DREES & SOMMER

THINKING AHEAD

LEAN PROJECT DELIVERY – A VISION OF THE FUTURE!

THINKING AHEAD

LEAN
IN THE CONSTRUCTION INDUSTRY

After its successful application in the manufacturing industry, Lean Management achieved its breakthrough in the construction industry – directly on the construction site, in planning, and in companies. But what is the current situation with Lean? What services can it provide, and what are the next steps? And what is Lean, actually? A methodology, an approach, or a solution?

The brochure ‘Thinking Ahead Lean Project Delivery – Looking into the future’ examines these questions and looks into an uncertain future. But we also look back and review developments that have taken place in recent years. This analysis is intended to help you and your company to make the right decisions.

LEAN PROJECT DELIVERY – A VISION OF THE FUTURE!

The construction industry is in a state of transition. The ever-increasing degree of digitization, automation and autonomization will radically change the nature of construction – and thus also of Lean Project Delivery. The future of project execution with Lean leads to ultraefficient projects – even if we don't know exactly what that means. But we do know that we need it, and we know that in order to get there, Lean must pass through five eras. Regardless of the era in which the company currently finds itself, it is important to anchor Lean culture in the strategy. Currently, many people consider Lean to be a service provided for projects. But Lean must become part of the culture and an integral part of a corporate strategy in order to achieve scaling effects and allow it to reach all employees of the organization.

Join us on a journey through the different Lean eras – from Analog Lean to Digital Lean, then on to Smart Lean and the autonomous era – and ultimately to the ultra-efficient project.

ANALOG LEAN

Analog Lean – We work hands-on,
physically, with sticky notes.
No project data is generated or collected.

DIGITAL LEAN

Digital Lean – software solutions are used to digitize the Lean approach.
In addition to physical screens, there are digital and remote solutions on
the construction site. Data is primarily collected by manual input.

SMART LEAN

Smart Lean – A smart project infrastructure connects people,
machines and materials. The generation, collection and evaluation
of data is carried out passively by existing systems.

AUTONOMOUS LEAN

Autonomous Lean – We observe a process of adaptation
to what are primarily technological disruptions.
The participants learn from data and work with data.

ULTRA EFFICIENCY

The ultraefficient project – the vision is the synchronous
construction site – and ultimately the perfect project.

EVERYTHING IS BASED ON IT …

HOW CAN WE ADAPT THE LEAN CONCEPT FROM THE MANUFACTURING INDUSTRY TO THE CONSTRUCTION INDUSTRY? DREES & SOMMER HAS BEEN WORKING ON THIS ISSUE SINCE 2006. INITIALLY, THE METHODOLOGY WAS AN EXTENDED PROJECT MANAGEMENT SERVICE FOR THE EXECUTION PHASE.

The primary focus was on creating transparency, shortening construction time, increasing schedule stability and adherence to deadlines, and improving collaboration in the project.

The solution was mainly aimed at principals. Over time, other people involved in the project also grew to appreciate the Lean Construction Management (LCM®) vision and methodology. Drees & Sommer then refined the methodology to make it particularly suitable for construction companies, subcontractors, plant manufacturers and construction suppliers.

LEAN CONSTRUCTION MANAGEMENT (LCM®) IN THREE STEPS:

› Overall process analysis:
This step analyzes the geometry of the building and divides it into equal areas and takt areas. Based on this, the Lean consultants then determine and define the process sequence – using sticky notes and brown paper.

› Process planning:
A schedule is applied to the defined process sequence. Here, the Lean consultants distinguish between taktable and non-taktable areas and plan the processes accordingly.

› Detailed planning:
This is used for scheduling on the construction site. Daily and weekly performance comparisons allow any impending deviations from the schedule to be detected and eliminated at an early stage. These performance comparisons mean that the project participants are constantly thinking about how they can further improve their daily work processes.

ANALOG LEAN

The core element of the methodology is the kanban card system. Drees & Sommer was one of the first companies in the construction industry worldwide to transfer kanban card systems to construction. The kanban cards are used for detailed planning. In addition to the kanban cards, Lean consultants also use sticky notes to analyze and plan the processes during the preliminary stages.

Over time, Drees & Sommer developed the Lean approach under the name Lean Design to cover earlier service phases as well. Lean Design Management serves on the one hand to optimize planning time and planning itself (for example, using Target Value Design, Agile Design Management and Last Planner System for planning) and on the other hand to optimize the content. In addition, there are aspects of modular planning that optimize the building itself.

Other Lean Project process systems were developed before or at the same time:

› The Last Planner System (LPS®) focuses on collaboration and cooperation within the project. The so-called Last Planners use the LPS to create the schedule. They are the people who actually do the work. The methodology generally ensures a positive experience for project participants. However, the LPS® also leads predominantly to qualitative results, in other words, results that are hard to measure.

› Takt planning and takt control: Most companies create the takt plan as part of work scheduling. The trades are assigned by category. A wide range is possible, from collaborative takt control to law-and-order structures. The takt planning shows directly measurable results. However, each takt plan requires multiple modification cycles over the course of the project in keeping with the learning curve. Involving the contractors allows agile takt control and a rapid response to what is happening in the ongoing project.

In contrast to the procedures listed above, LCM® is a hybrid approach that creates a takt plan at the beginning of the project. The participants implement the project with kanban card systems on the construction site and are guided by the takted preview planning. The contractors are constantly involved in the planning process. This approach delivers the greatest added value for large and complex construction projects.

All methodologies have pros and cons. We recommend adapting them according to the particular situation and project. Choosing the right methodology depends, among other things, on the parties involved and the project's complexity, cost, scale, and budget.

The overarching goal of all Lean Construction methodologies is to make work transparent. This makes it possible to identify and deal with risks and challenges at an early stage. This results in stable processes that continue to be consolidated. And reduces 'the mother of all types of waste' in construction projects – namely schedule slippage.

DIGITAL LEAN – ALL IN REAL TIME

THE DIGITAL AGE PRODUCES RELIABLE SCHEDULE DATA IN REAL TIME: SO CAN WE NOW SAY GOODBYE TO SCHEDULE SLIPPAGE?

Let's jump to 2015: It is from around this time that we have seen increasing moves to digitize analog Lean methods … and even to supersede them entirely. Think 'disruption'.

The digitization of Lean ways of working enables the collection of real project data: Costs, meeting minutes, process sequences, process durations and much more besides. The potential is there – but the primary focus is currently on communication and real-time collaboration. This means that the Lean consultants in projects try to replicate, both virtually and digitally, everything that takes place in a Lean room, including all emotions. This applies in particular to the solutions that digitize the Last Planner System. The prerequisite is that the methodology itself has been digitized or implemented in a software solution.

But let's take a closer look at the efforts to digitize the respective systems.

DIGITIZATION SYSTEMS:

› Takt planning
Users have conventionally used spreadsheet programs for takt planning. At the same time, an increasing number of software solutions for takt planning – as well as solutions that simplify and automate takt planning – are appearing on the market.

› Takt control:
There are promising hybrid developments in this area. This means that the daily or weekly takt can be interrogated using a digital data acquisition tool. This is usually done on the construction site.

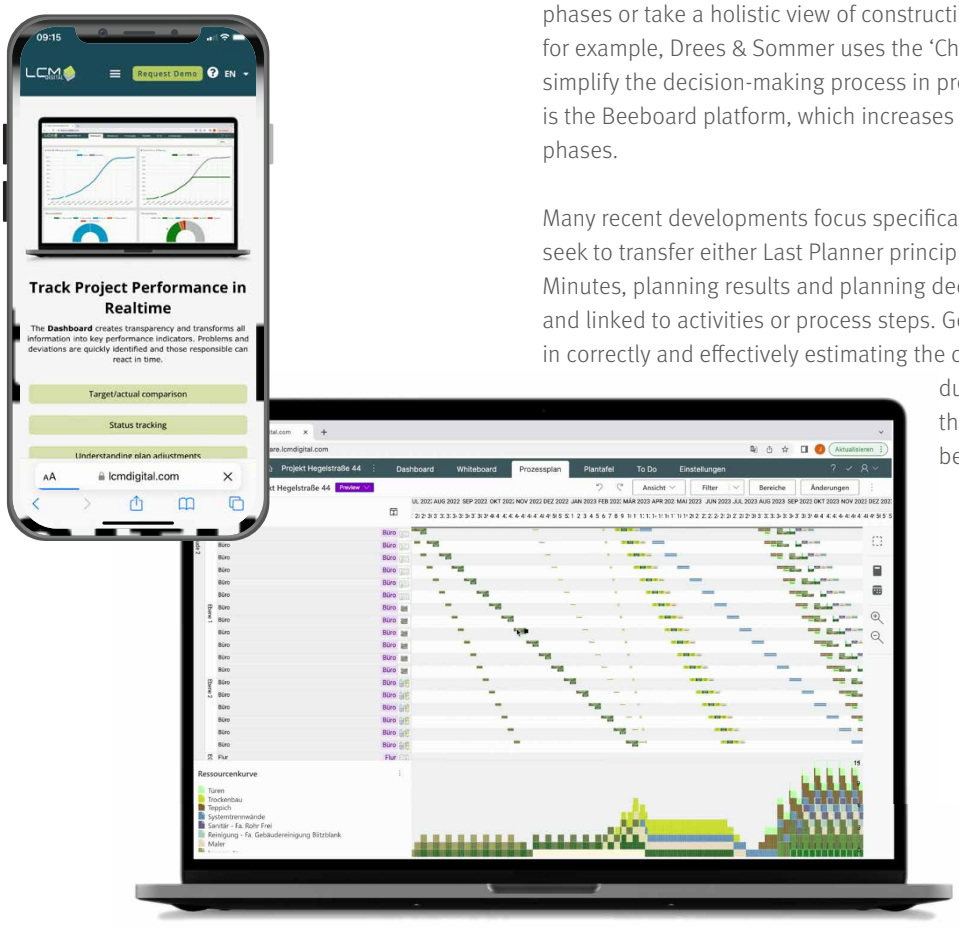
› Last Planner System:
The first step here was to create a digital concept. So far, the focus here has been on digitizing the methodology itself and recreating the emotions in the Lean room.

DIGITAL LEAN

New solutions have continued to appear on the global market since 2019. And there is now an independent, steadily growing startup scene. Drees & Sommer was also one of the first companies to establish its own startup: LCM.Digital is an online solution for real-time collaboration and digital Lean Project Delivery.

Using Lean principles, LCM Digital interconnects all stakeholders – from planning through to execution. From small projects to large and complex ones, LCM Digital leads to greater communication, collaboration and feedback cycles across all processes. This results in improved effectiveness and efficiency as well as complete transparency for all project participants – anytime and anywhere. The special feature of LCM Digital, however, is that it is based on and digitizes Drees & Sommer's analog Lean approach. As a result, the solution is one of the few in the world that both creates takt plans and uses collaboration for takt control. This hybrid approach requires users to have Lean construction skills.

Just as in the analog world, the previous focus of digital Lean tools has been on the execution phase of construction projects. But since 2020, there has also been an increase in digital Lean solutions for the early service phases of construction projects. On the one hand, developers are adapting existing Lean software solutions – such as LCM Digital – to the planning phase. On the other hand, there are new startups that focus on the early service phases or take a holistic view of construction projects. With Anchor Decisions, for example, Drees & Sommer uses the 'Choosing By Advantages' method to simplify the decision-making process in project management. Another example is the Beeboard platform, which increases transparency across all service phases.



Many recent developments focus specifically on the planning phase. They seek to transfer either Last Planner principles or agile approaches to planning. Minutes, planning results and planning decisions must be listed in some way and linked to activities or process steps. Generally speaking, the difficulty lies in correctly and effectively estimating the duration of the individual steps during the planning phase. Because the complexity of the task only becomes completely clear over time.

DIGITAL LEAN

Digitization and automation offer endless possibilities. But much of what is possible is not yet conceivable for the construction industry. Despite this, the construction industry has achieved a great deal compared to the manufacturing industry, which is still having difficulty digitizing shop floor management*: The digitization of process systems such as Last Planner, takt planning control and LCM® has come a long way. Currently, these tools compete with conventional software solutions. However, the digital Lean Design and Lean Construction tools allow project data to be maintained in real time by many project participants – theoretically from anywhere in the world. Also, the methodology – and, as a result, the nature of cooperation in projects – differs from the previous solutions. As an interim solution, the Lean community is trying to combine conventional and modern lean solutions. But this parallel use of systems and the associated duplication of operation is not sustainable in the long term.

The COVID pandemic and the associated restrictions accelerated the development into the digital era. Nevertheless, Drees & Sommer recommends starting with the analog approach. Even though the power of Lean lies in the vision and conviction that integrated cooperation, transparency of processes and visibility of tasks are the key to success, it would not matter whether you started with a digital or haptic approach. But the methodologies and procedures can be better learned and understood by using the haptic approach.

As a result, scheduling is becoming more reliable in the digital era, leading to improved schedule stability. The prerequisite for success is that the tools used are user-friendly, easy to handle and that the data is easy to evaluate. Data is the new gold – and that also applies to the construction industry and especially for project management using Lean approaches.

* Shop floor management is a management tool in which managers are present 'in the workshop' – where the action is – and actively control the value-added processes in production.

SMART LEAN – CONNECTING PEOPLE, MACHINES AND MATERIALS

DATA, DATA, AND YET MORE DATA! THE COLLECTION, GENERATION AND EVALUATION OF DATA DETERMINES WHICH COMPANIES WILL SURVIVE IN THE LONG TERM. AND THE DINOSAURS THAT RESIST THIS DEVELOPMENT WILL BECOME EXTINCT!

The potential of data for the construction industry and construction supplier industry is enormous. Construction projects worldwide generate tens of billions of terabytes of data every day. The challenge for the construction industry is to systematically collect and evaluate all this data.

Smart Lean Construction is already part of the vision of most technologies, product developments and software companies related to Lean Design and Lean Construction. But it is the companies that are just leaving their own startup phase that are developing fastest. Smart Lean is about networking people, machines and materials. While in the digital Lean era data was collected and generated by manual entry into the system, Smart Lean goes a step further: Data is generated passively and automatically networked.

SMART LEAN

Data is the new gold. Smart Lean is changing construction project management step by step.

The fact that Building Information Modeling and digitized Lean tools are merging at the procedural level has led to a technological breakthrough in construction project execution.

Smart Lean Project Delivery is a platform that enables project participants to network people, machines and materials. The possible scenarios are unlimited and depend only on the imagination and willingness to invest of those involved in construction. Due to the large amount of real-time data, demand for data scientists will be particularly strong in the construction industry in the future. Real-time data can be used to calculate future measures on a statistical basis.

But Lean is more than just a tool. Lean is a cultural change process that focuses on customer value. Behavioral changes and new routines are required to reach this level. Once the parties involved have internalized the customer value, they eliminate the biggest enemy – waste. In the project, this enemy is called schedule slippage. They achieve this by introducing a project process system such as LCM®. The biggest obstacle so far has been the additional effort that the implementation of this type of Lean project process system entails for those involved in construction. Why is that? Synergies are not being adequately investigated. Old structures are retained, and new Lean structures are created and managed in parallel. The added value is there. But in every project, participants complain about the maintenance and entry of data – whether in the form of notes in analog systems or digital sticky notes in digital systems. In the two previous Lean eras, the challenge was to manually acquire data before or after an activity. This manual acquisition leads to significant variations in data quality.

This changes in the era of smart Lean Project Delivery. Materials, tools, machines and people: The passive acquisition of data reduces the effort involved in generating and collecting project data. The ability to collect this data in a structured format during ongoing project operations, to evaluate it quickly and use it to drive improvements will be a key competitive factor in the future. Companies in the construction and construction supply industries that already have this capability will have a clear competitive edge. Principals who demand these structures from their construction partners and consolidate knowledge with the right structures will generate ROI faster.

But despite all the progress, construction projects continue to take shape brick by brick. This won't change until the next Lean era – autonomous Lean.

POSSIBLE USE CASES AND SCENARIOS:

› Integrating skilled manual workers' tools and materials with the takt plan in Building Information Modeling (BIM). This would allow progress to be seen in real time.

› Integrating smart materials with Lean tools: The progress of the project can be photographed with a smartphone and transmitted to the building model. The collaboration platform then updates the schedule.

› A further possibility is selective process improvement in the construction project. Here we transfer videogaming technologies to the construction project, using action cams, laser scanning, drones and robots to record issues at the process level for subsequent visualization. Building Information Modeling and videogaming technologies help project participants to solve these challenges in game-based way. The gamification of selective improvements could become a new niche market.

AUTONOMOUS LEAN – LESS OPTIMIZATION OF SKILLS, MORE OF MACHINES

THE WAY WE HAVE PLANNED, DESIGNED AND BUILT IN THE PAST WILL NOT MEET FUTURE REQUIREMENTS. COMPANIES IN THE CONSTRUCTION SECTOR ARE INCREASINGLY UNDERGOING VERTICAL AND HORIZONTAL INTEGRATION.

In the past, companies in the construction industry tended to integrate horizontally, that is, through mergers with and acquisition of related companies. Construction companies bought other construction companies and planning offices bought planning offices. This trend has already changed. Increasingly, construction companies are integrating planning companies, while planning companies are acquiring other disciplines and new services. In addition to this increasing vertical integration within the construction industry, companies are also venturing into other sectors – and other industries are entering the construction industry. Such cross-sector mergers are on the rise. As a result of developments in electromobility, for example, automotive suppliers are positioning themselves as building services equipment suppliers. Some companies in the construction industry have set up their own innovation centers, and are identifying and founding startups in a wide range of fields. Drees & Sommer's Innovation Center, for example, has set itself the goal of digitizing existing business units, developing new business models in an efficient and targeted way, and then launching them on the market. Collaboration with external startups and the establishment of own startups plays a decisive role here.

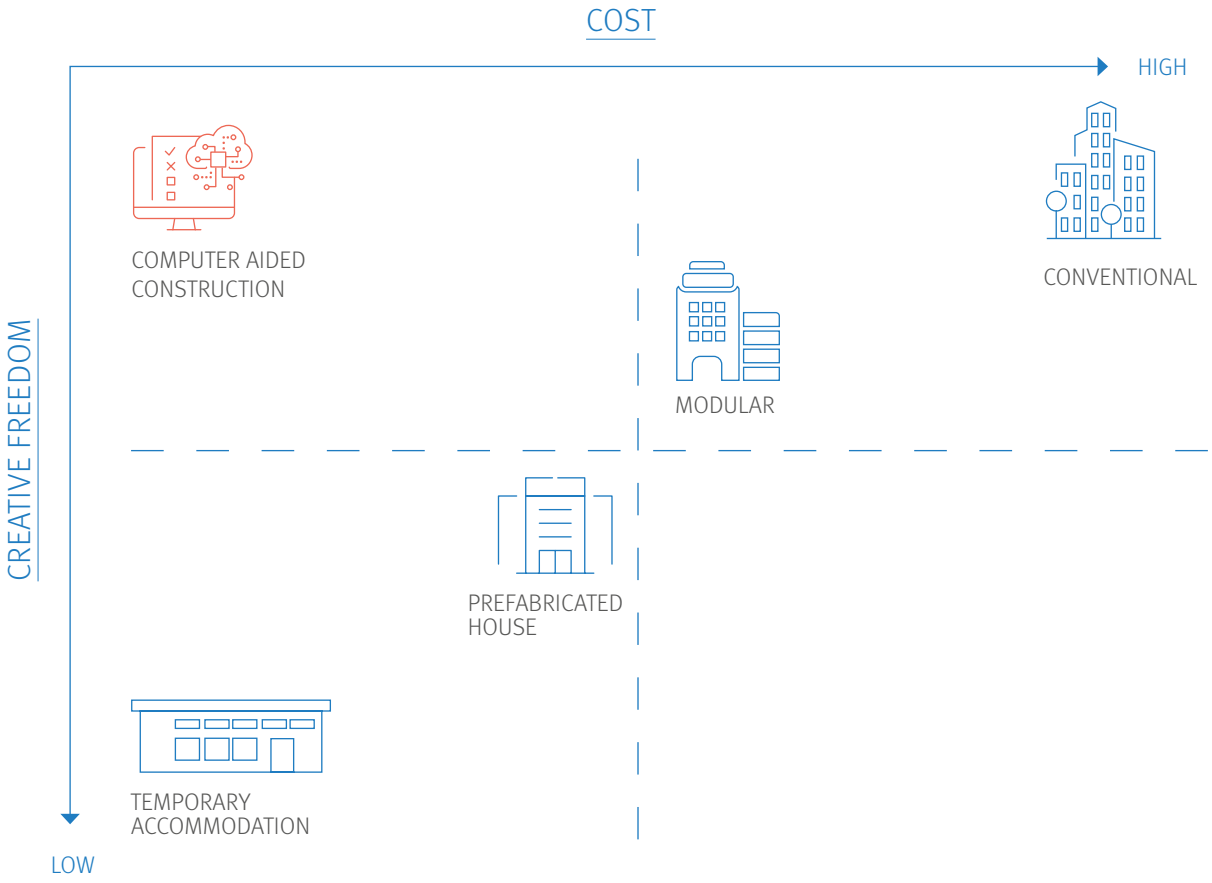
Robodog 'Spot' walks autonomously along predetermined paths on construction sites, scanning construction progress and detecting even the slightest deviation.

AUTONOMOUS LEAN

Construction itself is in a state of flux. Construction project management is actively looking for radical technological change. In addition to prefabricated and conventionally constructed buildings, there is a focus on modular construction. Some players probably see this as the future. But the real future lies in autonomous construction.

In this context, autonomous project management means, among other things, contour crafting or three-dimensional printing of buildings. Essentially, this represents an extension of Computer-Aided Design (CAD). In the 1990s, CAD revolutionized the planning of construction projects. BIM (Building Information Modeling) has not yet achieved a comparable degree of disruption. But this will change in the era of Smart and Autonomous Lean Design and Lean Construction: In this era, CAD will evolve into Computer-Aided Construction (CAC). The construction sector is adapting the manufacturing industry's Computer-Aided Manufacturing to its own needs.

In the era of Autonomous Lean Construction, the construction industry will be completely disrupted. There will be very few skilled manual workers left on the construction site. The planning system will transfer the data directly into a CAC system. Machines, robots and/or 3D printers will carry out the work on the construction site. The construction project will involve more suppliers than contractors. This will also result in a change in the disciplines represented on the construction site: The demand for mechanical engineers and special machine construction will steadily grow. Lean Construction will become comparable to Lean Production.

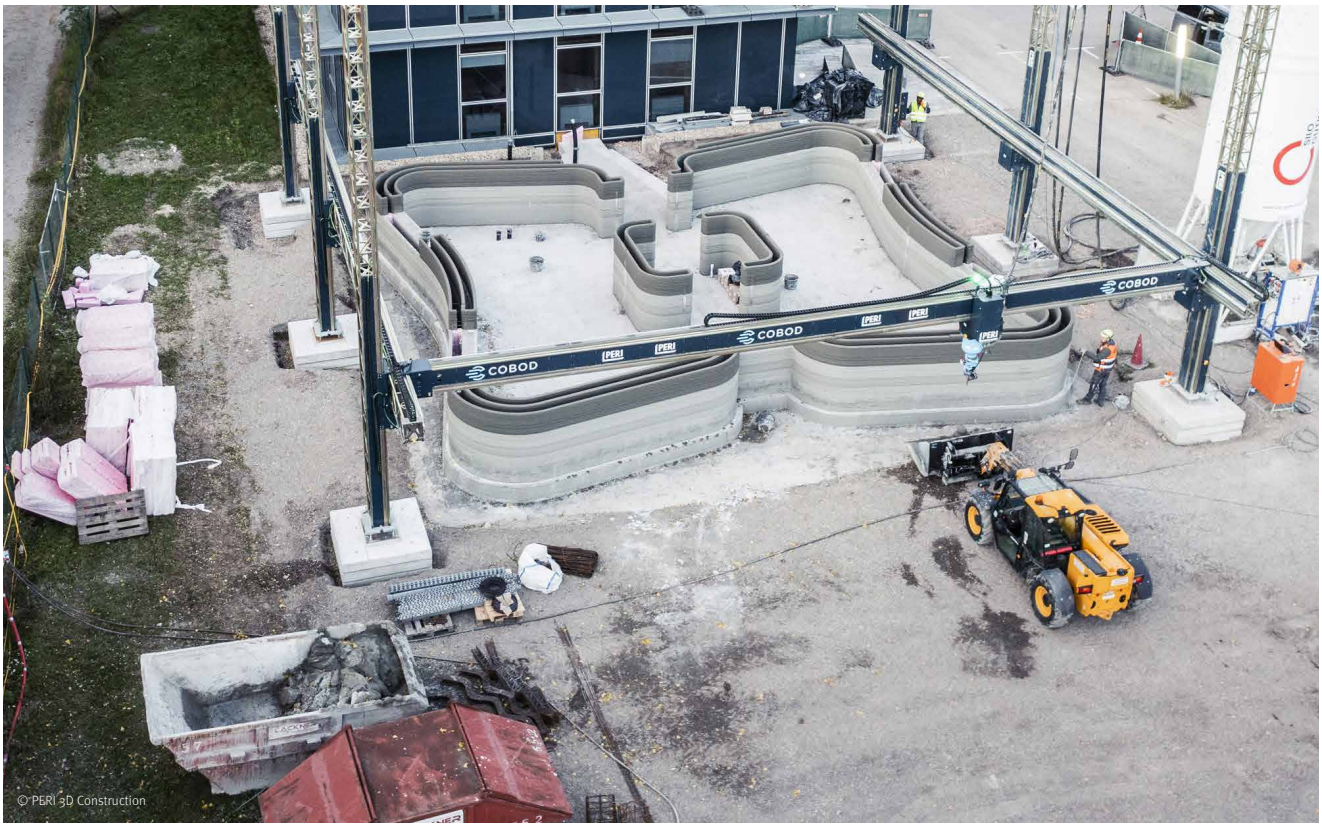


AUTONOMOUS LEAN

The optimization of people, trades trains and contractors will decrease, while optimization of the customer takt, machines and the supplier interface will increase. Project management will remain as a discipline, but will set new priorities and develop new tools to continue supporting investors and principals. Planning will be further modularized and standardized, while nonetheless allowing a high degree of creative freedom.

It is conceivable that in this era, autonomous Lean Construction will initially return to being analog. Shop floor cascade meetings on the construction site and down the line, coupled with a goal definition process as part of corporate strategy, will be indispensable. The current interface between Lean companies and Lean projects will disappear. Autonomous Lean Construction is very similar to Lean Production, but will adapt experiences and changes. Data will be transmitted directly from the machines, materials and tools used and flow directly into planning. Process mapping and selective improvements form the core of the Lean mindset and methodology – alongside implementing and maintaining the Lean project process system.

A building from the printer?
In the autonomous age, this guarantees
the highest level of design freedom
at equally low costs.



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ULTRAEFFICIENCY – NEBULOUS, BUT IN DEMAND

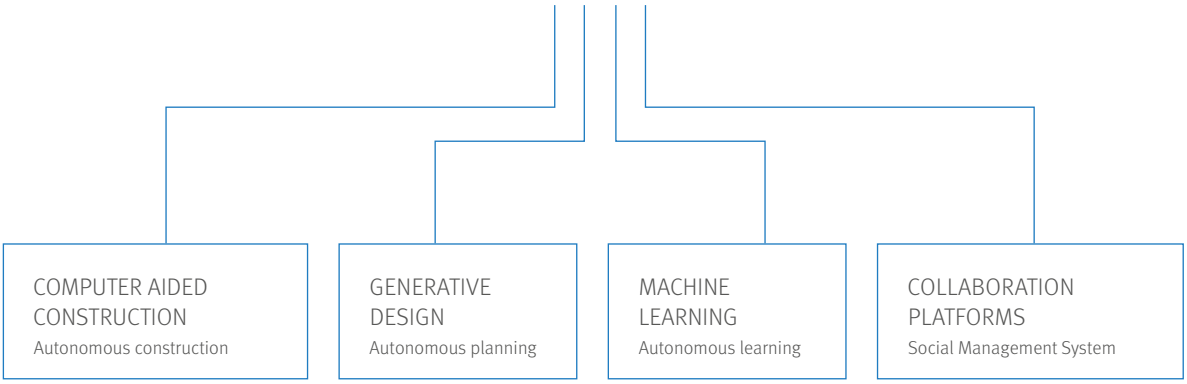
WHAT IS AN ULTRAEFFICIENT CONSTRUCTION SITE AND WHAT IS AN ULTRAEFFICIENT PROJECT? WE DON'T ACTUALLY KNOW. BUT WE KNOW WE NEED THEM. THE VISION OF EVERY LEAN FACTORY IS THE SYNCHRONOUS FACTORY. CONSTRUCTION SITES CAN PROBABLY ALSO EVOLVE IN THIS DIRECTION. THE SYNCHRONOUS CONSTRUCTION SITE FUNCTIONS FLAWLESSLY USING PROCESSES THAT ARE FULLY DIGITIZED, SMART AND AUTONOMOUS.

In view of growing project complexity, the synchronous construction site is a noble goal. The demands of sustainability, increasing cost pressure and ever-shorter project cycles mean that construction does not get any easier despite technological advances. On the contrary, engineers and technicians face increasingly difficult tasks.

In future, it will be about using technology to control projects via the planning framework. The need for holistic process systems that lead to structured consolidation and improvement of this synchronicity in implementation will take Lean to another level. This may ultimately lead to the disruption of Lean.

Visualizations, project-related data streams and smart connections between interdependencies and influencing factors will be transformed into autonomously created project and production plans. Thanks to artificial intelligence and real-time data, the project will constantly learn and improve. Perhaps the project will become the platform that will do everything independently in future. We don't know. But we do recommend that companies start preparing today for this coming era. The processes described will make it easier for companies involved to keep pace with the enormous changes that are to come.

OPTIMAL SCHEDULE,
REAL-TIME DATA,
PROJECT THAT LEARNS THROUGH
ARTIFICIAL INTELLIGENCE



FROM LEAN CONSTRUCTION TO LEAN SOLUTIONS

DREES & SOMMER HAS BEEN ON A LEAN JOURNEY SINCE 2006. ONE IMPORTANT INSIGHT: THERE IS NO SENSE IN SIMPLY COPYING THE MANUFACTURING INDUSTRY'S LEAN CONCEPT.

In the beginning, we tried to transfer the Lean concept from the manufacturing industry through selective improvements on the construction site. The principal aim was to identify waste in the on-site processes. This resulted in the development of tools and procedures to eliminate identified waste. In manufacturing, the main type of waste is over-production, whereas in construction, it is schedule slippage. If, for example, the painter fails to paint a room at the defined time, this leads to waste. Or another type of waste leads to the painter not being able to work on schedule.

Only over time did we realize that the Lean approach cannot simply be copied from the manufacturing industry. From then on, we gave priority to adapting values, principles and practices, and focused on developing a holistic system.

LEAN SOLUTIONS

We focused on kanban, because kanban can stabilize the process flow on the construction site. This allows waste in the form of schedule slippage to be avoided. Drees & Sommer called this system Lean Construction Management – LCM®. We continued to develop the system over time, transferring it to other service phases in the project lifecycle. In 2015, we differentiated between Lean Design Management and Lean Site Management. The focus changes depending on the service phase in which Lean is introduced. In early service phases, the priority is agility, while in later service phases, the aim is stability and continuity.

In 2017, the methodology was digitized and converted into an online software solution. This solution is called LCM DIGITAL. Drees & Sommer was one of the first companies to develop an online Lean Construction digitization solution of this kind.

Since 2022, we have been realigning our content with Lean Solutions. Instead of focusing on just one methodology, we are now implementing solutions that increase effectiveness and efficiency both in projects and in our company itself. We want to be one of the first players in the construction and real estate sector to firmly enshrine Lean culture in its corporate DNA.

WE WOULD BE PLEASED TO SUPPORT YOU
WITH THE FOLLOWING MILESTONES:

- Digitization of the existing Lean approach in your company or project
- Interaction between Lean and BIM in your company or construction project
- Linking existing and newly available technologies to form a Smart Lean system
- Advising on the integration of Lean into your company's DNA (vision and strategy)

SUMMARY

After countless projects, milestones and insights, Drees & Sommer has already completed an extensive Lean journey and is excited and optimistic about the future of Lean Project Delivery.

And we will happily share our wealth of experience with you. Our goal is to bring you considerably closer to your perfect project. For us, it is less about the method itself, and more about internalizing the Lean concept. We start working with you based on your current Lean implementation status.

Which Lean era are you currently in? And which step would you like us to support you with?

Please get in touch with **selim-tugra.demir@dreso.com** for an initial no-obligation discussion.

2006

BEGINNINGS

Pilot projects and initial attempts to position the topic at Drees & Sommer.

2010

LCM®

We have progressively improved this approach and optimized it by applying our wealth of project experience.

2015

LDM and LSM

We transferred the Lean approach with Target Value Design and Agile Design Management into planning and defined it as Lean Design Management (LDM). We integrated takt planning into Lean Site Management (LSM).

2020

LCM DIGITAL

We digitized the Lean approach for the construction site and founded a software startup.

2022

LEAN SOLUTIONS

Solution before methodology: We are broadly positioned in terms of content in order to allow us to shape the future of project management with Lean in an innovative way.