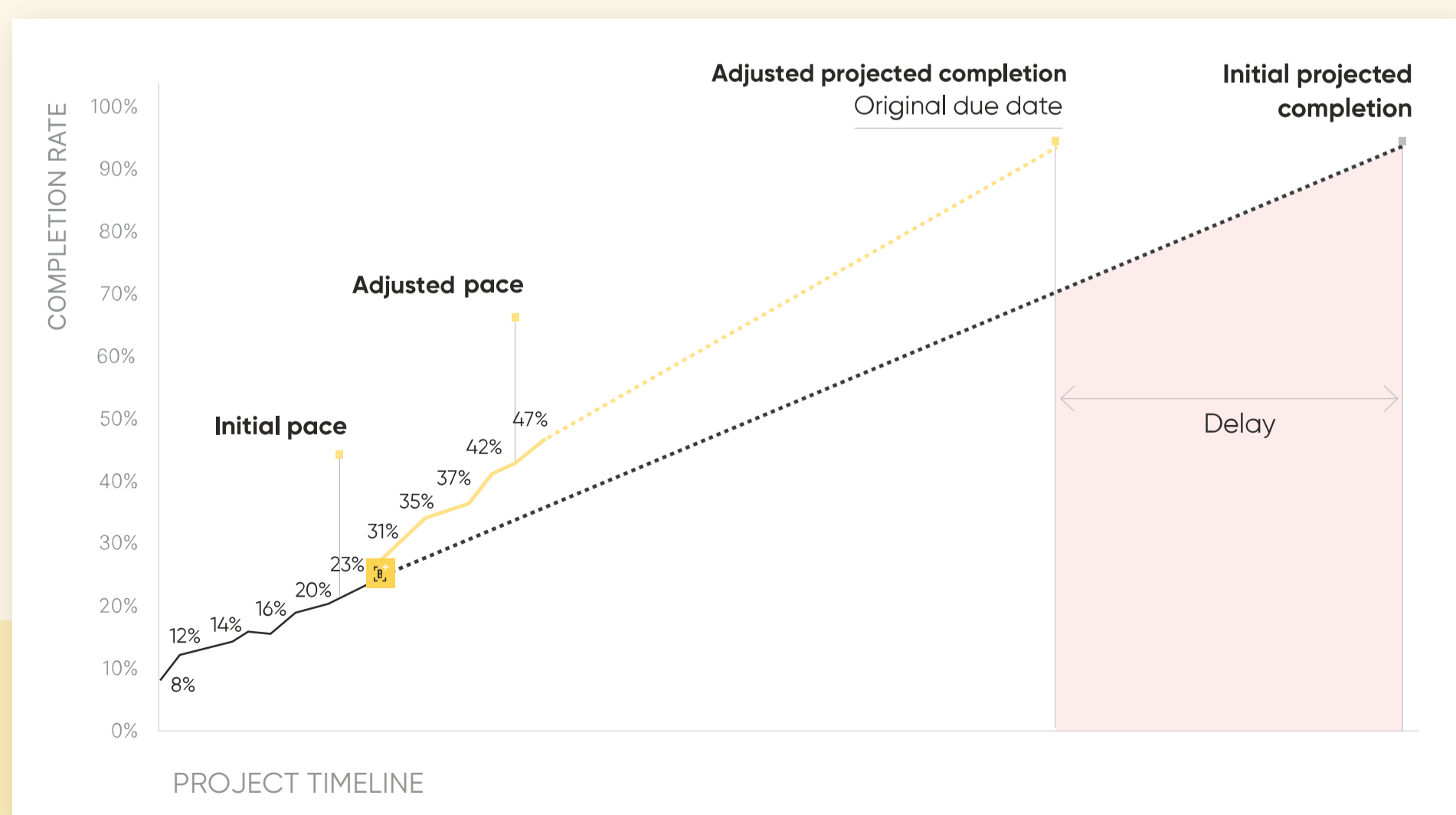
Steady percent plan complete growth

This chart shows how this GC doubled completion rates on one project from 30% to 60% in just six weeks by integrating data captured by an AI progress management platform into weekly work planning and control phases.



Addressing early-warning signs of delays

Here, you can see how the GC caught potential delays early enough to recover. Real-time data alerted the project team to a slow pace that risked missing milestones and affecting downstream tasks. By bringing in more labor, the GC in question completed the project over 100 days earlier than projected.



05 Optimize the whole

Think of your project team as a sports team. Both have clear and distinct roles and responsibilities but work towards a shared long-term goal. We all know that if every athlete focuses solely on their own stats and performance, their whole team is doomed to failure. But this is precisely how trades often behave on a construction site.

In some ways, this mentality is understandable. As long as you're doing a great job, you can't go wrong, right? Not so fast. As a subcontractor, being laser-focused on meeting your own goals at all costs can be detrimental to a construction project, causing site congestion, sequence deviations, relationship strain and, ultimately, delays.

In Lean Construction, optimizing the whole means prioritizing the entire project's success over individual targets or outputs. While it can require a mental adjustment, this mindset benefits everybody. Ultimately, getting everyone behind the same goal is what matters.

How does AI progress management help optimize the whole?

Communication and transparency

By integrating AI-captured data from across a project, teams can see how their work impacts others, leading to more coordinated and efficient operations.

Proactive problem solving

AI helps identify bottlenecks or resource shortages before they occur. By addressing these issues early, teams can prevent disruptions and maintain overall project flow, optimizing the whole rather than reacting to problems as they arise.

Resource allocation

AI analyzes how teams are deployed across entire projects and suggest how to allocate them more effectively. This helps teams make sure that no single part of a project is optimized at the expense of others.

Continuous feedback loop

A continuous stream of AI data allows teams to adjust their strategies in real time, so all activities align with overall project goals.

Cross-project learning

Teams can apply lessons learned across future projects, too. This optimizes the whole by building on past successes and helping to avoid repeat mistakes.



"It's easy for us to think external factors like weather or scope changes cause unproductivity. But the reality is that internal issues – inefficiencies, lack of communication, etc. – are the biggest factors causing delays and losses. Consistent data helps to reveal this."

KYLE NITCHEN, Senior Project Manager | Layton Construction



"Close collaboration is crucial. Years ago, we still thought, 'As long as I do what I need to get done, that's good'. Eventually, you learn that your sole success doesn't necessarily translate to project success and that you might not actually be successful operating that way."

CHRIS VINE, Project Superintendent | Hensel Phelps

06 Respect for people

The bedrock of Lean Construction is creating a work environment that values wellbeing and professional contributions.

This is arguably where **AI** progress management can have the most impact



A return to reasonable working patterns

The construction industry is working too hard. In a bid to finish on time and to a high standard, projects routinely spill into evenings, weekends and vacation days. While the work ethic of many in this industry is admirable, this simply isn't sustainable. It's little wonder that construction wrestles with so much poor mental health – a global issue tackled by organizations like [CIASP, I Build America, MATES in Construction and Get Construction Talking](#).

Ultimately, there's a finite number of hours in a day, and as projects become more complex and timelines become more demanding, AI progress management offers a valuable lifeline. By slashing administrative work and minimizing the need for rework, it can finally help this industry start working smarter, not just harder. The knock-on effects could help set it on a new path...



Attracting talent

The construction industry is facing an acute talent crisis. Older workers are retiring en masse, and there isn't enough new blood entering the field. The industry's reputation for physically demanding work, safety concerns, rising paperwork and cyclical employment can deter potential talent. But there's also a pervasive view that construction is old-fashioned – stuck in its ways and slow to adopt new tech.

Embracing new technology that boosts effectiveness and efficiency is vital to attracting new talent. It modernizes the work environment and showcases the industry as innovative and forward-thinking.



Resolving conflict

For superintendents and project managers, completing a complex project can feel like carrying the weight of the world on your shoulders. Conflict is far too common, and it can be hard to listen to the most accurate voice in the room rather than the loudest one.

AI helps defuse conflict on projects by giving everyone a shared source of truth. Accurately tracking progress down to the last plug socket, pipe or piece of ductwork removes the 'he said, she said' and finger-pointing from meetings. It also reduces the need for rework and disputes – common causes of conflict.



"Let's offload some of the admin work to AI and technology, so we can focus less on project administration and more on strategy. That's where I want the industry to go. The next generation is going to love that."

KYLE NITCHEN, Senior Project Manager | Layton Construction



"There's no gray area with AI progress management, data is presented in an objective, factual way. So, when you're sitting in the trailer having those morning huddles, the data you present on how much work has been done and where can't be disputed. It's as simple as that."

ANDY STEELE, Chief Strategy Officer | Buildots

Conclusion

Whether you've read this whole whitepaper or skipped straight to the end, we want to clarify one thing. AI progress management and Lean Principles belong together. They're completely complementary.

We hope we've shown you how everyone can reap the rewards of integrating the two. Doing so isn't just a tech upgrade or 'yet another tool', but a strategic move towards more predictable, high-quality outcomes that benefit everyone.

We leave you with a last word from our industry experts



"The construction business model is fundamentally broken. It's no reflection on the wonderful people in this industry. It reflects how we've structured our industry and the resulting problems. The talent crisis is getting a lot of attention at the moment. But it's more systemic than that. We've got to look at the root causes behind our problems, examine the relationships between all project stakeholders, and find new ways to improve them. I believe we can make a huge difference with technology... Think about the huge amount of time your organization spends manually creating data and insights. All of that can be outsourced to AI."

ANDY STEELE, Chief Strategy Officer | Buildots



SKANSKA

"In a car, you have a really clear idea of how much gas or battery you have, how far you can go and when you'll need to stop. This isn't true in construction, and I think our industry can do better. Even projects that have embraced a lot of Lean Principles and collaboration are using some pretty old, tired metrics. This still incentivizes us to react rather than plan ahead."

JEREMY CORTESIO, Project Executive | Skanska



"If you're using AI and this performance-based methodology now, I'm sure you're excited, as you already see that you can do more with less. If you're not, then great news: the tech you need is now much more accessible. This means you don't need to hire more staff or price yourself out of your scope to get the data you need. We're super excited about AI and using it ourselves."

CHRIS VINE, Project Superintendent | Hensel Phelps

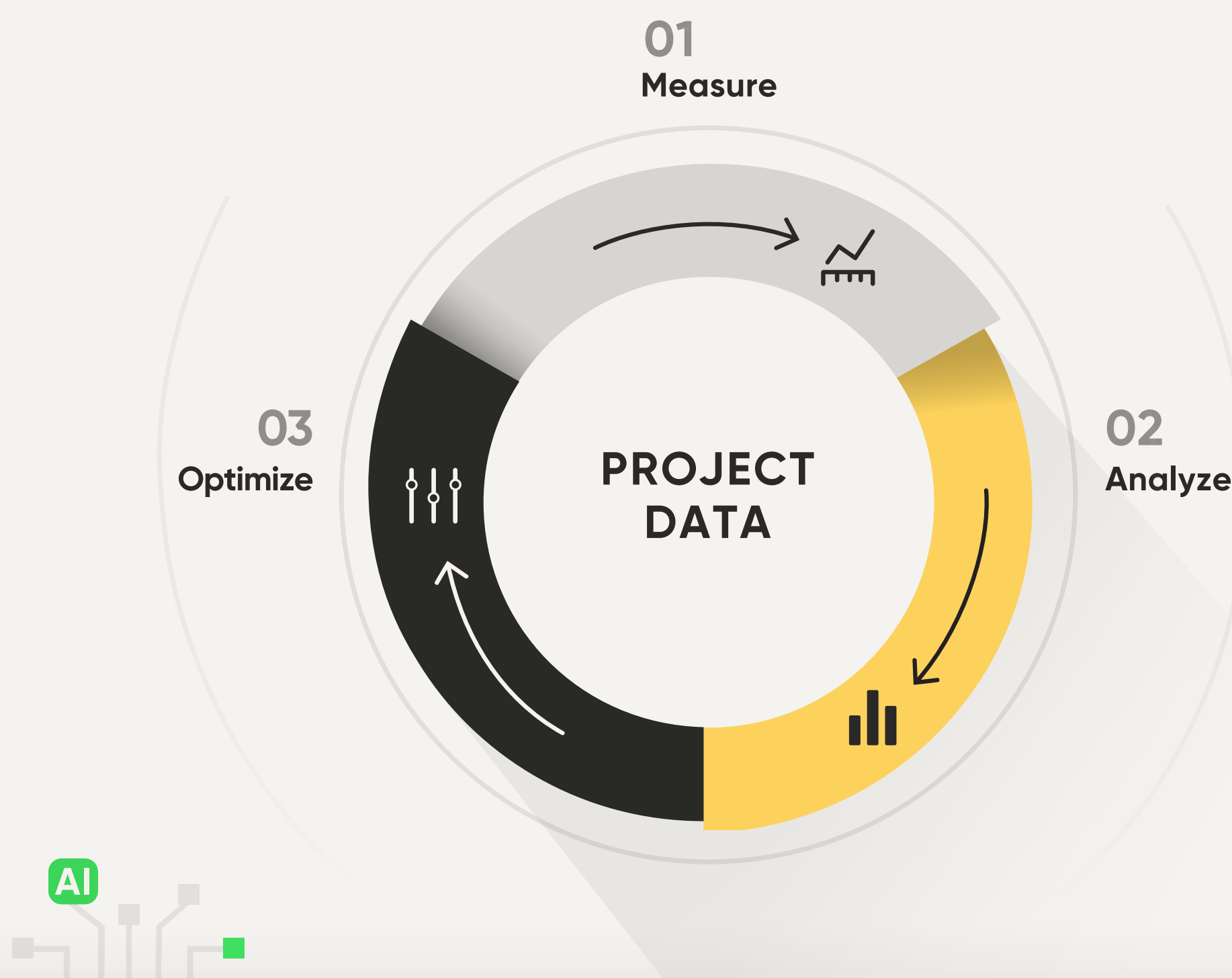


The Buildots framework that complements Lean: **Performance Driven Construction Management**

The PDCM framework allows you to build Lean Principles into your workflows, making it easier to keep them at the forefront of your projects.

We need to shift construction management away from subjective reporting and reactive problem-solving. This is why Buildots developed the Performance Driven Construction Management (PDCM) methodology. Created alongside construction industry leaders, PDCM uses in-depth data and insights to create a performance-focused culture. This approach enables project teams to anticipate delays, optimize processes and steer projects towards success.

In short, PDCM helps teams make informed decisions and solve problems proactively. It has been tested and validated in various project environments, including those using Lean. Ultimately, Lean Principles and PDCM drive towards the same goal – improving construction efficiency and effectiveness. PDCM simply adds an extra layer of transparency by integrating data-driven performance insights with project teams' inherent expertise to get the best possible outcomes!



You can learn more about PDCM and its applications here [➔](#)

About Buildots

Buildots, an award-winning leader in construction technology, leverages AI and computer vision to enhance traditional project management methods, introducing a performance-driven approach to managing construction projects. Our platform automatically generates accurate, unbiased data and actionable metrics crucial for strategic decision-making. Enhancing visibility and control for site teams and management alike, Buildots sets new standards for efficiency and productivity, effectively minimizing delays and ensuring projects are completed on time and within budget.