SHADOW VENTURES

Disrupt a Broken Industry - The Industrial Construction Sandbox

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Executive Summary

Incremental innovations to the current built environment structure will not advance the industry in a meaningful and impactful way. The existing structure is antiquated and must be disrupted to create the value needed to meet the rapidly changing demands of the industry. Even with the advancement of emerging technology trends like AR/VR, robotics and automation, big data/IoT/connected job sites, blockchain, and BIM, the industry still lags behind more technologically advanced verticals. The built environment still struggles with labor shortages, addressing demand, sustainability needs, cost controls, affordability, and efficiency gains. So what's missing? We need something beyond incremental change, something that will truly disrupt the industry, increase the value of other innovations, and tackle industry challenges. The answer: industrialized construction technology with off-site manufacturing as the cornerstone. Technology innovation becomes exponentially more valuable when placed in this context.

Industrialized construction is the future of the built environment. It possess the capability to transform, the way we construction and fabricate, the way we use digital technologies to design, manage and operate, and increase transparency and knowledge on how we procure and deliver projects. The questions that remain unanswered are when will it happen, who will lead the way, and how will change come? This disruption will be felt by every stakeholder in the industry and every company in the value chain. Preparing now and understanding how this new structure will impact your business is key to being ready.

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Abstract

When I first started creating this research report regarding offsite manufacturing, my opening statement was, “Good Luck!” The challenge and the hurdles to reach scale seemed too large to overcome. However, as I continue to explore further, the opportunities are too significant to ignore.

The value of industrial construction is well documented. The use cases aren’t that different from what we hear from today’s startups:

- Improve safety
- Increase efficiency
- Grow profitability
- Improve quality
- Address demand
- Solve labor shortages

The case for “why” has been well established in reports by Autodesk & RICS and McKinsey. I highly recommend anyone just starting in this space to read these reports. As can be expected with McKinsey and RICS, the dollar figures and infographics illustrating the opportunity are thorough. But the argument for “how” is mostly ignored.

Within this report, I lay out a new, bold opportunity focused on rebuilding the built environment called the ***“Industrialized Construction Sandbox”*** *(placeholder title because I hate naming things)*. The IC Sandbox’s goal is to increase demand for offsite manufacturing by creating transparency and knowledge for all built environment stakeholders by creating an open-source digital kit of parts.

Please note, I do not consider myself to be an expert in this space. This report is based on numerous conversations I have had with experts who have been tackling this challenge for much longer than me. Through this research, these conversations, and my outsider perspective, I hope to challenge current thinking. I welcome the opportunity to speak with you about the work below and improve the report based on future collaborations. The goal is to fund and create technology solutions that make this new structure a reality.

The Challenge

The built environment keeps trying to innovate within the current construct. The problem is that the contemporary built environment is broken. According to McKinsey, the US has the highest labor cost of construction, the highest demand for new construction, and one of the lowest adoptions of offsite manufacturing in the world. We have constructed *(no pun intended)* artificial walls and procedures that do nothing but create roadblocks, diminish transparency, destroy efficiency, and create massive waste. As Gerald McCaughey, the CEO and founder of Entekra and founder of Ireland's largest panel manufacturing company Century Homes, "our industry is a 4 x 100 relay race where the baton gets handed off from one person to the next. Instead, we should be running a 200 sprint together." When most people talk about innovation in the built environment, they create incremental changes to a broken system. These are flawed attempts to try and squeeze another ½ percentage point of margin.

The technology and capabilities are there and have been available for some time. We see it in other industries that went through this transformation in the 1820s during the industrial revolution. Is the built environment 200 years behind? Maybe. As other more advanced industries move into Industry 3.0, we are scrambling to enable 1.0.

It's not just other industries that possess the technology and skills; it's also the rest of the world. The knowledge, skills, and capabilities to deploy industrialized construction and offsite manufacturing at scale have been proven by much of Europe and Asia, especially Japan *(area for a future report)*. According to Gerry McCaughey, "The US is at least a generation behind, if not more." Gerry is someone who wrote his first research report on offsite manufacturing and the opportunity it presented while attending University in Dublin in the 80s. Forty years ago, Ireland had systems to educate future industry pioneers like himself, who would go on to build multi-national corporations. Ted Benson, the founder of Bensonwood, Unity Homes, and Tektoniks, regularly travels to Europe to partner with Universities to recruit talent and bring new interns to the US on work visas.

If the US is a generation behind Europe, we are probably two behind Japan. Sekisui House is the largest modular home builder in the world, having completed more than 2.46M houses. The level of automation and sophistication of their manufacturing facilities is a marvel.

There are models, and there is a structure that works—just not here. While in much of this paper I talk about breaking down our entire structure, we have a playbook for rebuilding that will enable the industry to capitalize on this opportunity .

The Case for Industrial Construction

Industrialized construction can bring a wrecking ball to the entire structure and build a new industry, designed from the ground up. If we think big, we can completely disrupt the whole space.

The impacts of emerging technologies like Robotics, AR/VR, Blockchain, AI, Big Data, IoT, and more all become exponentially more valuable when applied to a new built environment structured around industrialized construction and offsite manufacturing. Let's have a look at some examples:

1. Robotics and automation work best when doing repetitive tasks, not doing custom jobs. When looking at advanced construction robotics like 3D printing, the challenge of deploying the 3D printers and materials at scale is a significant challenge. The CAP-EX investment of using robotics on job sites and the inability to calculate an accurate ROI will be a major barrier to scale. We have all seen Boston Dynamics Robotic Dog for the construction industry, but how many believe that will disrupt the industry? While an incredible piece of technology, it's years away from scaling in a meaningful way. There is a more immediate value add for robotics. The case for robotics is demonstrated in virtually every industry that relies on manufacturing. Repetitive tasks and new technologies continue to fill and remake the factory floors. Financing this type of investment is a known practice. ROI in terms of increased productivity and other KPIs can be easily calculated to determine the payback period and justify the expense.
    a. IC will also require a hybrid of offsite and onsite fabrication. Increased standardization of products emerging from offsite manufactures will enable robotics to more efficiency fabricate onsite.
2. AR/VR is more powerful when design change decisions and outcomes can be displayed in real-time. Startups like Kreo in Shadow Labs are developing solutions around generative design, which has the broadest application in scenario planning when applied to an off-site manufacturing digital database.
3. Blockchain creates massive transparency in the supply chain when controlled in a manufactured setting. Blockchain could create full transparency into when and where any product is in the supply chain to better prepare and make more informed decisions. Having a digital ledger of every nut, bolt, and screw also could be realized when applied to an industrial type setting - finally, the value BIM promised could be achieved. Chris Sowa, the Global Vice President, Strategy & Innovation for the Energy Management Business at Schneider Electric notes, "BIM software solutions are becoming model driven with 3D BIM models also including cost, scheduling and detailed cost specifications to create true 5D BIM models. This can enable industrial construction processes across the whole supply chain from design to build."

The Case for Industrial Construction

4. Big data is best when that data is clean (common) and consistently collected automatically. As Gregg Wallace at Hilti points out in his incredibly insightful paper on connected job sites, "Bulldozing the Digital Chaos," the number of sources that can collect data on a job site is virtually endless. In the current system, trying to collect this disparate and inconsistent data and then relay it back to stakeholders in a meaningful way is a monumental undertaking. In an industrialized setting where a repeatable process can be created and variables can be controlled, the data throughput becomes much more valuable.
5. IoT is best deployed in settings where the cost of deploying a sensor and hardware network can be recouped over time. A job site is temporary, and creating mesh networks of sensors that need to be continuously adjusted as construction progresses creates major challenges. Justifying the ROI of deploying this strategy will require a lot more value and sustainably lower prices than currently available. In contrast, an industrialized setting lets you create an IoT enabled factory - a well-established process with proven technology. Further, when construction begins, the offsite manufactured products themselves can be IoT enabled for improved tracking, a more transparent supply chain, and more efficient onsite assembly.
6. The Case for "Smart" and expensive technology integration in buildings is a challenge. With the rapid pace of technology innovation today, by the time a design is complete, the technology is outdated. Shadow Ventures has been speaking with CIM Group, and their massive development in Downtown Atlanta called Centennial Yards on this exact challenge. Industrialized construction creates an opportunity for technology in the built environment to be updated via push software updates quickly. Though standardized design, hardware can be easily changed and swapped out with new systems that don't require a massive renovation. This ease of technology updates can help ensure that our buildings stay technologically advanced much longer, and much more affordable than what is available today.

Industrial construction will enable three key disruptions in the built environment.

1. **Physical disruption:** Enable a combination of offsite, onsite, and other creative combinations of innovative construction and fabrication processes.
2. **Digital disruption:** Enable the full value and deployment of new digital tools to improve the way we design, manage, and operate.
3. **Delivery disruption:** Enable greater transparency around where products are and greater knowledge around what can be used and their function.

Several factors reinforce the position that now is the time to embrace this new disruption.

Why Now

The US finds itself in a position to which we are not accustomed; we are playing catch up to much of the developed world in Europe and Japan. As they continue to out-innovate, and fund offsite manufacturing with government support, the US is at risk of falling further behind if we don't act now and disrupt ourselves first.

- COVID is the perfect storm for disruption. Please note that I have tremendous respect and heartfelt compassion for those who have lost loved ones or have been displaced from work because of this virus. However, it has created certain factors that didn't exist before, and it could force the industry to move forward in a meaningful and impactful way. Here's why:
    - Traditional construction practices make social distancing nearly impossible. Try and construct a new commercial development while standing 6ft. from your coworker; it's nearly impossible.
    - While labor shortages already plagued this industry, sick workers and quarantine protocols have exacerbated this challenge.
    - Work from home protocols forces companies across the industry to look at new solutions to manage their projects remotely with new digital technologies.
    - A looming recession will likely result in a pullback of new construction projects. This is an opportunity for owners and developers to reflect on the current processes. They just need the tools to make better decisions.
    - The use of buildings, their design, and format is being tested like never before. Commercial office space, hospitality, retail, and more—the traditionally "safe" asset classes—sit empty. Flexibility and customization of space will be demanded.
- Offsite manufacturing is nothing new; it's been around in the US since before WWII. The Sears Modern Home was sold via catalog from 1908-1940 and they claim that over 70,000 of these homes were sold. Equally impressive, they offered 370 different home designs. So, why now, again? In the past, offsite manufacturing brought about many challenges around the design, build, and operate process. Today, with the rise of new technology and digital tools, those challenges no longer exist. Many of these digital tools will not realize their full value unless deployed in an industrial environment. Digital tools can streamline designs, accelerate construction, and create supply chain transparency never before imagined.
- The US construction industry is primarily controlled by a small number of very powerful contractors. The employees at these firms are motivated by earning their bonuses, not by innovating. It's a theme we see across corporate America: the larger a firm gets, the harder it becomes to innovate. With the construction industry booming, they can't look more than 6 inches ahead. A major disruption caused by outside influences must force them to change, or risk losing their bonuses.

The alignment of building demand, industry challenges, external forces, and technology innovation have created a perfect storm for adoption.

The Industrial Construction Sandbox

The moonshot vision for industrialized construction creates the design-build-operate structure the built environment speaks about but is unable to provide. Its goal is to increase demand for offsite manufacturing solutions by creating more **transparency** (cost and schedule) and increasing **knowledge** (value, options, and customization). The IC Sandbox will prioritize processes and people to ensure designers, engineers, and contractors have the tools and capabilities to operate successfully in this new ecosystem.

Anyone who says they have a solution for design-build-operate and is still trying to work within the existing structure will fail to create the holistic value this industry deserves. It will fail because the current system fails to align the principal parties and decision-makers. It will also fail because without a central platform creating transparency and insights, the standardization needed to scale any single solution will never be realized.

The IC Sandbox will create a digital ecosystem for assembling a "kit of parts," including those parts' cost and performance. Its mission is to answer the following core questions:

1. Location: Who can supply the project?
2. Performance: How do they function? 2D elements or 3D volumetric
    a. Use type: Multifamily, residential, healthcare, hospitality, etc
    b. Upgrades: Energy, technology
    c. Complexity: Structural or fully functional
    d. Scale: Individual units (panel), completed structure (module)
    e. Fabrication: Offsite, onsite, combination
3. Look: What is the architectural aesthetic? Overall appearance and customization
4. Cost: How much does it cost? Budget trade-offs based on performance and look.

According to the McKinsey report, Modular Construction: From projects to products, "Design firms are looking to develop libraries of modules for the manufacturing process… One client identified savings of almost 15% in design time through modular libraries." I argue that beyond design firms, the IC Sandbox will create value for all major players in the built environment. As stated in a conversation with Peter Devereaux, Chairman & CEO of HED, "Currently, there is no digital tool that allows everyone involved in the delivery of a new building to collaborate on its design and construction but that will come and it will be the big disruptor."

- **Private Developers/Owners:** The IC Sandbox aims to start at the top with the developer and the owner by creating more transparency (cost and schedule) and knowledge (options and customization) about the industrialized construction opportunity. To accelerate adoption, the developers and owners must be bought in. As the group that stands the most to gain in terms of cost savings, improved building, marketability, quality, and accelerated timelines, this group should be the target market for any product development. From this target audience, the value waterfalls down the value chain with more advanced features and functionality deployed in the future from this target audience.

The Industrial Construction Sandbox

A Developer Case Study

I was convinced that I had created the perfect model until I met Aaron Holm, the Co-CEO of Blokable. So here is an alternative case to the IC Sandbox. According to Aaron, "the problem with offsite manufactures today is that they are job shops." To summarize a wonderful conversation: when developers are your customer, you are in constant competition with your customer for who gets to keep the money. Developers will push the cost so low that it's not worth being in that business any longer. If you've seen the margins, contractors will understand this. If the economy tanks and construction slows, it's going to become a race to the bottom. The only winner in all of this is the developer who owns equity in the asset. Aaron and his partner Nelson Del Rio at Blokable have broken all the rules: they are a vertically aligned developer. They develop, design, manufacture, and construct their buildings. In doing so, any value they create from the efficiency gained, material cost saved, energy efficiency created, etc. all goes towards improving their real estate financing economics. "We don't sell boxes; we develop real estate." So has Blokable destroyed my value proposition in this report... kinda. Aaron and Nelson are extremely sophisticated developers; more sophisticated than most. They have created an elegant yet complex business model that will be challenging for most of the industry to replicate. How many developers will have the appetite and knowledge to become vertically integrated? Further, believe the IC Sandbox creates opportunities for others to act as their own developers by increasing transparency, removing uncertainty and lowering risk. The built environment is massive, and similar to the industry today, there will be several business models in the future and plenty of room for all.

The Industrial Construction Sandbox

- **Architects:** In this new ecosystem, architects are at the most considerable risk of being disrupted if they don't change what tools they use and how they work. For this group, education is also crucial. According to the same McKinsey report, modular design currently takes longer and costs more than traditional design. There is no excuse for this, and we must start educating the future generation of architects to embrace this new landscape. Like we see in Europe, education around these new industries must begin early to gain widespread adoption. If we don't, these job functions will be outsourced overseas to Europe and Asia, where the talent and skills exist. Those who welcome the opportunity to unshackle themselves from Autodesk will finally be free, but those who refuse to adapt and evolve can be displaced. According to Peter Devereaux, "The design firms that are nimble enough to adapt quickly to this new collaborative process will be the ones who will own the future."
    - The IC Sandbox will provide architects a new design tool for building aesthetics. Like engineers, architects will see massive time savings and efficiency gains created by design scripts that automate aspects of the design process.
    - The IC Sandbox also creates an opportunity for architects to monetize product design. With a robust digital kit of parts, "starchitects" can create custom branded designs that can become available to the masses. As Shadow's friend Paul Doherty, CEO of The Digit Group, points out, "who wouldn't want a Frank Gehry kitchen, the value that option creates for developers is massive." These otherwise inaccessible architects can create repeatable revenue and designs that for the first time would be available for the masses. It also creates a platform for future architects to stake a claim and earn recognition to a wider audience. The IC Sandbox can create "Architecture Influencers."
- **Engineers:** The IC Sandbox will provide engineers with a tool to confirm structural durability, performance, and feasibility. The role of the engineer will drastically change in the IC Sandbox to one that prioritizes value engineering. Engineers will be tasked with further pushing innovation and capabilities, and the repetitive tasks associated with built environment engineering will diminish. Once the engineers certify a design, that work will not be needed again. This is a sharp contrast from today's environment when every building must be custom engineered. Engineers will also have to change their mindset in what they are engineering for, with a new focus on process engineering to improve manufacturing productivity. The excitement for engineers should come from the opportunity to be inventors again. IC creates an opportunity to develop new structures and systems and optimize their performance and cost.
    - As noted by Landon Pascua, the Senior VDC Manager at ViaTechnik, "in today's ecosystem engineers typically only specify products they are familiar with." This severely limits innovation adoption since education of an entire profession takes such a long time. What's needed is a 3rd party BPM system or catalog of digital parts like the IC Sandbox.

The Industrial Construction Sandbox

- **Operators:** The IC Sandbox will finally bring the value of BIM to the forefront for building owners and operators, creating an insightful digital database of its structure and components. Technology upgrades will also no longer require massive renovations. Capitalizing on standardization, technology updates, and hardware housing can be designed and manufactured to be more accessible. This will ensure a building remains operationally advanced long after it opens.
- **Manufacturers:** The IC Sandbox will be an open-source platform where different manufactures can upload all critical data and information about their structures. According to McKinsey, to reach economies of scale, manufacturers must be manufacturing around 1,000 units/year. To achieve full optimization through automation that number increases to 5,000 units/year. The only way to reach this kind of scale in a meaningful ecosystem is to increase demand across the market considerably. Jacob Frydman, the CEO of Deluxe Modular describes themselves as a "Tech company focused on fixing the built environment." This mindset and commitment to technology and innovation needs wider adoption.
- **Building Product Manufacturers:** The IC Sandbox will create a digital world where BPMs begin to design complete systems rather than parts and pieces. As Nathaniel Renfo, the Digital Design Leader at BLOX describes, "the biggest challenge in this space is the supply chain." The cornerstone of this supply chain is BPMs. Rather than selling to fragmented installers, BPMs will sell to manufacturers who require greater standardization, transparency, and control. The systems will be designed for the manufactured structures and will possess different performance capabilities based on the customer's preferences.
    - The IC Sandbox also creates an opportunity for BPMs to more effectively collaborate with leading technology companies. According to Chris Sowa in the context of new technology, "Schneider Electric is interested in pursuing opportunities that optimize design, cost, and energy. To gain the high-performance and connectivity aspirations of future built environment assets, Silicon Valley and the Tech Giants need a way to marry-up their capabilities with building products. "

The Industrial Construction Sandbox

The challenge will be creating a centralized platform capable of managing these teams. While a company like Autodesk talks about the value of IC, they are the worst possible company to lead us into that future. Why? Because it involves them destroying their current closed ecosystem business model. A public company like Autodesk with deeply rooted technology solutions in the space cannot reinvent itself and move fast enough. Public companies across all industries fail at innovating because the costs and risks associated with doing so adversely impact short-term shareholder value. I predict that a smaller, more agile technology company will create the answer, and disruption will follow. This, combined with the architecture community's overall distaste for and dissatisfaction with AutoDesk, will create challenges. As documented in a newly released joint public statement to AutoDesk from 17 major UK architecture studios, stakeholders are increasingly becoming frustrated with the rising costs and lack of innovation being developed by the company. "Where once Autodesk Revit was the industry enabler to smarter working, it increasingly finds itself a constraint and bottleneck," said the letter. "Every day digital design leaders around the world wrestle with software which at its core is twenty years old and incapable of the potential of multi-core computing and graphics power designed to process within today's real and virtual workstations." The industry and stakeholders are ready for a change.

Another major challenge that cannot be understated is a need for rules which govern design. For any sandbox to effectively work, and to ensure what is designed can be built, the product catalog and associated rules that govern the custom configurations will have to be robust. As stated by Paul Doherty, "the taxonomy of data is key and should follow the 16 divisions of product categories already established." Designing and implementing the process by which these rules are created will undoubtedly be one of the most significant challenges facing this concept. As noted again by Gerry McCaughey, "the most important part of offsite manufacturing is the design and engineering, the manufacturing is easy." Dafna Kaplan, the Founder & CEO of Cassette Systems—an emerging modular company with an incredible team—has placed such a priority on the process that they have formed an entire consulting practice to support teams on the feasibility and implementation of offsite projects. Thankfully, processes again exist, well oiled and optimized in other industries.

Inspiration in Other Industries

Think of the Mustang. Ford makes 11 models of the Mustang, ranging in prices from $25k - $75k. As a consumer, I could show you any of these models, and you would be able to say, that's a Mustang. That's because the structure of the Mustang is mostly the same regardless of the price. What's different are the systems that make that Mustang. The engine, the breaks, the transmission, and technology components in each model vary. The more premium the systems, the more the model costs and vice versa. As the consumer, you get to customize what system you want, the color you want the car to be, and add on new structural components based on your budget and wishes.

Ford doesn't make all the systems; they make the Mustang. They have a vast network of suppliers responsible for making the systems that make a Mustang; suppliers who also make systems for their rivals. And Ford doesn't just make the Mustang; they make other models (the F150, Escape, etc.) to appeal to a broader audience.

Now relate this same principle to offsite manufacturing. The manufacturing companies need to be like Ford. Or, better yet, Tesla.

Why Tesla? Because Tesla knows their competition isn't other electric car manufacturers; it's the rest of the automotive industry. They have made their designs open-source to grow this space, creating paths for new companies to enter and disrupt the incumbent.

In the built environment, those incumbents are on-site construction companies and the existing built environment.

So offsite manufacturing should think like Tesla. They should design different structures: Model 3, Model S, and Model Y. Then they should make these models open source to allow BPMs to create custom systems for that model. The BPM should each design different systems ranging in price and capabilities that come prefabricated to fit in each model.

If you are a finance person and need proof, as of today, Tesla's market cap is $290B (founded 2003), Ford's is $27B (founded 1903). Technology, innovation, openness, transparency, and collaboration are the future.

Think Like a Brand

Think like a brand, promote the product, and create a story. Offsite manufacturers need a branding agency. Today they are going to market like construction contractors, and it's all wrong. Unless you work in the built environment, I'd be willing to bet that 90% of people can't name a single company on the GC ENR400. There is a massive opportunity for manufacturers to change this by creating a brand that consumers recognize. Create a personality, create a story, and use that to sell your product. When you think of Ford, do you think of a manufacturing company? Or, do you think of the Mustang, the F150, the Bronco? Each has a distinct product with a defined use and target consumer. Are you going after the intellectually curious and technology-savvy consumer? Maybe go with something like Apple's "Think Different." How about the America-loving, blue-collar worker? Get inspired by Chevy's "Like a Rock." This thinking creates value for both residential and commercial consumers. For homeowners, the house now becomes a symbol of their benefits. For commercial developers, it's a new marketing opportunity to attract tenants. Do you want the space that's an eco-friendly Toyota, the performance Ferrari, or the tech-future Tesla?

- Look no further than Entekra and their commitment to building a consumer brand. According to Gerry McCaughey, "Homebuilders aren't builders; they are more land acquisition and marketing guys." They don't create project value by opening a building faster or for less money. They create value by taking a piece of property, building something, and then marketing that new thing. Their ability to do this successfully determines the overall success of that project more than any other variable. Developers need a product to market, and manufacturers can create that product and the brand to match.

Opportunities for the Industry

While offsite manufacturing faces several long-term challenges, there are several immediate opportunities that can be acted upon today which will create tremendous value.

- **Collaboration is Critical:** You are not competing against each other yet. You are competing against the old guard. If you want to force adoption and increase demand, you must stop working in a bubble, and you must start working together. According to McKinsey, modular construction could claim $130B by 2030 in the US & Europe. McKinsey also says the construction sector globally is valued at $10T. $130B by 2030 is only 1.3% of the pie. That percentage improves to 10% when you look at just the US's $1.3T construction market. The point remains: to accelerate adoption, you must collaborate today and compete tomorrow. A sandbox can create this foundation where knowledge is shared to create a more sustainable market for all.
- **Panels vs. Mods:** The debate rages on! In the context of this report, for either to win, they must both win. I've spoken to leaders at Modular companies like Deluxe Modular, and leaders at panel companies like Entekra. Both passionately believe their solution is best. This is the exact type of passion great entrepreneurs possess. But they are both right, and the market is more than large enough for both to survive. Picking only one would be the same as saying everyone can only drive a motorcycle. Customers demand options; like every product in every other industry, products have best uses and are designed with a purpose. The same holds true in this industry. Also, no manufacturer (regardless of industry) is going to be best at everything for everyone. Offsite manufacturers need to pick their lane and focus on making the best possible product for that customer segment. We are early in the customer adoption curve, and the only way to go up the curve is together.
- **Contract Manufacturing:** Shadow works with several budding modular manufacturers including; LiveLight who has developed a novel racking modular system, Cassette (mentioned above), and Module delivering affordable and sustainable housing to cities. All these companies are approaching offsite manufacturing in their own unique way; all try to achieve scale and drive down costs through economies of scale. In an emerging trend, they are also trying to do this without standing up a factory. The burdensome CAP-EX requirements of launching a manufacturing facility make the barriers to entry in this space challenging. The challenges continue once a factory opens. The current ecosystem is structured around projects, not products. If there are no projects, the manufacturing facility doesn't run but still has costs to stay open. If the manufacturers start to think more like product manufacturers, they shouldn't care what products they are making, just as long as the factory is always running and the cost of changing products isn't too high. This will also allow more modular companies to begin expanding nationally without the barriers of launching a network of manufacturing factories. They can achieve this by establishing a network of partner manufacturers instead. Eventually, as demand peaks, manufacturers can focus on exclusively making their products, but a path and solution must be created in the interim.

Opportunities for the Industry

Building product suppliers: Start thinking about systems and not about products. The disruption to come from industrialized construction will include building product manufacturers. An opportunity for BPMs is to help solve the challenge around customization vs. standardization. Once you have chosen an offsite manufacturer, it is hard to customize a unit beyond how they fit together, their color, and some material changes. BPMs can create greater customization through the systems that make up the structure. Higher performing, more technologically advanced units will create premium positioning and value. With opportunity comes considerable risk. Industrialized construction and offsite manufacturing will significantly disrupt supply chains, product designs, relationships, and sales channels. BPMs must start today to understand better:

1. The threat and gaps in the current industrialized construction landscape as it relates to building product manufacturers.
2. Define the strategic opportunities to pursue.
3. Develop new best practices and processes to deploy in an industrialized construction built environment.
4. Begin building relationships with leading manufacturers today.
5. Rethink the design and engineering of systems to create higher standards.

If acted upon in the short-term, these factors can begin to drive demand and increase the size of the total addressable market.

Where We Go From Here

Digitize, collaborate, and invest.

The built environment must continue to embrace and aggressively develop new digital technologies committed to disrupting the current ecosystem. Without this widespread accelerated adoption, the entire industry will continue to lag.

It's time to stop working in innovation silos and start collaborating to accelerate innovation across the industry. Without the demand from customers to drive and fuel offsite manufacturing growth, the opportunity we currently have in front of us will be lost. Manufacturers and stakeholders can drive demand by collaborating to educate the industry around the opportunity and increase transparency around the available options.

Finally, we must massively invest in this space to ensure entrepreneurs have the capital they need to survive and thrive. I have been surprised by the lack of technology startups emerging to support the ecosystem. There are plenty of offsite product solutions, but where are the startups with software and technology solutions to support this new industry? Startups with solutions to address supply chain, design, and process challenges. The demand challenge of having a large enough market, and manufactures themselves still selling to early adopters creates additional barriers. Still, I have studied several trends in the built environment, including ConTech, connected job sites, AI, big data, etc. None excite me as much as industrialized construction and offsite manufacturing.

For an innovation addict, the opportunity here is unmatched. For an investor, the financial value to unlock through the creation of new verticals is exponential. As I have stated before, all trends and technologies being developed for the built environment are more valuable when placed in an industrial setting. To grow offsite manufacturing, money must continue to be invested from VCs to facilitate early growth. Traditional lenders like banks must open paths to financing the development of new modular designs. Finally, PE has the opportunity to drive demand by investing in off-site manufactured products for their projects.

The opportunity to create the built environment all entrepreneurs and industry professionals describe is here. We all know the challenges we face; we understand why we need change; now is the time to deploy how. Industrialized construction is the key to unlocking that future.

Get In Touch

Brian Sayre is a Senior Associate with Shadow Ventures, a seed-stage venture capital investing in built environment technology startups