property, compared to 100 percent when the tangible property is directly held by the Opportunity Fund. This means that some property can be located outside an Opportunity Zone or acquired before December 31, 2017. The 70-percent rule is good for investors because more businesses will meet the requirements to qualify for Opportunity Zone incentives. (It's important to note that the statute uses the word "business" to distinguish tangible property from other Opportunity Zone property, including stock or partnership interests.)

A 31-month working capital safe harbor is available to qualifying Opportunity Zone businesses, easing concerns about potential bottlenecks and penalties at the Opportunity Fund level. Because investors must invest capital gains within 180 days, they could encounter problems if the Opportunity Fund isn't ready to spend down the capital, including running afoul of a rule that requires 90 percent of the Opportunity Fund's assets to be held in Opportunity Zone property.

Know the Options

Opportunity Zone incentives are resilient and flexible so that investors, developers and entrepreneurs will take advantage of them. While some investors may want to put their money directly into qualifying Opportunity Zone tangible property, others will find that investing in qualifying Opportunity Zone businesses will maximize tax benefits.

Whichever approach is used, investors should use care before making any decisions to avoid costly and irrevocable mistakes that could result in disqualification for preferential treatment of capital gains, as well as the loss of development and new businesses in designated Opportunity Zones. ■

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Should Construction Consider a High-Tech Makeover?

The sector's productivity hasn't improved much in years, but that could be changing as workforce challenges increase.

By Trey Barrineau

Automation, robotics, the "internet of things" (IoT) and other technological advances are revolutionizing the commercial real estate industry in areas such as leasing, property management, building operations and financing. But construction, one of the most crucial aspects of the development process, hasn't kept pace when it comes to the adoption of high-tech labor-saving advances.

According to a February 2017 report from the McKinsey Global Institute, productivity in areas such as manufacturing, retail and agriculture has grown by as much as 1,500 percent in the U.S. since 1945, but it's barely budged in construction. Worldwide, the report finds that labor-productivity growth in the construction sector has averaged just 1 percent a year during the past two decades. By comparison, manufacturing productivity has risen an average of 3.6 percent a year during the same period, McKinsey says.

According to the report, if construction labor productivity could catch up with other sectors of the world's economy, the industry's value added could rise by $1.6 trillion a year. That would be enough to meet half of the world's rising infrastructure needs.

Getting there won't be easy, though. In the U.S., construction ranked next to last on McKinsey's 2015 digitalization index, which examines 27 indicators to measure the digital assets, digital usage and digital workers in various sectors of the economy. McKinsey's report says the main reason construction fares so poorly in digitalization is because it's a highly localized, labor-dependent industry.

Why Construction Lags

There are several other reasons why high-tech solutions haven't caught on in the construction industry. First of all, there's the simple fact that construction is a fragmented process with many non-repetitive tasks, which don't easily lend themselves to automation. McKinsey's research also shows that the global construction industry is extensively regulated, over-dependent on public-sector demand and highly cyclical.

Additionally, many jobsite functions are often isolated from each other, which is linked to the design-bid-build process that's prevalent in North American construction. In this system,

Rise of the Robots

Robotic solutions for the construction jobsite are in their infancy, but here are two notable examples that could become commonplace in the near future.

Japan's National Institute of Advanced Industrial Science and Technology has developed a robot named **HRP-5P that can install drywall autonomously** and may eventually be able to accomplish the task more efficiently than humans. However, the robot is in the development stage and still struggles with parts of the job.

Automated bricklaying robots such as **Hadrian can lay 3,000 bricks per hour** and complete the structure of a house in 16 hours. ■

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a developer or building owner enters into separate agreements with architects, engineers, general contractors and subcontractors for a project. That means the building process isn't fully integrated from conception through final construction.

Single-Entity Solutions

Design-build, on the other hand, is a project delivery system in which most design and construction services are handled by a single entity. It's becoming an important part of the construction industry. A research study released in January 2018 by FMI, a construction management consulting and investment banking firm, estimates that North American design-build projects will grow 18 percent between now and 2021 and make up 44 percent of total construction spending during that time.

One popular, technologically advanced technique for building commercial and residential structures is off-site construction. It's defined by the Na-

New & Noteworthy

433,945 sq. ft.

Mountain Development Corporation recently wrapped up construction on a newly renovated **office complex, 56 at Roseland**, in **Roseland, New Jersey.** Ware Malcomb provided interior architecture and design services for the project, a four-story, 433,945-square-foot office building in a campus setting on 56 acres. The project entailed the renovation and updating of most common areas and shared amenities. This included improvements to the building's two-story atrium lobby, conference center, courtyard patio and lounge area, a 400-seat café (including serving and seating areas on two floors) and more.

378,405 sq. ft.

Ridgeline Property Group and its investment partner, USAA Real Estate, recently broke ground on **Interstate 80 Logistics Center**, a 378,405-square-foot Class A **logistics facility** in **Fairfield, California**. The project, which is expected to be completed in the summer of 2019, is located a mile from Interstate 80, the east-west route connecting the San Francisco Bay Area to Sacramento and the Central Valley. The project includes a 36-foot clear height, cross-dock design, 69 dock-high doors, four drive-in doors, 56-foot-by-60 foot column spacing with 60-foot speed bays, 31 dedicated trailer parking spaces and 192 auto parking spaces.

259,947 sq. ft.

Trammell Crow has begun construction on a Class-A, 259,947square-foot **office building** for the General Services Administration in **Irving, Texas**. The one-story structure, which will house the U.S. Citizenship and Immigration Services' Texas Service Center, meets the government's security and energy-efficiency requirements. It will be completed in early 2020. The facility, situated at the northwest intersection of N. Belt Line Road and President George Bush Turnpike, will sit on approximately 27 acres and has a 40-year ground lease with the DFW Airport. Gensler is the project architect and Manhattan Construction Company is the general contractor. CBRE will handle property management.

Five High-Tech Construction Trends to Watch

A June 2016 report from the McKinsey Global Institute, "Imagining Construction's Digital Future," describes five trends that will shape construction and capital projects in the coming years:

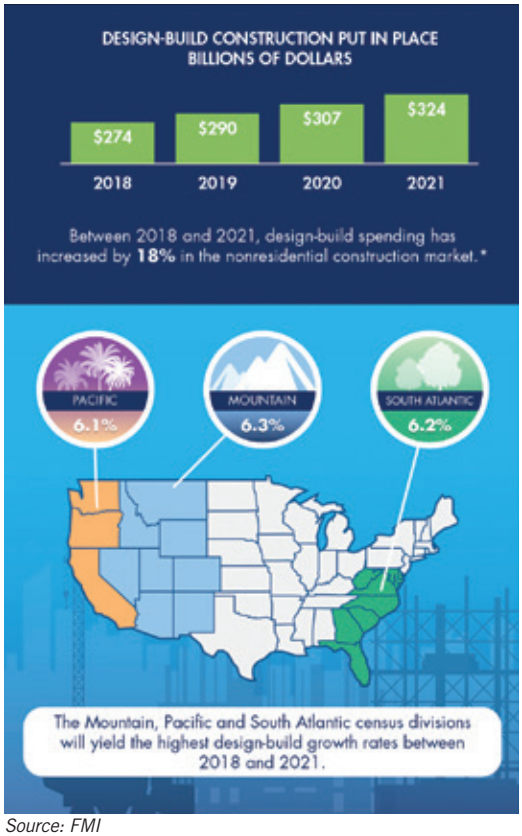
Higher-definition surveying and geolocation. "New techniques that integrate high-definition photography, 3-D laser scanning, and geographic information systems, enabled by recent improvements in drone and unmanned-aerial-vehicle (UAV) technology, can dramatically improve accuracy and speed."

Next-generation 5-D building information modeling (BIM). "Next-generation 5-D BIM is a five-dimensional representation of the physical and functional characteristics of any project. It considers a project's cost and schedule in addition to the standard spatial design parameters in 3-D. The 5-D BIM platform allows owners and contractors to identify, analyze, and record the impact of changes on project costs and scheduling."

Digital collaboration and mobility. "Process digitization means moving away from paper and toward online, real-time sharing of information to ensure transparency and collaboration, timely progress and risk assessment, quality control, and, eventually, better and more reliable outcomes."

The "internet of things" and advanced analytics. "On a construction site, the 'internet of things' would allow construction machinery, equipment, materials, structures, and even formwork to 'talk' to a central data platform to capture critical performance parameters."

Future-proof design and construction. "New building materials, such as self-healing concrete, aerogels, and nanomaterials, as well as innovative construction approaches, such as 3-D printing and preassembled modules, can lower costs and speed up construction while improving quality and safety." ■



Source: FMI

tional Institute of Building Sciences as "the planning, design, fabrication and assembly of building elements at a location other than their final installed location to support the rapid and efficient construction of a permanent structure."

According to the 2018 Off-Site Construction Industry Survey, nearly 88 percent of respondents said they had used off-site fabricated components on projects during the past year, and about 82 percent said they expected to do so in the coming year. Survey respondents said the main benefits of off-site construction are shorter project schedules, improved quality and lower costs. Off-site elements are being used to build commercial, industrial, health care, education, multifamily, hospitality and data center properties.

Construction startup Katerra, which has raised more than $1 billion in venture capital in the past three years, has announced ambitious plans to vertically integrate the entire process — from architectural concepts, to designs, to finished buildings. The company says it envisions a jobsite that "more closely mirrors a process of precision-sequenced product assembly than traditional construction." So far, however, the company has experienced production delays and other problems.

Labor Issues Fuel Innovation

In the U.S., a shortage of skilled workers looms over the U.S. construction industry, and it's not going to get better anytime soon as increasing numbers of older employees head toward retirement.

In 2017, there were 10.7 million workers employed in construction, according to the Bureau of Labor Statistics. About 4.8 million of them, or 45 percent, were 45 or older. Additionally, a 2017 survey from FMI shows that construction companies will lose between 14 percent and 20 percent of key workers such as executives, field managers, senior managers

In 2017, there were 10.7 million workers employed in construction, according to the Bureau of Labor Statistics. About 4.8 million of them, or 45 percent, were 45 or older.

and project managers during the next five years to retirement or attrition.

Those demographic changes are starting to push companies to adopt digital solutions to their labor challenges.

In January, a survey by the Associated General Contractors of America (AGC) and Sage Construction and Real Estate found that while 79 percent of construction firms plan to increase staffing in 2019, 78 percent say they're having a hard time filling craft positions. To ease those labor problems, 32 percent of the firms that took part in the survey said they're using high-tech methods such as "lean" construction (which focuses on ways to minimize waste of materials, time and effort), virtual construction techniques or off-site prefabrication to reduce overtime, while 28 percent are investing in labor-saving equipment such as drones, robots and 3-D printers.

The survey shows that 42 percent of respondents will increase their information technology (IT) investments in 2019, with 30 percent of firms planning to boost investments in project and document management software. More companies are moving data to the cloud as well — 31 percent said they are very comfortable doing that, up from 24 percent last year. ■

Trey Barrineau is the managing editor of Development magazine.

New & Noteworthy

230,000 sq. ft.

Interior architecture and planning firm **H. Hendy Associates** recently completed a new 230,000-square-foot **corporate headquarters** for Behr Paint Company, one of the nation's largest suppliers of architectural paint and exterior wood care products. Located in **Santa Ana, California**, the building has formal training and meeting rooms; workstations to foster teamwork and ideation; data and innovation areas; and the Behr Den, an indoor-outdoor space featuring a large patio with tiered seating. The den can also be used as an event space and is designed to comfortably fit 500 people. A hallmark of the new space is a 30,000-square-foot, state-of-the-art research and development laboratory featuring unique graphics, art and access to natural light.

Takata Photography

152,618 sq. ft.

The C.W. Driver Companies recently completed **California State University**, **San Bernardino**'s new $78 million, 152,618-square-foot **student housing and dining commons**. The 407-bed student housing complex and 750-seat dining facility provides much-needed accommodations for incoming students and supports the university's future growth. Sustainable features include the use of natural light and ventilation, energy-efficient LED lighting with day lighting controls and occupancy sensors, high-efficiency fixtures and appliances, solar panels, energy-efficient mechanical and plumbing systems, and low-water landscaping with smart irrigation controllers.

100,000 sq. ft.

Fidelis Healthcare Partners has announced its first project, the five-story, 100,000-square-foot **Saint Joseph Medical Office Pavilion** on the Uptown **Denver** campus of Saint Joseph Hospital. It will be located on a prominent 1-acre site on the campus at the intersection of Park Avenue, Ogden Street and 18th Avenue. Three floors will be dedicated to Class A medical office space; the ground floor will accommodate convenience retail and restaurant uses; and the rooftop will offer wellness/fitness and entertainment options. The project also includes ground-level, covered parking for physicians and an adjacent parking lot that will offer free parking for patients, visitors and tenant employees.