



2019 MODULAR CONSTRUCTION UPDATE

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 **Skender**

Introduction

The past year was a big one in the world of modular construction. With the industry continuing to hone the new processes and technologies behind offsite construction, early adopters are beginning to reap the rewards. We've been hearing about the potential benefits of streamlining project delivery with offsite production for years--shorter project schedules, relief for budgets, improved conditions for workers, more control over the quality of the product and the schedule--but now we're actually seeing it in action. Real-world examples of modular projects are not only becoming taller and more impressive, they are also becoming more common. What does that mean for the construction and development industry? It could mean that the bar for efficient project delivery is finally being raised.

The global market for modular construction was valued at roughly \$111 billion in 2018, according to a report by **Zion Market Research**. By 2025, that share is projected to increase to \$175 billion, and growth has skyrocketed in the past year alone. In a recent survey of **BuiltWorlds Members**, 79% of respondents indicated that they anticipate modular construction's market share to increase at a faster rate over the next 5 years than it has over the past 5 years, with 21% expecting growth at a constant rate. No respondents anticipate a slow-down of new modular starts; it has become clear that the industry is ready for modularization.

We asked Skender's Chief Design Officer Tim Swanson if he thought adoption of modular construction would increase in the coming 5 years. "It has to increase because it's the only way to respond to and solve the challenges that are facing not just our industry, but our society."

Anecdotally, projected growth in modular construction's market share comes as no surprise. Recent headlines have grabbed our attention with announcements about exciting new projects from industry leaders like **Katerra**, **Skender**, **Prescient**, and others (read on for more on those projects), and we expect to continue seeing more of those headlines. In a rapidly urbanizing world, demand for efficient construction of affordable housing, healthcare facilities, office buildings, and residential homes is growing--and that growth in demand is driving innovation in project delivery. Despite this growth, modular construction still only constitutes 3% of the North American construction market. With the industry racing to fill that market, we want to look back at the past year in modular construction and explore what's next.

Why Go Modular?

Let's first revisit some of the benefits of modularization to help understand what all the buzz is about. In a previous research report, we looked at how the practice of lean construction is bringing construction closer to the operational efficiencies achieved by the manufacturing industry. Those guiding principles--minimizing wasted time and resources, eliminating inconsistencies in process, reducing strain on workers, etc.--are the building blocks of the modular approach. By shifting the fabrication and production stages of the construction lifecycle offsite, builders are able to establish and optimize consistent workflows to make sure that the building process is as waste-free and efficient as possible. Let's take a look at the 4 primary benefits of modular construction:

1

Shortened Project Schedule: fabrication, assembly, and testing can be completed offsite at the same time as any site development and facility work. Weather delays and other external factors can also be dramatically minimized with production work completed in a controlled offsite setting. Lastly, by using a consistent offsite production facility less time is spent by crews setting up make-shit fabrication spaces and systems onsite. This all means that buildings can be ready for occupancy as much as 30% - 50% sooner than with conventional construction methods. With an accelerated project delivery timeline, builders are able to take on more projects and scale their businesses more effectively.



2

Reduced Costs: with a fully implemented modular system project costs can be greatly reduced by minimizing wasted material, decreasing labor and operational costs from shorter overall project timelines, reducing design requirements with modular units, and decreasing the amount of equipment to be used and maintained on site. With consistent components and production styles, modular projects also have fewer resource requirements than traditional construction projects.

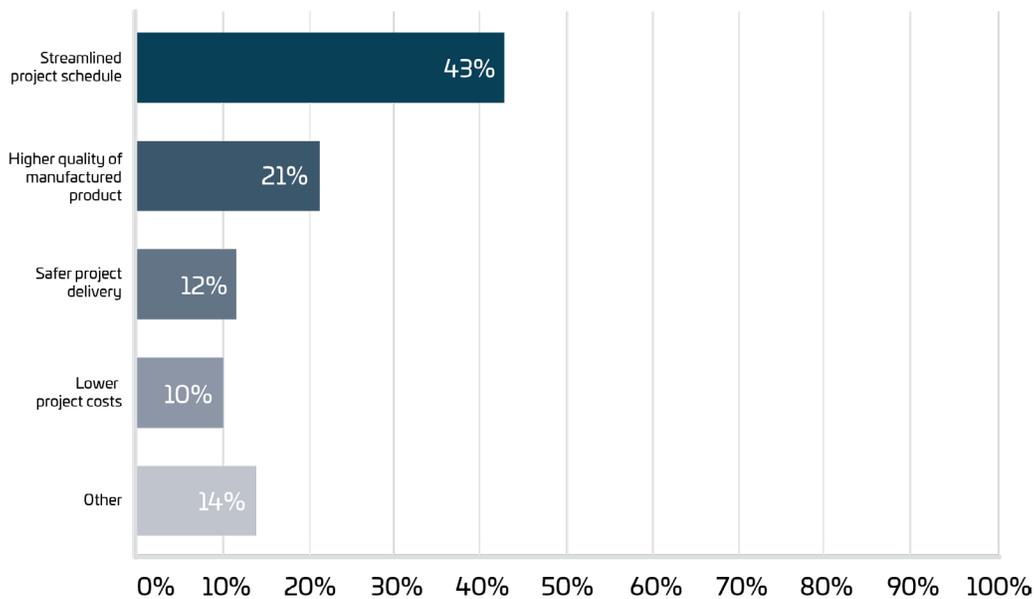
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Improved Safety: with smaller crews, fewer hours spent onsite, increased control over factory production, and reduced risk of weather delays, conditions for workers are much safer with an offsite approach to construction. This not only has implications on the appeal of the industry for future generations of workers, but also decreases the risk and liability costs associated with construction work for contractors.

4

Higher Quality of Manufactured Product: with the improved conditions of the factory setting comes improved control over fabrication, welding, pipe-fitting, and assembly. The result is that crews are able to establish consistency in production, resulting in “economies of process” as builders are able to truly optimize their workflows. This has implications on maximizing ROI for project owners as well as the experience for the end-user.

Most Appealing Benefits of Modular Construction



Source: BuiltWorlds Insights

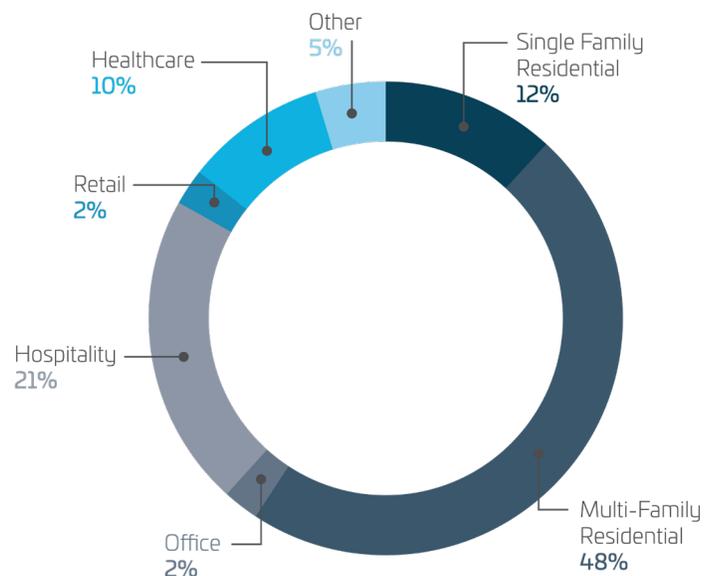


Types of Modular Construction

The concept of modular design and construction has applications across construction end-markets and with a range of building materials. Before modularization can be applied so broadly, however, the industry is waiting on proof of concept from some of its most established leaders, as well as a few bold newcomers, with the resources and agility to try new methods and explore its capabilities.

Today, we're seeing a lot of modular projects come from the multi-family residential space. It comes as no surprise that developers are looking to offsite construction to fill the supply gap in the housing market; with rising density in urban areas, cities are looking for quick ways to provide increased housing at an affordable rate as costs continue to rise while construction labor shortages persist. To that end, modularization offers a low-cost, efficient alternative to deliver multi-family housing complexes. While larger multi-family developers have been "preached" at about offsite construction and the associated technologies for years, smaller single-family builders aren't quite there yet. As a result, the adoption of modular construction in the single-family arena has lagged as we continue to combat the stigma of a paradigm shift in construction project delivery. This also has to do with an increased return for multi-family projects on the massive initial investment associated with the shift to modular and offsite production (investing in a factory facility, purchasing equipment, training workers in the shop, etc.). As adoption increases and the cost of technology falls, it won't be long before the return on those smaller single-family projects becomes just as appealing.

Best Positioned Market for Modular Construction



Source: BuiltWorlds Insights

Another pair of end-markets that have benefited from modular construction are hospitality and healthcare. For hospitality, a market that is highly dependent on fast occupancy and cost-effective construction, the same appeal and ROI of modular multi-family housing applies. According to the **Modular Building Institute**, growth in modular hotel construction is expected to increase into 2019 as a result of the strong existing partnerships in place



between leading hotel chains and leading modular builders. Projects like Marriott's AC Hotel New York NoMad (read more below) will serve as important benchmarks pushing that market forward. In healthcare, current applications for modularization apply to components within hospitals, such as bathroom and medical pods, as opposed to entire hotels. That may change, however, as increased demand for more healthcare facilities and smaller clinics rises with urbanization.

Another conversation surrounding the modular construction space deals with uses for different building materials and techniques—namely the distinction between steel, concrete, and wood. The Modular Building Institute has found that in 2018, 70% of modular construction utilized wood-framed modules, as compared to 80% only 5 years earlier. That decrease comes as more and more modular manufacturers are using steel framing for modular construction due to the higher potential for full life cycle impact reduction.

Regardless of end market or building material, the general benefits of offsite project delivery can be applied across the board. Again, at this stage, the adoption of these processes in a broad range of contexts depends largely on the success and scalability of the early modular adopters who have emerged in recent years.

The Technology Behind Modular Construction

A big reason that offsite construction processes are becoming more widely adopted is the pace of technological development. Now more than ever before, contractors have the ability to use technology to solve long-standing problems, streamline time-intensive tasks, digitize and share critical project information, precisely track and monitor project progress, improve resource planning, and optimize fabrication processes using collected data. Let's quickly review 3 of the tech trends of the past year that are expanding the construction industry's collective toolbelt and enabling a modular approach to building:

1

Automation: automated fabrication technology has been used for decades by the manufacturing industry to complete precise, repetitive, tasks along the production line. In construction, as more builders take their work from the field to the shop, we've seen automated robotics emerge that can complete a range of construction functions, from cutting systems to assembling steel beams. Check out our [Machines 50 Top List](#) for some examples of automated construction technology.

2

Digital Twin: utilizing building information modeling (BIM) is becoming standard procedure in the construction industry. With modularization, the ability to feed digital design files directly into the machines and software platforms responsible for prefabrication is especially valuable. Companies like **ENGworks** provide important BIM services that can integrate across other project management and operational analytics platforms.

3

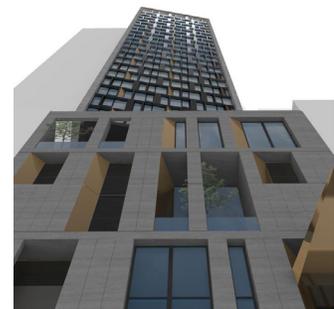
Project Management and Planning Software: the construction industry has plenty of options for project management platforms these days. Increasingly, those platforms are positioning themselves for the emergence of offsite production, and serve as important links between the construction office, the factory, and the field. Look for companies like **ManufactOn** to play an increasingly large role in the proliferation of offsite construction.

The Past Year in Modular Construction

OK, time to take a pulse on the industry's progress with modular construction. What are the projects that have pushed the boundaries of project delivery? Who are the players involved? What challenges did they have to overcome? Let's take a look at the modular projects that have headlined the past year.

Danny Forster & Architects AC Hotel New York NoMad | New York City, NY

This **Danny Forster & Architecture** project clocks in as the world's tallest modular hotel at 360-feet. Fully outfitted guest rooms will arrive at 842 Sixth Avenue with each module containing beds, sheets, pillows, flooring, and even toiletries. As with all modular construction projects, the physical erection of a building can be sped up and NoMad is no different, with the project expected to go up in just over a 90-day period.



"We wanted to demonstrate that modular building can do more than just harness the efficiencies of the factory. It can produce a graceful and iconic tower. And yes, it can do so at the rate of an entire floor a day."

- Danny Forster

Marriott has committed to advancing their business through the utilization of modular construction techniques, a necessity in an age of increased building needs and labor shortages. This project offers an optimistic view on the future of offsite construction as Marriott, the largest hotel company in the world continues to prove the value of the methodology on dozens of projects nationwide.

The Past Year in Modular Construction

Prescient is On Track with Generation Atlanta | Atlanta, GA

Kaplan Residential announced its selection of the **Prescient** modular construction system for its development of a 336-unit apartment complex called Generation Atlanta. Together with **Niles Bolton Associates** and **CBG Building Company**, Prescient plans its tallest project to-date. Vertical building is set to begin this month on track for a 2020 completion.



"It is clear that our proprietary modular construction system is attracting premier developers, architects and contractors to help complete projects within budget and ahead of schedule."

- Satyen Patel

With a unique position as a leader in lean construction and a dedication to advanced manufacturing techniques, Prescient separates itself as a new way to do business. The Prescient Digital Thread is a model-centric construction software designed to help projects execute in an orderly progression, connecting all key stakeholders from developers to designers to suppliers and contractors. Prescient also uses robotics, laser cutting systems, and flexible manufacturing systems to deliver consistent buildings similar to that of other manufacturing industries.

FullStack Modular's New York Affordable Housing Project | Brooklyn, NY

The City of New York has announced its plans for an affordable housing development in partnership with **Thorobird**, non-profit **Bangladeshi American Community Development and Youth Services (BACDYS)**, **Think! Architecture and Design**, and local manufacturer **FullStack Modular**. The 167-unit complex plus medical center sits on city-owned land, making this public-private partnership ('PPP') a modular construction case study for the ages. It becomes necessary to utilize faster delivery methods that also meet the living standards as New York continues to be space-constrained.

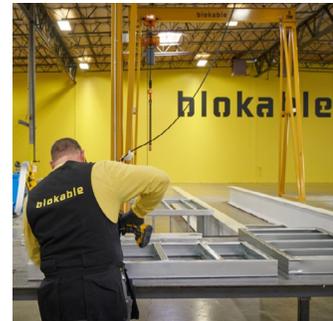


Having an entire NYC-based development team from design to build also promotes the idea that the modular mentality can become a localized operation. Roger Krulak, Founder & CEO of FullStack Modular noted their excitement in having, "a factory humming with good-paying jobs for New Yorkers." The future is bright for New York as this modular project sets the stage long-term for the countries most densely populated city.

The Past Year in Modular Construction

Blokable's First Affordable Housing Complex | Seattle, WA

Blokable, a Seattle-based modular unit builder has recently revealed its new “housing development as a service” offering outlining an effort to bring affordable housing to everyone. Its first housing complex development with **Compass Housing Alliance** is taking place in Edmonds Washington, a Seattle suburb. The three-story complex of 70 units is being built in stages with units ranging from studio to 3-bedrooms.



Each Blokable unit has a standardized structure with customized elements like doors, windows, and additional fixtures. The goal is not only to build faster and safer, but to produce an attractive and somewhat flexible design that elevates each neighborhood. BlokSense, the company's smart monitoring system is built into each unit as a way to elevate the operational process by keeping track of air quality, humidity, and predicting maintenance needs. Blokable plans to expand its reach to San Francisco, Los Angeles, Utah, and even New York City.

Skender Launches Modular Facility | Chicago, IL

Modular building is often times thought of as a coast-constrained effort due to the difficulties in large-scale land transportation, but Skender is seeking to change this mentality. Its recently launched modular unit has wasted no time, planning the opening of its 105,000-square-foot modular factory on the southwest side of Chicago. Skender's first modular project will be an order of 10 three-flats for **Sterling Bay** that will help address the city's critical affordable housing shortage. The steel-frame three-flats will be completed in a nine-week production schedule, approximately 80 percent faster than conventional methods. In addition, the firm is planning a 7-story, 83-unit, 92,000-square-foot modular apartment building that starts in early 2020.



Skender has established itself as a future-forward contractor, fully accepting modular construction as a new, more efficient, and cost-effective building process. Bringing design, engineering, contracting, and trades work under one roof has separated Skender from its competition, a move that will reduce costs, time, and broader inefficiencies that come from multiple companies performing separate tasks.

"This is a 10 to 12-month project that, soup to nuts, we'll do in seven."

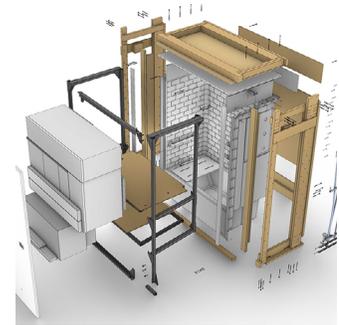
- Tim Swanson

The Past Year in Modular Construction

Katerra's K90 Apartment Block Development

| Las Vegas, NV

Katerra has had enormous buzz surrounding its record year of funding in 2018 that brought in over \$1 billion. With the dollars and expertise backing the company, its first product launch took place in February 2019. The set of solutions ranges from materials (Cross-Laminated Timber) to energy systems (Katerra Energy System (KES), a reduced footprint design to a traditional HVAC system (KVAC), Halio™ smart-tinting glass, a Bath Kit product, and a line of KOVA high-quality interior fixtures and finishes) to software (Apollo) that manages the entire process.



Many of these new products and materials are being showcased at Katerra's K90 apartment block development just outside of Las Vegas, Nevada. The 24-unit building has a completion time of just 90 days, setting a baseline timeline to compete with just about any modular process out there.

Conclusion: Driving Wider Adoption

The time for change in the construction industry is no longer 5 years from now; it's now. While asking construction companies to undertake large-scale changes to project teams, workflows, and systems is a tall order, they have all the tools they need to make those changes, if only incrementally at first. Even without implementing a fully-integrated design and construction team, developers and contractors can still move toward modularization within a more traditional project structure by working alongside modular builders and pre-fabrication services as subcontractors. Earlier still on the adoption timeline, companies can begin implementing some of the digital design, automation, and project management tools that will eventually serve as vital integration points between factory work and field work. By updating procedures incrementally and optimizing process at each pain point, companies can effectively ease the transition into streamlined offsite project delivery.

As leading companies complete more flagship modular projects, other builders will follow suit as the benefits become increasingly attainable and the bar for efficiency in construction is raised. As exciting as the past year has been in the world of modular construction, we at BuiltWorlds are even more excited for what is yet to come.

References:

Raghi Iyengar, Founder & CEO, ManufactOn | Tim Swanson, Chief Design Officer, Skender | "Aircon unit that fits in a wall": Prefab start-up Katerra launches new products | City Announces Plans to Build Over 160 Units of Modular Housing in East New York | Contractor plans factory-built apartment project in West Loop | Edmonds Lutheran tackles housing crisis head-on with world's first Blokable village | Global Modular Construction Market Will To Reach USD 175.15 Billion By 2025: Zion Market Research | Katerra Introduces Expansive Suite of New Products at Katerra TAKE OFF | Marriott Plots World's Tallest Modular Hotel in New York | Modular Building Institute's 2018 Permanent Modular Construction Report | Modular Construction for Multifamily Affordable Housing | Modular Housing May Help Bridge The Affordable Housing Gap | NYC to use modular construction for affordable apartments in Brooklyn | Paul Allen Backed Blockable Delivers First Unit Part Housing Project Seattle Suburb | Reinventing construction through a productivity revolution | Revolutionary Prescient Technology Platform Commissioned for | Generation Atlanta by Kaplan Residential | The construction revolution continues as Cross-Laminated Timber goes modular | The 5 Major Advantages Of Modular Process System Design | World's Tallest Modular Hotel Set To Rise In New York City This Fall, Highlighting Marriott International's Vision To Disrupt The Way Buildings Get Built



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