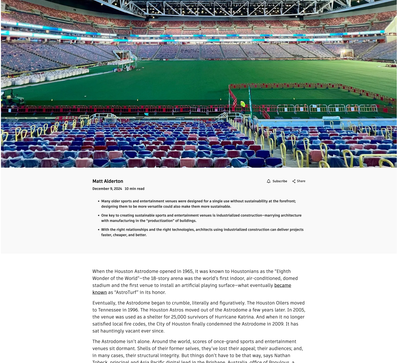
How Populous is innovating venue productization—with stadium-size impact

Global architecture firm Populous leads the way in venue productization, borrowing concepts from industrialized construction and product manufacturing to build transformative, eco-friendly sports complexes.

By embracing a modular approach and reusable components, Populous is making venues like Irving-Texas's Las Colinas Sports Park adaptable and more sustainable.

Image courtesy of Populous



Matt Alderton
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- Many older sports and entertainment venues were designed for a single use without sustainability at the forefront; designing them to be more versatile could also make them more sustainable.
- One way to creating sustainable sports and entertainment venues is industrialized construction—marrying architecture with manufacturing to the "productization" of buildings.
- With the right relationships and the right technologies, architects using industrialized construction can deliver projects faster, cheaper, and better.

When the Houston Astrodome opened in 1965, it was known to Houstonians as the "Eighth Wonder of the World"—the 18-story arena was the world's first indoor, air-conditioned, domed stadium and the first venue to install an artificial playing surface—what eventually became known as "AstroTurf" in its honor.

Eventually, the Astrodome began to crumble; literally and figuratively. The Houston Oilers moved to Tennessee in 1996. The Houston Astros moved out of the Astrodome a few years later. In 2005, the venue was used as a shelter for 25,000 survivors of Hurricane Katrina. And when it no longer satisfied local fire codes, the City of Houston finally condemned the Astrodome in 2009. It has sat hauntingly vacant ever since.

The Astrodome isn't alone. Around the world, scores of once-grand sports and entertainment venues sit dormant. Shells of their former selves, they've lost their appeal; their audiences; and, in many cases, their structural integrity. But things don't have to be that way, says Nathan Tobeck, principal and Asia Pacific digital lead in the Brisbane, Australia, office of Populous, a global architecture and design firm that specializes in the design of sports arenas, stadiums, convention centers, and other multiuse event venues.

"Our industry can do things better," says Tobeck, whose firm is taking a new, more sustainable approach to sports-and-entertainment architecture by embracing industrialized construction techniques that use digital tools to "productize" complex projects.

"When you're investing multiple billions of dollars to build venues that are used somewhere between 50 and 200 times a year, you really have to maximize the value of that investment," says Jonathan Nelson, global head of digital at Populous. "Productization and industrialized construction absolutely play a huge role in that."

What is productization in construction?

Populous used venue productization concepts to design new Slant Arena in Las Colinas Sports Park. Image courtesy of Populous

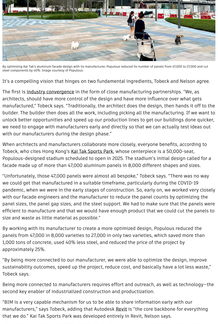
The premise of venue productization and industrialized construction is simple: Designers and builders can make projects faster, more efficient, and more sustainable by borrowing principles and processes from the product design and manufacturing (PD&M) industries, then adapting them to the architecture, engineering, construction, and operations (AECO) sector with the help of digital technology.

"The irony of our industry is that every time we do a project, everybody gets together and almost pretends they've never done this before," Nelson says. "My job is to help alleviate that by saying, 'Actually, we have done this, and here's how we can bring it to what you're doing now.' That's where efficiencies and productivity gains start to appear."

Consider a car. When an automobile is manufactured in a factory, the product engineers don't design each individual vehicle from scratch. Rather, they have reusable templates for common parts and components, which they produce and assemble en masse in a mechanized fashion.

With the right tools and foresight, buildings can be similarly "manufactured." "Our infrastructure is getting larger and more complex, but we haven't fundamentally changed the way that we procure and build buildings at all—our industry is a massive laggard," says Nelson, who notes that it took the aerospace industry just 63 years to advance from the Wright Brothers' planes in Kitty Hawk, NC, to landing a person on the moon. "What have we done in our industry in 63 years that shows that level of advancement? It's a fascinating problem to try and solve."

Starting a "reuse" revolution



The Nassau County International Cricket Stadium, a temporary venue, was disassembled two weeks after the 2024 T20 Cricket World Cup. Image courtesy of Getty Images.

With industrialized construction and productization, Populous thinks it can help solve the AECO sector's stagnation problem, not to mention the warts that come with it.

A project that perfectly illustrates its approach is the Nassau County International Cricket Stadium. This 34,000-capacity venue was used as the New York venue for the 2024 T20 Cricket World Cup. Because cricket isn't as popular in the United States as many other sports, the stadium was designed from the start to be temporary, using a modular strategy. The stadium's design focused on sustainable, temporary solutions while meeting stringent cricket standards, offering a world first for the sport.

The vast majority of parts used were based on the standard sizes of tents, scaffolding, and equipment available on the event rental market, which have highly standardized modules. For the stands, the bulk of the bowl was constructed from stands repurposed from recent Formula 1 races, and only small sections—the triangular sections between modular stands—were constructed in the traditional fashion.

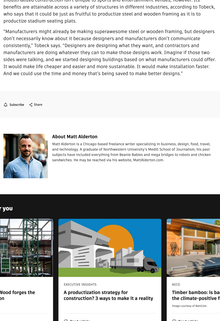
One overarching goal was to not just assemble a temporary stadium, but to make it as close as possible to a permanent venue in terms of amenities, which included multiple seating products; VIP and club spaces; team locker rooms; and press, briefing, and broadcast spaces, all derived from a series of seven module groups.

Modular systems also played a significant part in the design and delivery of the venue; the project progressed from a blank sheet of paper to opening day in just nine months whereas permanent venues of comparable size can take several years to construct.

Sustainability was also a key driver. Two weeks after the T20 tournament, the venue was disassembled and repurposed to serve other events in North America—all that was left was the cricket pitch.

Tobeck says the project illustrates the potential value of portable and modular seating in use cases like temporary venues. "Cricket isn't a sport that's often played in America, but what if there were a way to manufacture seating plats and seats in a system that we could erect to be super fit-for-purpose for a spectacular one-off event? Those same seating plats and seats could then be pulled down and resurrected somewhere else for baseball to suit another community in the future, as opposed to the white-elephant situations where people build stadiums for something like the Olympics, and then the city has no need for it anymore."

Strong partnerships, smart technology



By optimizing Kai Tak's aluminum facade design with its manufacturer, Populous reduced its number of panels from 67,000 to 25,000 and cut their components by 60%. Image courtesy of Populous

It's a compelling vision that hinges on two fundamental ingredients, Tobeck and Nelson agree.

The first is industry convergence in the form of close manufacturing partnerships. "We, as architects, should have more control of the design and have more influence over what gets manufactured," Tobeck says. "Traditionally, the architect does the design, then hands it off to the builder. The builder then does all the work, including picking all the manufacturing. If we want to unlock better opportunities and speed up our production lines to get our buildings done quicker, we need to engage with manufacturers early and directly so that we can actually start ideas out with our manufacturers during the design phase."

When architects and manufacturers collaborate more closely, everyone benefits, according to Tobeck, who cites Hong Kong's Kai Tak Sports Park, whose centerpiece is a 50,000-seat, Populous-designed stadium scheduled to open in 2025. The stadium's initial design called for a facade made up of more than 67,000 aluminum panels in 8,000 different shapes and sizes.

"Unfortunately, those 67,000 panels were almost all bespoke," Tobeck says. "There was no way we could get that manufactured in a suitable timeframe, particularly during the COVID-19 pandemic, when we were in the early stages of construction. So, early on, we worked very closely with our facade engineers and the manufacturer to reduce the panel counts by optimizing the panel sizes, the panel gap sizes, and the steel support. We had to make sure that the panels were efficient to manufacture and that we would have enough product that we could use the panels for size and waste as little material as possible."

By working with its manufacturer to create a more optimized design, Populous reduced the panels from 67,000 to 8,000 varieties to 27,000 in only two varieties, which saved more than 1,000 tons of concrete, used 40% less steel, and reduced the price of the project by approximately 25%.

"By being more connected to our manufacturer, we were able to optimize the design, improve sustainability outcomes, speed up the project, reduce cost, and basically have a lot less waste," Tobeck says.

Being more connected to manufacturers requires effort and outreach, as well as technology—the second key enabler of industrialized construction and productization.

"BIM is a very capable mechanism for us to be able to share information early with our manufacturers," says Tobeck, adding that Autodesk Revit is "the core backbone for everything that we do." Kai Tak Sports Park was developed entirely in Revit, Nelson says.

Tools such as Autodesk Informed Design make the digital connection between architect and manufacturer even stronger, Tobeck says. For example, he envisions a future when architects can incorporate information from Autodesk Inventor into their Revit models. "Being able to input Inventor content from the manufacturer into our models in a lightweight and proxy-like manner could help us engage with them a lot earlier," he says. "And then we could use things like Autodesk Construction Cloud to receive updates from the manufacturer when they've updated a product, launched a new line, or discontinued something. We could actually sit down and communicate with them directly to figure out which products are available, where they're available, and what they'll cost. Being able to receive that information and then design around it to speed up our timelines would be phenomenal for everybody."

Populous is also using artificial intelligence to inform its designs. "We're using machine learning very actively when we design seating bowls," Nelson says. "We can take all of these specialized data that we have, and we can use it to figure out optimal ticketing sections . We can say, 'For a C-shaped concert, your ticketing segmentation looks like this. For a U-shaped concert, it looks like this. For basketball, it looks like this.' We can use that to inform our designs to make sure we maximize both experience and revenue for the venue over time."

Unlocking value-added architecture

Therein lies the true potential of productization. By collaborating with forward-thinking clients and contractors, architects who collaborate with manufacturers can continue to add value long after the design phase. "Our goal is to be with our clients throughout the entire asset lifecycle, from needs and planning all the way through end-of-life and repurposing, so we're developing tools and services that stretch out along that," Nelson says.

Populous takes an integrated approach to designing and operating venues. "Aside from the main design part, we also do major event planning and adjacent services because we're experts in the use of our facilities," Nelson says. "We make sure everything we design for our venues is fit-for-purpose because we may also be designing the events that go on inside them. We think of ourselves as a sports and entertainment company, not as an architecture and design firm."

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Industrialized construction isn't unique to sports and entertainment venues, however. Its benefits are attainable across a variety of structures in different industries, according to Tobeck, who says that it could be just as fruitful to production steel and wooden framing as it is to production stadium seating plats.

"Manufacturers might already be making superawesome steel or wooden framing, but designers don't necessarily know about it because designers and manufacturers don't communicate consistently," Tobeck says. "Designers are designing what they want, and contractors and manufacturers are doing whatever they can to make those designs work. Imagine if those two sides were talking, and we started designing buildings based on what manufacturers could offer. It would make life cheaper and easier and more sustainable. It would make installation faster. And we could use the time and money that's being saved to make better designs."

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About Matt Alderton
Matt Alderton is a Chicago-based freelance writer specializing in business, design, food, travel, and technology. A graduate of Northwestern University's Medill School of Journalism, his past subjects have included everything from Beanie Babies and mega bridges to robots and chicken sandwiches. He may be reached via his website, MattAlderton.com.

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