

An aerial, high-angle view of a construction site. The ground is dark, and the structures being built are light-colored. A prominent blue 3D model of a structural framework, including beams and columns, is overlaid on the construction site. The text is positioned in the upper left corner.

REALITY CHECK:

A step-by-step guide to maximize laser scanning in building construction

Discover the easy way to drive cost savings, efficiency and growth with reality capture technology.



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MIKE HARVEY

Senior product manager for reality capture
Leica Geosystems

INTRODUCTION

To stay competitive in construction, you need to adopt the tools and technologies that will help your company deliver projects in the most efficient and effective manner possible. Like most mid- to large-market general contractors, you know the value of using 3D reality capture technologies. Laser scanning can help you capture project conditions and milestones, conduct quality-assurance and quality-control checks, and reduce the risk of construction errors.

Construction errors can lead to hazardous conditions and trigger the need for rework that can cost upwards of 20% of a project budget, according to Mike Harvey, senior product manager for reality capture at Leica Geosystems. By adopting laser scanners, construction trades are able to complete their work right the first time and reduce the need for rework to less than 5% of a budget, he estimates. For a major project, that difference can translate into millions of dollars of savings, all of which can go toward your profit margin.

Despite recognizing its value, you may be outsourcing your laser scanning needs. Not only might this approach slow down your productivity, but it also may be a poor long-term strategy for your growing company. This guide will help you understand the advantages of in-house laser scanning services and move forward with confidence.



Owning your technology is key to maximizing your potential

Let's face it: The pace of construction isn't slowing down. Buildings and infrastructure are increasing in complexity, and the cost of labor and materials is only rising. You'd be hard-pressed to find an owner happy to learn their projects will take longer or cost more than they expected due to unforeseen conditions or construction errors.

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TED MOBERG

Reality capture lead sales engineer
Leica Geosystems

How can having internal reality capture services help? A laser scanner can be used for much more than capturing a project's start and end points. It can become your go-to device for multiple use cases, according to Ted Moberg, reality capture lead sales engineer at Leica Geosystems. "You can gain speed and efficiency across many workflows," such as QA/QC checks on formwork, rebar and cutout locations during concrete pre-pour, edge of slab documentation, floor flatness tests, and comparing construction conditions against a BIM model. Tasks that can take hours or days to complete manually can be done within minutes.

If you outsource your reality capture needs, you will likely be paying between \$5,000 and \$20,000 per visit. The cost of these visits will quickly add up if you want to take advantage of reality capture's speed and accuracy across multiple workflows. Plus, you will lose a bit of your efficiency if you have to find and hire a service provider, communicate scope and required deliverables, and wait for a standard processing time for each and every scan.

Bringing 3D reality capture services in-house allows you to leverage the full capabilities of laser scanning technology across multiple project stages, generating a quick return on your investment.

"If you start thinking across all the workflows of your project," Moberg says, "you'll quickly see the value of bringing laser scanning in-house."



Image courtesy of Weitz.

Success Spotlight

For a new student residential complex in Florida, the Weitz Co. brought in Leica Geosystems scanners at project milestones to compare and update the design BIM model with as-built conditions. A tight timeline coupled with omnipresent inclement weather conditions meant the in-house virtual design and construction (VDC) teams often had only hours or minutes to scan the site between trades, such as electrical rough-ins and concrete pour, and before site shutdowns. By regularly scanning the project as subcontractors wrapped up their scopes, Weitz's VDC team stayed on top of design deviations and their impact on future work.

Read more [here](#).



Image courtesy of Weitz.

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Steps to Seamless and Effective Technology Integration



Plan your budget



Determine your hardware needs



Determine your software needs



Make sure you have backup

1

Plan your budget



Quality, accurate, reliable and durable technology requires an investment. The savings in avoided costs due to fewer mistakes and errors on one large construction project can be enough to generate a payback. However, performing your own laser scans can also actively support your company's growth.

Any time spent by your site superintendents or VDC teams to conduct or process the laser scans can be billed directly to your projects. Instead of spending your budget to pay another firm, Moberg says, "all that money is staying within your company, and you can recoup the cost of your assets quickly." In fact, Moberg says, the do-it-yourself model for scanning is increasingly common among large firms.

But you don't have to justify a big check with purchasing quite yet. Instead, you can explore many financing options.

Purchasing

You can buy a laser scanner outright with a one-time payment or finance it through the manufacturer or your bank. The laser scanner will be yours to use and bill to your projects. Your company can also depreciate the asset over five years, per Section 179 of the U.S. internal revenue code.

Renting

Renting gives you the flexibility of seeing which model works best for your needs without a long-term commitment. It offers a low barrier of entry to state-of-the-art equipment that is owned and maintained by the manufacturer. Equipment can be delivered right to your job site ready to use. Your rental fees may also count toward the future purchase of the equipment when you find it indispensable to your workflow.

Leasing

A leasing agreement can give you access to the newest laser scanning models while preserving your cashflow. Leasing requires less investment upfront and a fixed monthly payment that you can expense across your projects. Leasing offers a lower rate than renting, and you don't have to worry about holding onto technology that becomes obsolete.

Moberg sees many general contractors moving toward a leasing model. "We've worked toward a model of hardware-as-a-service and believe in giving our customers more flexibility," he says.



Success Spotlight

Regardless of how you finance your technology, your company's digital transformation can pay off in labor hours saved alone. After creating a workflow that round-trips BIM and scanner information between the site and office, McCarthy Building Cos. quickly saw the benefits of a connected jobsite. "The digitalization of our workflows is paying off every single day," says a representative in a [Hexagon Building Solutions case study](#). "We are saving hours on the job site on a repeatable basis with our digital workflows."

Takeaway

Work with a manufacturer that offers a range of products to suit your budget and a financing plan that meets your business model.



2

Determine your hardware needs



With a range of financing options at your fingertips, you now have to select your laser scanner. Identifying the right device for your company will require several considerations.

APPLICATIONS

What are your typical scan subjects?

If your company focuses on infrastructure projects, you might be scanning campus-scale sites, earthwork and roadways. If your company works primarily on building construction and renovation, you will likely be scanning structural elements, floor plans and utility infrastructure.

ACCURACY

What level of accuracy do you need?

For site overviews and trade coordination, you might have a higher tolerance than if you are performing a lot of precision work, like sizing pipes for prefabrication.

DELIVERABLES

What type of deliverables will you be producing and how frequently?

Are you capturing the entire site or conducting spot scans? Will your point cloud be used to create a 3D segmented mesh for high-level visualization, a comprehensive building information model, or detailed shop drawings?

And don't forget that you might change or expand into new markets in the future, Harvey says: "Think outside the box for possibilities besides the immediate problem you're solving."

Sensor types

Laser scanners come in many formats with a range of features and capabilities. General contractors typically use three types of scanners.

Terrestrial laser scanner (TLS): These stationary scanners are portable, fast and accurate. With a scan range between a few hundred to a few thousand feet, TLS devices can capture upwards of 2 million points per second and deliver detailed scans with accuracies ranging from less than a millimeter to a few millimeters.

Mobile or handheld scanner: The compact devices are small and lightweight. Simply hold them in your hand and walk through the desired scan area — no tripod or multiple setups are necessary. The scanners use SLAM (simultaneous localization and mapping) technology to track where they are on the site. Mobile scanners capture a few hundreds of thousands of points per second at a lower resolution and shorter range than TLS devices.

Autonomous laser scanner: For hard-to-reach areas, such as building exteriors and rooftops, an autonomous flying laser scanner can capture aerial views via a control interface on a mobile device. For scanning hazardous or complex environments or for regularly tracking progress with a set area, an autonomous laser scanning module can be mounted on a robot that follows a predetermined route.

You want a laser scanner that will meet your needs today and tomorrow, withstand a range of environmental conditions and be intuitive to use.

Look for scanners with one-button operation and real-time, in-device feedback and troubleshooting. Request a hands-on demonstration or trial period before making a purchasing decision.

Takeaway

Rather than focusing on a single laser scanner, think of reality capture as a tool kit that can expand with your team as your applications grow.



3 Determine your software needs



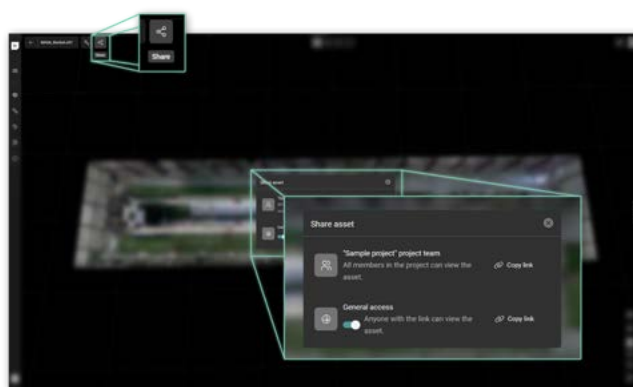
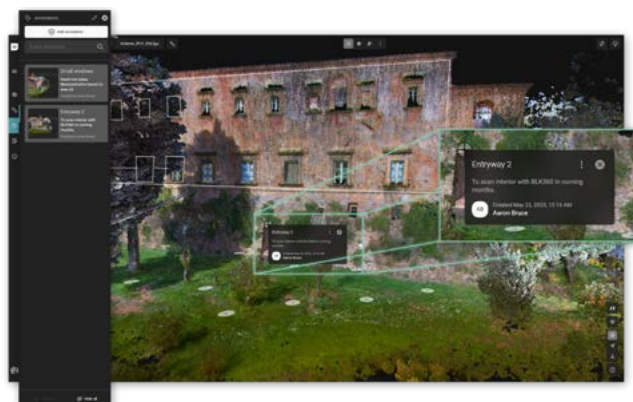
Practically speaking, you can find hardware that meets your desired resolution, accuracy and speed for most construction-related use cases. “Now,” Harvey says, “most of the magic of everything that happens is in the software.”

Digital tools are capable of running complex analyses of laser scan data, often with the help of artificial intelligence. Recent capabilities include automated point cloud registration, object surfacing and classification with 3D mesh segmentation algorithms, deviation comparison with a BIM model, clash detection prediction, and advanced visualization effects.

Your VDC team and other trades may rely on popular BIM tools by developers such as Autodesk and Bentley. As a result, choosing a laser scanning solution with deliverables compatible with common industry solutions is key.

Your scanning solutions provider should offer advanced design and analysis programs, as well as plugins for your BIM platform of choice. It should also help you curate the right software package to meet your needs. Additionally, the ability to easily centralize your reality capture data in a cloud environment can improve collaboration among stakeholders.

With construction’s emphasis on efficiency, you want to aim for a repeatable software workflow that your company can standardize. “As you become more successful and are able to add more sensors, you want a workflow that can stay the same so your learning curve is small even as you expand your portfolio,” Harvey says.



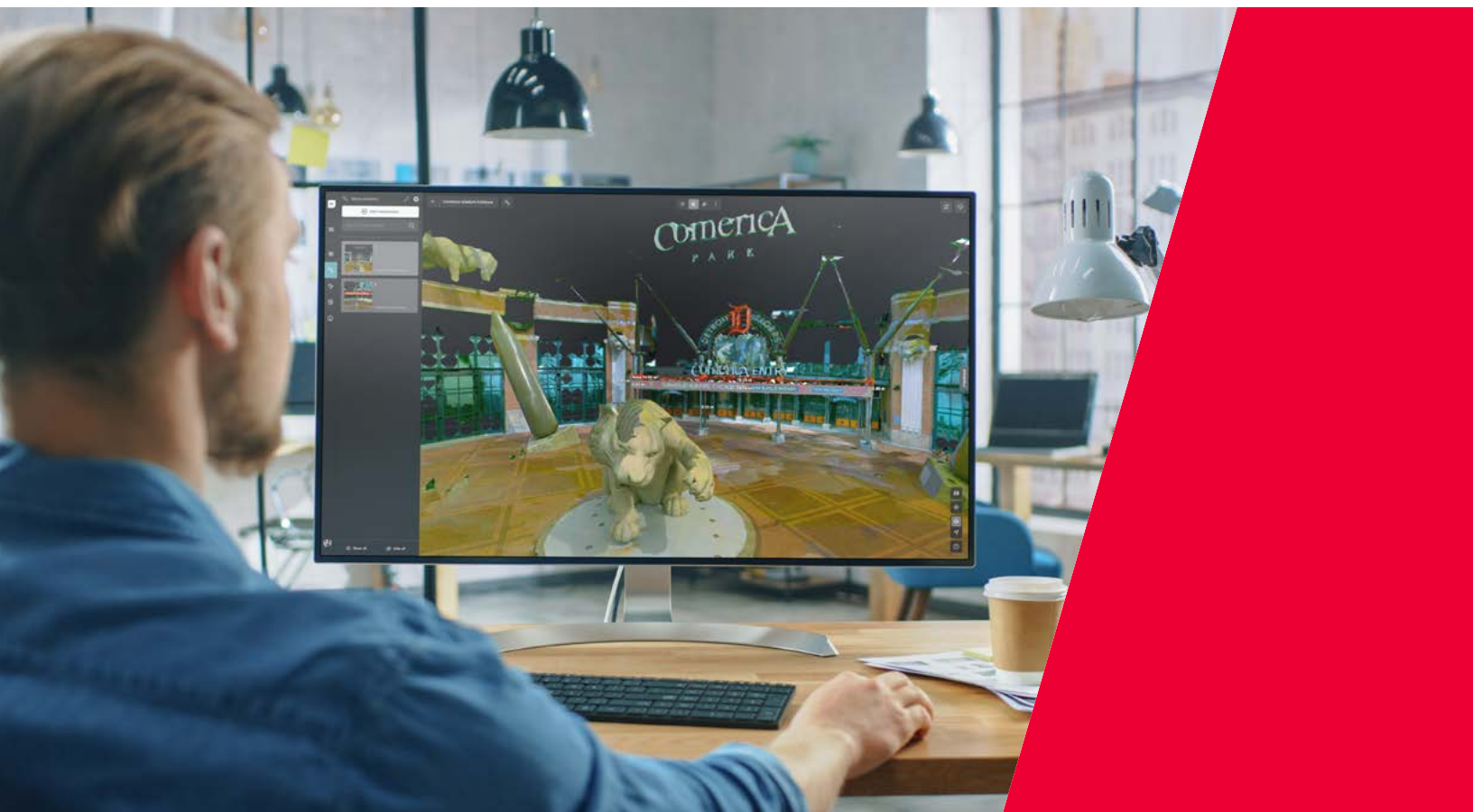
The ability to share, visualize, and use digital reality data directly in the cloud with platforms such as Reality Cloud Studio, powered by HxDR, makes collaboration effortless.

Success Spotlight

For the student residential complex in Florida, the Weitz Co.'s VDC team caught several site deviations with its laser scanners. In one instance, the rebar for a cooling tower concrete pedestal was 1.5 feet lower than designed. "I was able to get that information to the project team within the same day, and the next day the subcontractor corrected it," the contractor's representative said in the [Leica Geosystems case study](#). If the mistake hadn't been caught until the cooling tower was lowered onto the pedestal, the rework would have been costly and disruptive to the schedule. Additionally, the rep noted, "once the cooling tower is on site, where are you going to put it to redo the work?"

Takeaway

Find a workflow that standardizes and scales your VDC capabilities, ensures file compatibility with industry software, and offers cloud solutions for collaboration and quicker project delivery.



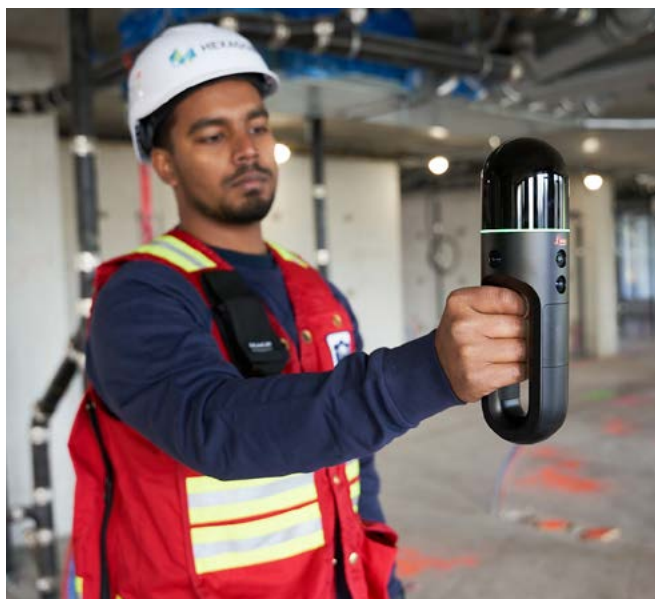
4

Make sure you have backup



Great customer service does not stop at the point of sale. Once you have invested in a company's product, you should expect to become part of the family, so to speak. "Many people don't necessarily choose one device over another because of how many points their device can capture per second," Moberg says. "They care if a manufacturer is going to answer the phone when they call and that their equipment will get serviced quickly. They care if the manufacturer is going to be a good partner."

This partnership should extend beyond resolving your immediate hardware and software needs to ensure that your company stays competitive and innovative for the long term. Leica Geosystems and Hexagon's Building Solutions can help you strategically apply your surveying and reality capture solutions to address greater challenges in the construction industry, such as layout optimization and progress tracking and reporting.



Onboarding and training

Though modern laser scanners are intuitive to use out of the box, you and your team will benefit from learning workflows and pro-tips vetted by industry experts to get the deliverable you need in the most effective and efficient manner.

With Leica Geosystems, your training journey can start with the unpacking of your new equipment at your project site or office. "We will start with a simplistic workflow to get the result that you're initially seeking," Harvey says. "And then, while we're there, we will scale your workflows to broaden your scanning capabilities for a whole range of other tasks."



Continuing education

Online learning, webinars and video tutorials have become the standard. Leica Geosystems leads the way by offering a variety of continuing education courses and virtual training classes that are regularly produced and updated.

Customer and technical support

Regardless of whether you're new to laser scanning or operating at an expert level, as Murphy's law puts it, "Anything that can go wrong will go wrong, and at the worst possible time." But a quality manufacturer will be there for you around the clock if you have a hardware or software question.

Leica Geosystems offers multiple avenues for help. You can call and speak with a live representative or research common issues in its online resource library. If you need an immediate lifeline and can connect to your site's Wi-Fi, a Leica Geosystems support engineer can remote into your equipment, see what you see, and guide it back to working order often within minutes.

Bringing 3D reality capture services internal to your company makes economic and strategic sense. With the array of hardware, software and support options available, Leica Geosystems will find a path that makes sense for your company's current and future goals.

Takeaway

Look for a manufacturer that cares about your success and offers plans and programs to support you throughout your digital transformation journey.



Begin your
journey today at
bimlearningcenter.com.



Leica Geosystems – when it has to be right

With more than 200 years of history, Leica Geosystems, part of Hexagon, is the trusted supplier of premium sensors, software and services. Delivering value every day to professionals in surveying, construction, infrastructure, mining, mapping and other geospatial content-dependent industries, Leica Geosystems leads the industry with innovative solutions to empower our autonomous future.

Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous — ensuring a scalable, sustainable future.

Hexagon's Geosystems division provides a comprehensive portfolio of digital solutions that capture, measure, and visualise the physical world and enable data-driven transformation across industry ecosystems.

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