Trimble

How to Get Started with Connected Workflows

A GUIDE FOR TRADE CONTRACTORS

Technology Delivers Building Blocks but Also Roadblocks

From reality capture software and positioning systems to fabrication management and building information modeling (BIM) solutions, digital technology touches nearly every corner of the modern construction project. Understanding *how, when* and *where* to use technology is crucial. Companies that get the equation right operate more efficiently and cost-effectively. In a best-case scenario, they're able to achieve transformative results.

Specialty contractors recognize that digital technology plays an integral role in advancing their business.

According to a 2022 study conducted by Trimble and Dodge Data & Analytics:[1]

86%
of trade contractors who currently have a low level of digital adoption plan to invest in digital workflows.

60%
who have a high level of digital adoption plan to continue investing in technology.

This includes areas as diverse as materials and inventory management, document management, job costing and labor management.

Make no mistake, digital workflows that connect people, data and machines unlock significant value for construction firms.

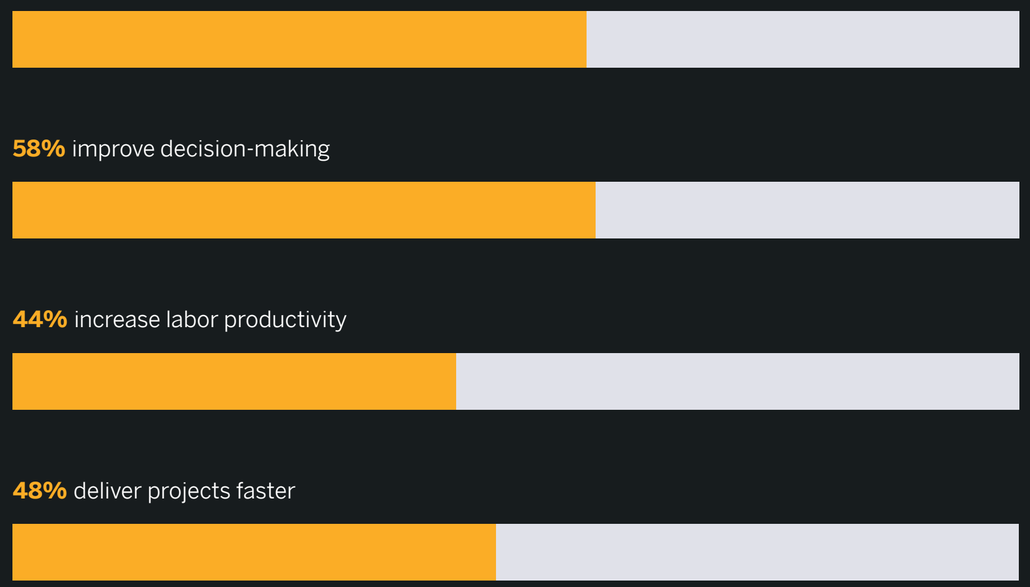
The same Trimble-Dodge study found that:[2]

57% of businesses realize efficiency gains for internal processes

58% improve decision-making

44% increase labor productivity

48% deliver projects faster



But that's where things get difficult. Simply adding technology to the mix doesn't necessarily unlock maximum value. It's all about how a business uses various tools, technologies and solutions together—and how they synergistically create advantages.

[1,2] Dodge Data & Analytics and Trimble Construction, *Connected Construction: The Specialty Contractors' Perspective*, 2022.

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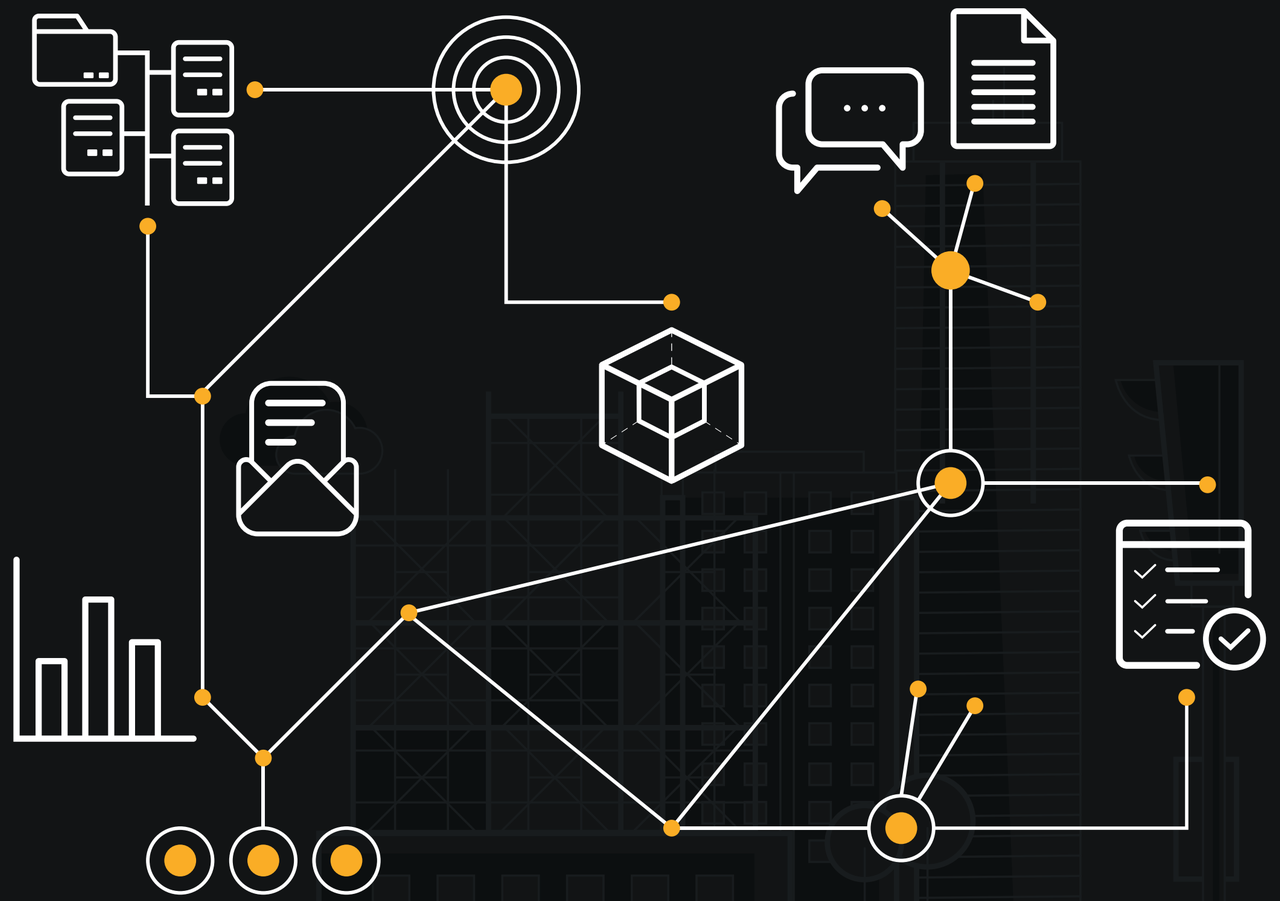
A common problem in the construction industry and beyond is that the quest for faster, cheaper and easier ways of working leads to a chaotic array of point solutions that rely on different data sources, formats, schemas and standards. The number of applications can easily reach into the hundreds or even thousands.

The result is a company that achieves only incremental gains when much larger gains are possible. Instead of witnessing breakthroughs in cost reduction, competitive advantage, safety, sustainability or profitability, an organization winds up with silos of digital processes and data—along with duplication and errors.

As a supply chain or business ecosystem expands, the challenges escalate and technical debt accumulates. Worse, different design, construction and business users cannot access essential data in the right format and on the right device at the precise moment it's needed.

Standalone point solutions can transform a single workflow, but transforming how your teams collaborate, how you deliver projects and how you run your business requires bigger thinking.



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Paving a Path to Progress

Organizations that tap into connected construction, which in its simplest form means integrating data across the project lifecycle, are able to make big process improvements in the areas that matter most:

- **Increased productivity**
- **Higher levels of profitability**
- **Reduced rework**
- **Improved safety**
- **Enhanced forecasting models**
- **Stronger security**
- **Improved budgeting**
- **Improved regulatory compliance**

These gains take place across business models, project types and business initiatives. They encompass conventional and progressive design-build, public-private partnerships, integrated and high-performance value chains, new products and services, modularization and prefabrication, and horizontal and vertical integrations.

As an organization becomes data-driven, it's equipped to fully leverage model-based estimating and takeoff, optioneering, digital as-builts, automation, AI and other advanced technologies. It evolves from reactive reporting to predictive and prescriptive analytics. All of this leads to a higher level of collaboration and transparency across stakeholders—and the ability to act and react faster to changing conditions. This digitally agile enterprise is equipped to address the opportunities and challenges that technology delivers.

This eBook will guide you through the steps required to start on your connected construction journey. It focuses on practical strategies and components revolving around:

GOALS **DATA** **WORKFLOWS** **PEOPLE** **SYSTEMS**

This structure serves as a blueprint for digitizing and connecting workflows across a trade construction company. In the following pages, you will learn about best practices and proven ways to construct a path to predictability and profitability.

New to connected construction?
Start here for basic definitions and use cases.

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Common Pain Points

Here are some warning signs that you aren't taking advantage of digital connected workflows:

- Time-consuming file and data management
- Rogue project managers
- Scope misalignment with clients, vendors and other stakeholders
- Frequent rework and changes in the field (20% of large projects wind up behind schedule[3])
- Misalignment between labor, materials, equipment and schedules
- Low cost predictability (only 31% of projects come within 10% of budget[4])
- Disappointing labor productivity
- Slow payables and receivables
- Inability to trace the root cause of errors or delays
- Dark data that can't be used to improve project or business outcomes

Benchmark Yourself Against Your Peers

Are you keeping up with digital workflow adoption?

Learn more about how connected technologies can build a scaffolding that supports best practices.

[3] McKinsey & Company, "Imagining construction's digital future," 2016.

[4] KPMG International, *Climbing the curve: 2015 Global Construction Project Owner's Survey*, 2015.

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GOALS

Identify Your Objectives

The first step in becoming a connected digital enterprise is to understand what connected construction offers. Digitization delivers gains on three primary levels:

Good:

A system automates an existing process. This trims time and dollars by introducing a more efficient way to tackle the task.

Example: Using fabrication management software to eliminate manual timesheet entry and data transfer

Better:

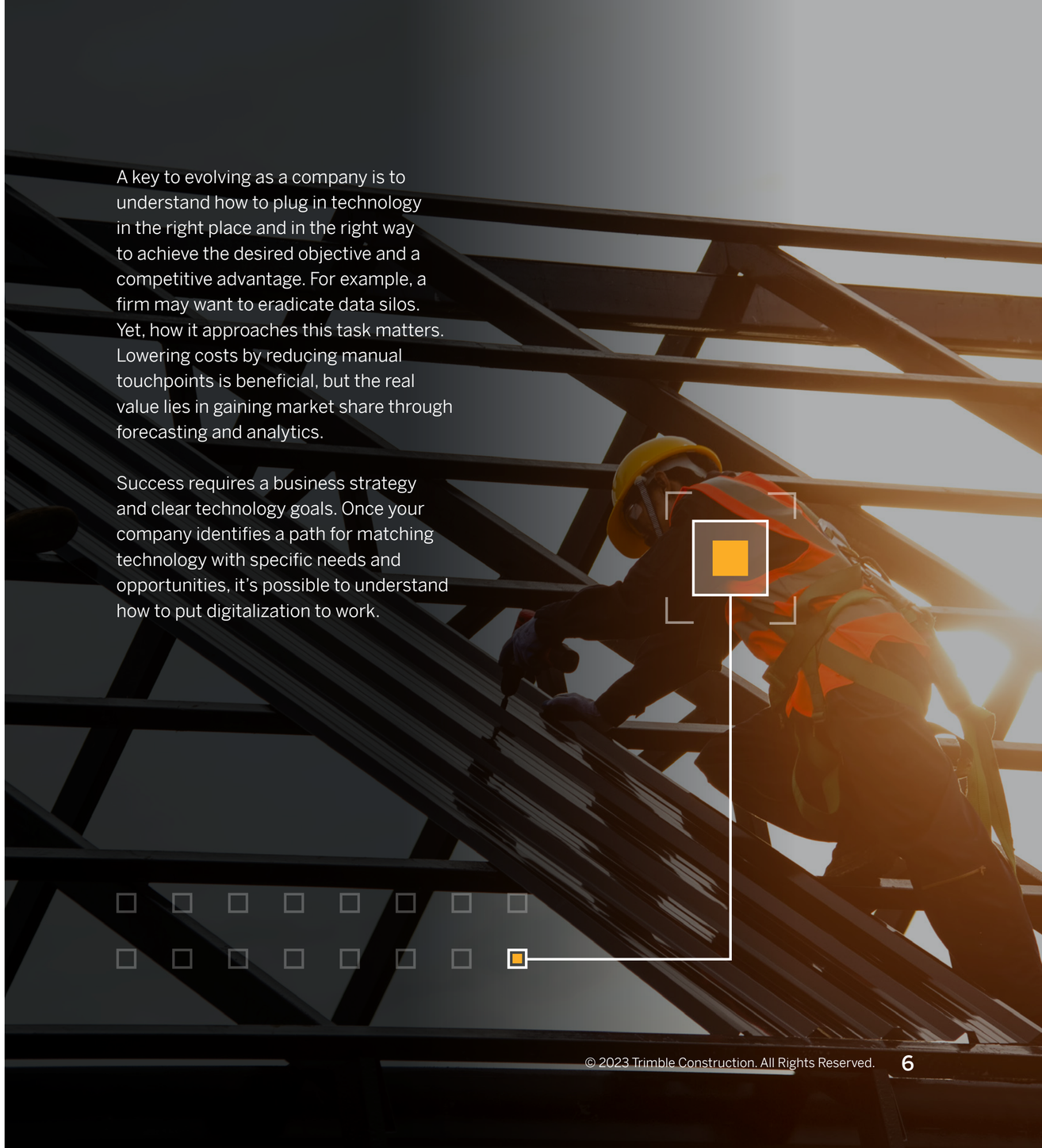
Software or hardware that significantly improves an existing process

Example: A robotic total station that enables 1 person to layout 600 points per day at a mm-level accuracy vs. traditional layout which requires 2 workers to layout 75 points per day

Best:

Technology that drives strategic business gains and innovation

Example: A cloud framework that allows teams to connect and collaborate in real-time—across offices, suppliers and geographic regions



A key to evolving as a company is to understand how to plug in technology in the right place and in the right way to achieve the desired objective and a competitive advantage. For example, a firm may want to eradicate data silos. Yet, how it approaches this task matters. Lowering costs by reducing manual touchpoints is beneficial, but the real value lies in gaining market share through forecasting and analytics.

Success requires a business strategy and clear technology goals. Once your company identifies a path for matching technology with specific needs and opportunities, it's possible to understand how to put digitalization to work.

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DATA

Establish a Solid Foundation for Managing Data

The second step toward becoming a highly digitized organization is to take stock of where you are and where you want to be. It's important to recognize that workflows are the way your organizational objectives play out. Data is the fuel that powers them. Consequently, it's vital to create a clear roadmap. **A best practice approach revolves around seven critical factors:**

Understand/identify your mission and goals.

It's essential to embed goals into benchmarks and KPIs. This might include: *Are costs in line with what we expect? Do processes require the number of labor hours we projected? Is our win rate where we would like it?* Learn more about how Blue Mountain Mechanical and GMF Industries approached this process.

Prioritize technology projects based on the value they deliver to the entire ecosystem.

This step requires an analysis of individual projects and an understanding of what represents best-of-breed solutions. It's important to focus on technology at both the data flow and workflow levels. For example, after conducting an analysis, Performance Contractors Inc. adopted Trimble's Connect AR, Field Link, XR10, RTS873 and X7 solutions. This resulted in a 10x decrease in labor for its layout process.

Establish and deploy standards, rules and templates.

Next, it's important to document current systems, data formats, data format needs and standards. It's also crucial to identify so-called "dark data" that winds up inaccessible or overlooked despite the fact that it could improve decision-making and outcomes. Standardization and governance are critical. Many of Trimble's most innovative customers establish a governance office and team, along with a centralized data standards database capable of synchronizing data across systems and user personas.

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DATA

Integrate IT systems and software.

With data standards, industry standards and workflow documentation in place, integrating systems becomes easier. At this point, a specialty contractor can work with technology partners to fully understand their long-term strategy and roadmap—and ensure that the solution and the desired result are closely aligned. For example: *Can a specialty contractor use cumulative design data in an integrated way across construction processes? Does the data deliver insights into regulatory mandates? Can a business capture data that streamlines and optimizes future bids?*

Train teams to use the system.

Improving data standards and workflows establishes a framework for gains. Yet, it's vital to train teams to use new systems and workflows. The good news is that integration and automation simplify both processes and training. For instance, when HC Blake began training new hires how to use modeling systems along with Trimble Connect, its teams began mastering MEP systems within six months.

Address custom development requirements.

As part of a broad industry trend, specialty contractors are shifting away from custom development and adopting commercial off-the-shelf (COTS) solutions that deliver flexible data formats and adaptable workflow configurations. This allows Trimble and other technology partners to develop API-based scalable solutions that unlock value through custom integrations. For example, Trimble and Microsoft accelerate digital and physical world connectivity through a dedicated construction cloud.

Tap outside consulting expertise as needed.

As IT systems and cloud frameworks extend across companies, partnerships and alliances become essential. Deloitte found that 73% of engineering and construction firms with highly connected digital systems realize value. By contrast, only 27% that handle all development in-house report gains.[5] Trimble Consulting works closely with other top consulting firms to build custom workflows. Trimble also taps several large channel networks that deliver field services, training and support.

[5] Deloitte, *Ecosystem pathways for connected construction*, 2021.

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CASE STUDY

ATG Uses Single Management Suite to Standardize Data Across Accounting and Operations

Advanced Technology Group (ATG), an Oregon-based architectural and mechanical union contractor, was struggling with duplicate work, getting the correct information to the field and using past data to justify decisions. By moving to Trimble Construction One and Viewpoint Analytics, ATG is confidently able to automate where possible and use real-time data to monitor project activity and performance. Best of all, leaders have access to reports, instead of relying on a single person to compile and translate business intelligence.

Read the full case study

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WORKFLOWS

Where Connected Workflows Matter

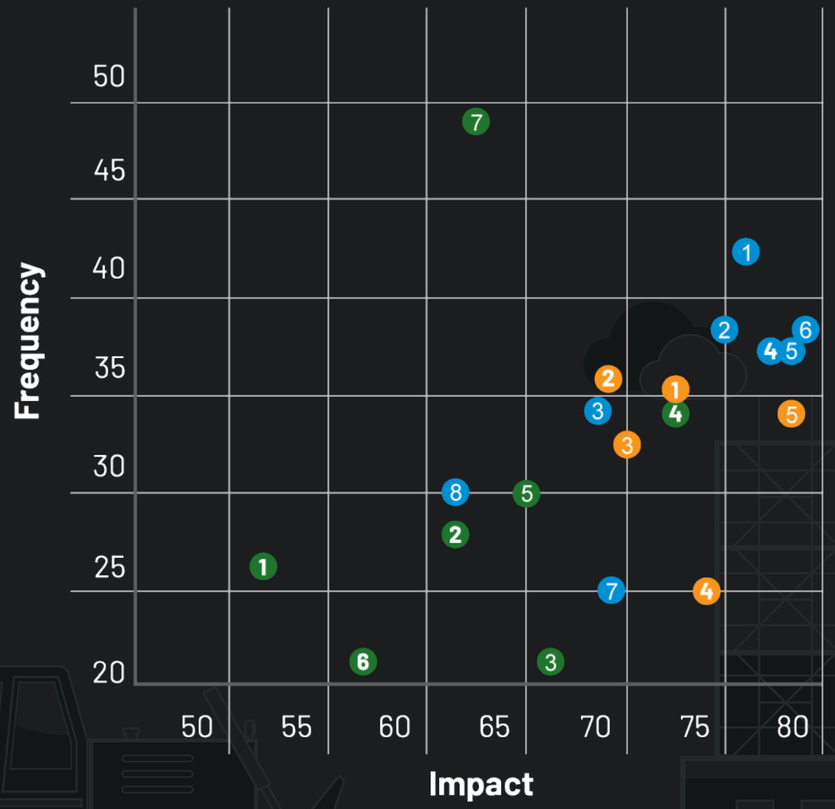
In the Dodge + Trimble study referenced previously, trade contractors using connected workflows were asked which administrative, operations and field/crew processes are most often at the root cause of errors and delays.

When plotted out, their responses reveal that most problems stem from the processes that happen frequently and have a large impact on projects and the business, including subcontract management, change management, labor management, accounts payable, project drawing management and accounts receivable.

These insights can serve as a roadmap for trade contractors who want to digitize and connect processes that will deliver deeper business value.

Frequency and Impact of Activities Identified as Root Causes for Errors/Delays

Dodge Data & Analytics, 2022



Administrative

1. Accounts Payable
2. Accounts Receivable
3. General Ledger
4. Job Cost/WIP Analysis
5. Billing
6. Payroll
7. Analytics/Reporting

Construction Operations

1. Project Document Management
2. Change Management
3. Purchase Order Management
4. Job Cost/Projections
5. Labor Management
6. Materials/Inventory Management
7. Safety Oversight Management
8. Service Management

Field/Crew Management

1. Field Ticket Management
2. Crew Time Entry
3. Work Order Management
4. Safety Process Management
5. Work Progress Entry

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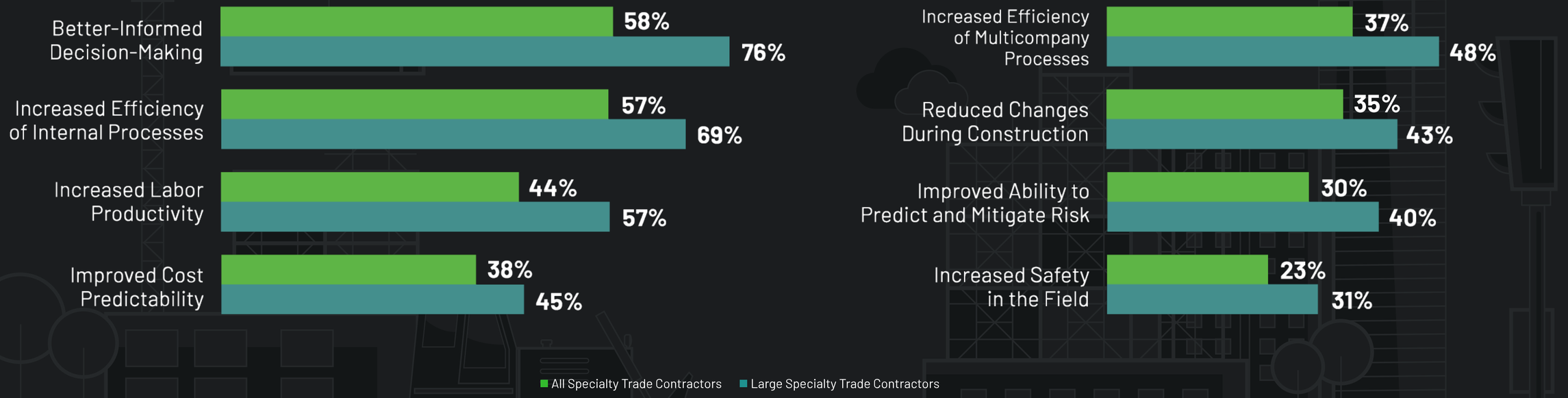
WORKFLOWS

The Benefits of Connected Digital Workflows

Benefits Frequently Experienced by Specialty Trade Contractors From the Use of Digital Workflows

Dodge Data & Analytics, 2022



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PEOPLE

How to Cultivate a Culture That Supports Change

Building a robust and modern digital framework and developing the right processes and workflows are only part of connected trade construction. A cultural shift must take place so that people understand the value of a project, how workflows and processes change, and how to use the technology to maximum advantage.

Here are seven ways to ratchet up results:

Focus on use cases and value, not the specific technology. Tie performance gains, reduced costs or labor demands, improved safety and other tangible outcomes to the technology—not the other way around.

Stay focused on your goals. It's incredibly easy to become overwhelmed by daily events and begin to stray from a strategic focus. For example, many specialty contractors simply create new divisions or groups for new technologies. But oftentimes, upskilling is far more efficient and less costly.

Be patient. Give teams and individuals time to internalize new concepts, ideas and technologies. This often means making groups aware of changes in stages so that they aren't surprised by them. Study up on the psychology of change.

Communicate. Help groups prepare mentally and gain an understanding of how the new framework will change their jobs, costs and daily routines. Focus on improvements but also possible pain points.

Motivate groups to change the way they work. Provide resources and support employees' need to navigate change. Introduce incentives for adoption, when and where they're appropriate.

Play the long game. Create a multi-year strategy that management can clearly articulate. Establish key milestones and reinforce wins through frequent communication or gamification.

Invest in training and development. The rapid pace of technological advancement makes ongoing training essential, whether it covers advancing skill sets or coping with cultural changes. Remember that 24% of specialty contractors don't fully adopt digital workflows because there is insufficient training.[6]

[6] Dodge Data & Analytics and Trimble Construction, *Connected Construction: The Specialty Contractors' Perspective*, 2022.

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CASE STUDY

Bennett Steel: Real-Time Collaboration and Connected Steel Management Leads to 10x Production Increase

The old cliché, if it isn't broke, don't fix it doesn't apply to the digital economy. After nearly 20 years using the same fabrication management solution, Bennett Steel found that a new version of the software no longer met the company's requirements. The company turned to Tekla PowerFab and Trimble Connect. This framework now allows crews to work more efficiently and profitably. For example, Bennett Steel has increased production by tenfold and trimmed four and a half days from setting up new jobs.

Read the full case study

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SYSTEMS

Connected Construction Features and Requirements Checklist

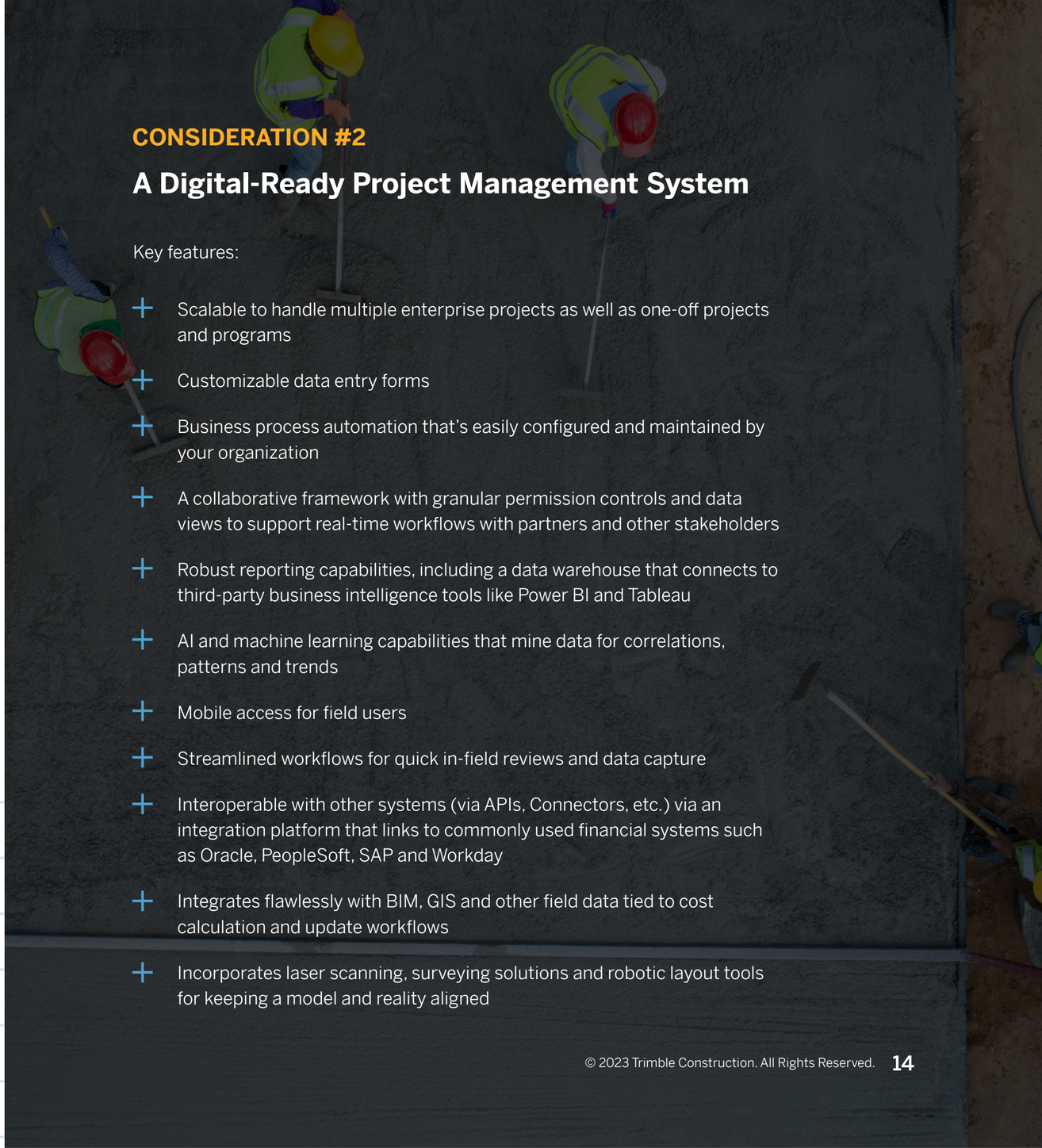
Whether you're starting from scratch or expanding your digital arsenal, the selection process is at the center of success. Here are seven key considerations for building a best practice framework:

CONSIDERATION #1

A Common Data Environment (CDE)

Key features:

- Adherence to open industry standards
- Interoperability with other systems (via APIs, connectors, etc.)
- Manages proprietary file formats while maintaining data fidelity
- Manages document-based, object-based and asset-based workflows
- Scalable to meet project data needs and data types (BIM data, GIS data, Lidar data, Survey data, high volume raw data, etc.)
- Tracks all activities with the data
- Includes a "data management layer" such as an approval workflow



CONSIDERATION #2

A Digital-Ready Project Management System

Key features:

- Scalable to handle multiple enterprise projects as well as one-off projects and programs
- Customizable data entry forms
- Business process automation that's easily configured and maintained by your organization
- A collaborative framework with granular permission controls and data views to support real-time workflows with partners and other stakeholders
- Robust reporting capabilities, including a data warehouse that connects to third-party business intelligence tools like Power BI and Tableau
- AI and machine learning capabilities that mine data for correlations, patterns and trends
- Mobile access for field users
- Streamlined workflows for quick in-field reviews and data capture
- Interoperable with other systems (via APIs, Connectors, etc.) via an integration platform that links to commonly used financial systems such as Oracle, PeopleSoft, SAP and Workday
- Integrates flawlessly with BIM, GIS and other field data tied to cost calculation and update workflows
- Incorporates laser scanning, surveying solutions and robotic layout tools for keeping a model and reality aligned

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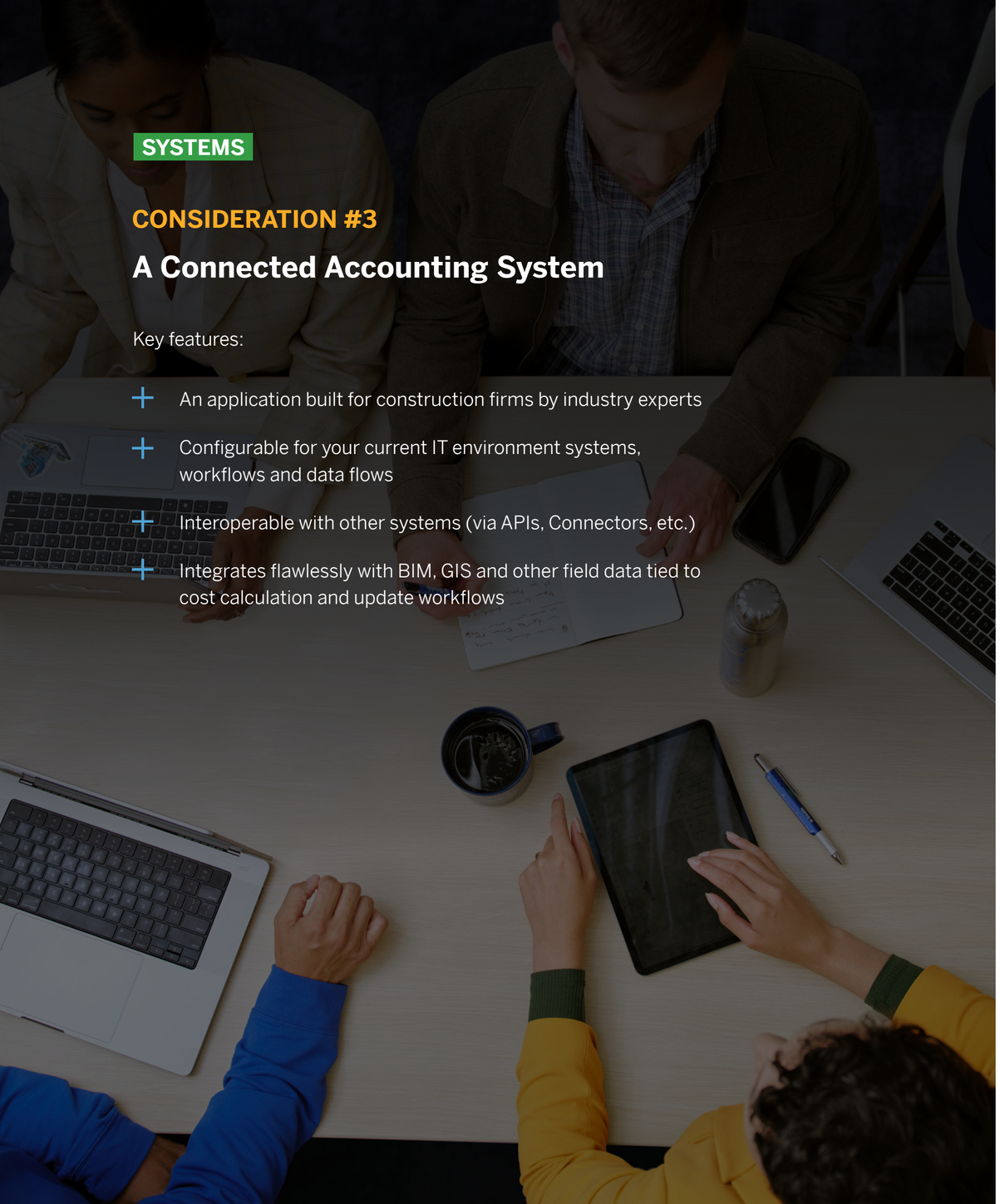

SYSTEMS

CONSIDERATION #3

A Connected Accounting System

Key features:

- An application built for construction firms by industry experts
- Configurable for your current IT environment systems, workflows and data flows
- Interoperable with other systems (via APIs, Connectors, etc.)
- Integrates flawlessly with BIM, GIS and other field data tied to cost calculation and update workflows

CONSIDERATION #4

A Highly Precise 3D Modeling and Detailing Tool

Key features:

- Adherence to open industry standards
- Interoperability with other detailing, analysis, barcoding, scanning, MIS and CNC machine systems (via APIs, connectors, etc.)

CONSIDERATION #5

A Powerful Estimating Solution

Key features:

- An application built for construction by industry experts
- Accelerates or improves your existing estimating workflow
- Configurable for your current IT environment systems, workflows and data flows
- Interoperable with other systems (via APIs, Connectors, etc.)
- Integrates flawlessly with BIM and other field data tied to asset changes and updates
- Automates manual steps across workflows

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SYSTEMS

CONSIDERATION #6

A Streamlined Fabrication Management System

Key features:

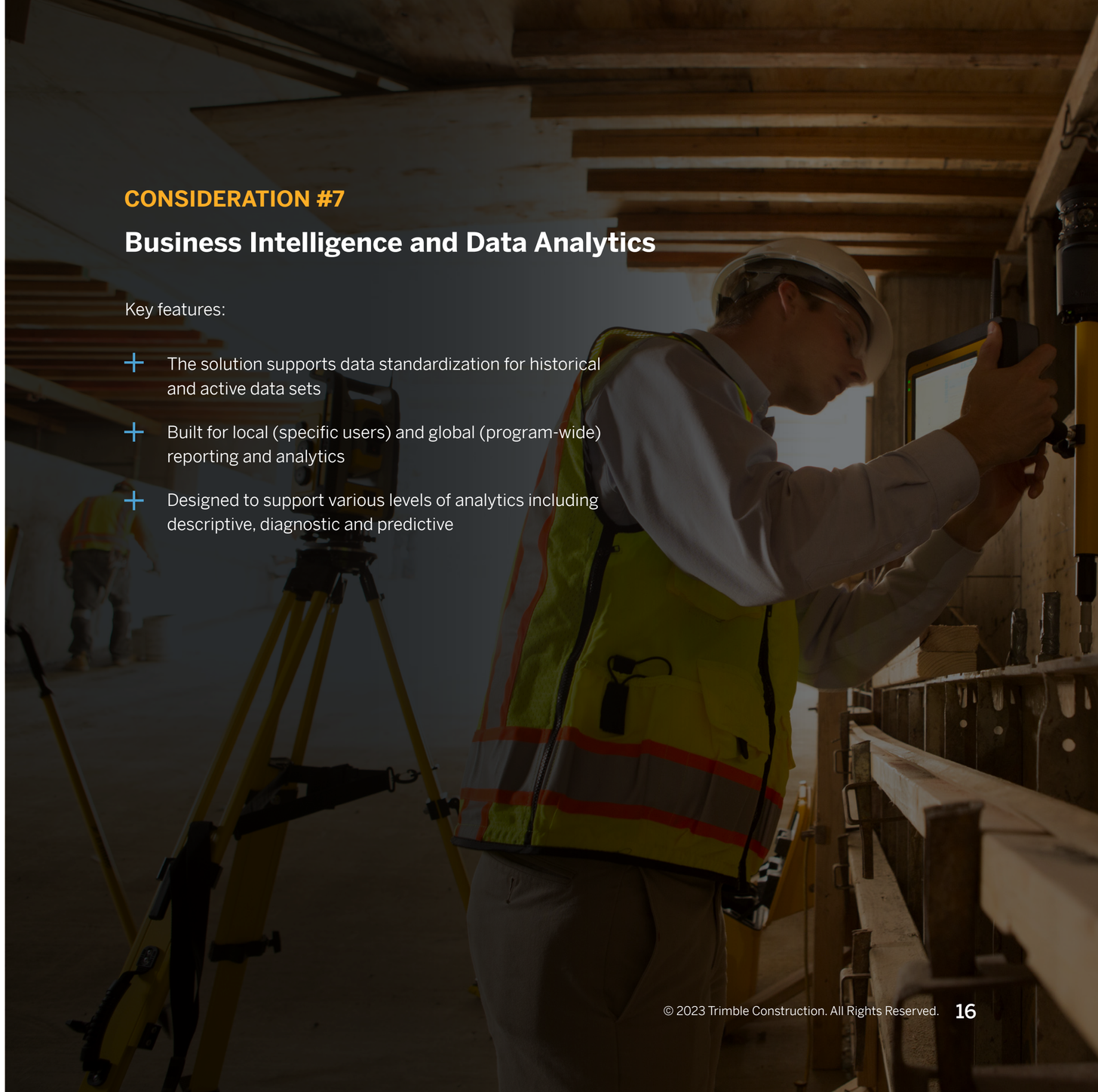
- Import and understand all materials needed to produce a project
- Accurately nest and generate purchase orders
- Route and track production through the fab shop
- Access project data via tablets on the shop floor

CONSIDERATION #7

Business Intelligence and Data Analytics

Key features:

- The solution supports data standardization for historical and active data sets
- Built for local (specific users) and global (program-wide) reporting and analytics
- Designed to support various levels of analytics including descriptive, diagnostic and predictive



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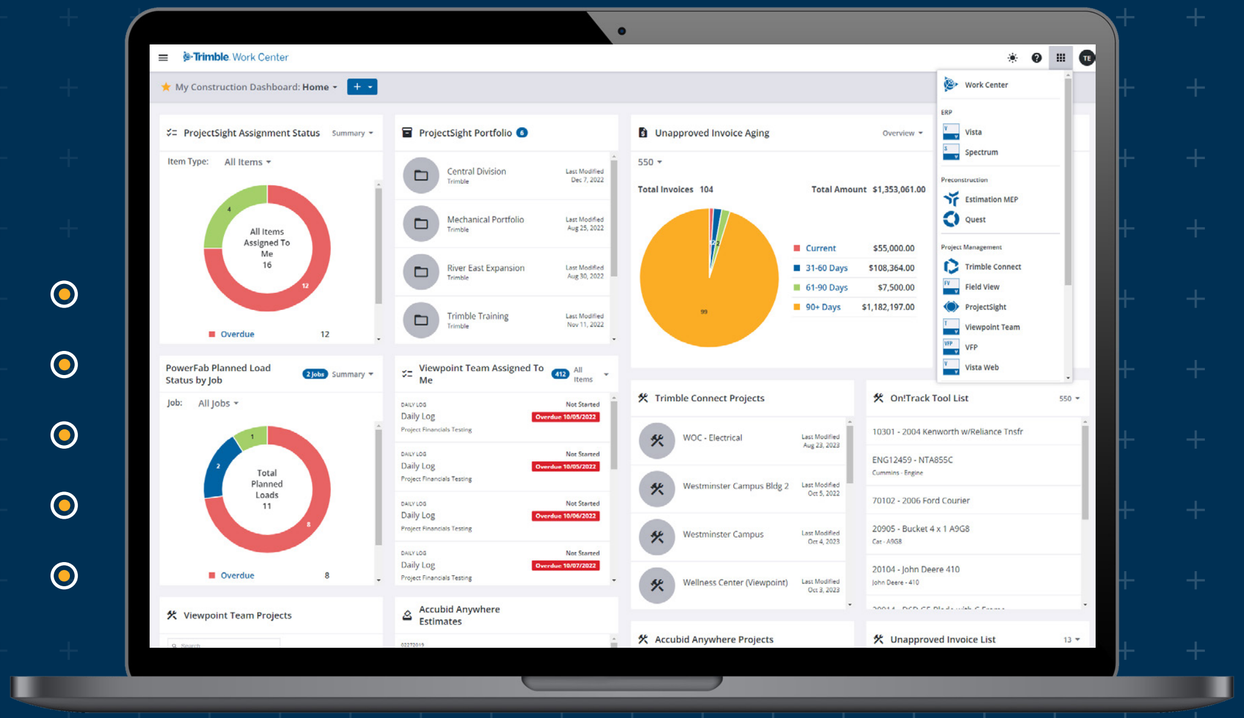
Connections Equal Opportunity

Getting the right information to the right people at the right time isn't always easy. But the payoffs of better decision-making, efficiency and risk reduction are worth it. And a business-as-usual approach to your goals, data, workflows, people and systems just isn't going to get you there.

Technology that connects workflows doesn't have to be complicated. Trimble Construction One is a custom suite of interconnected tools built specifically around your needs and workflows. Give your firm a way to successfully leverage digitization while simplifying your tech stack.

Learn how



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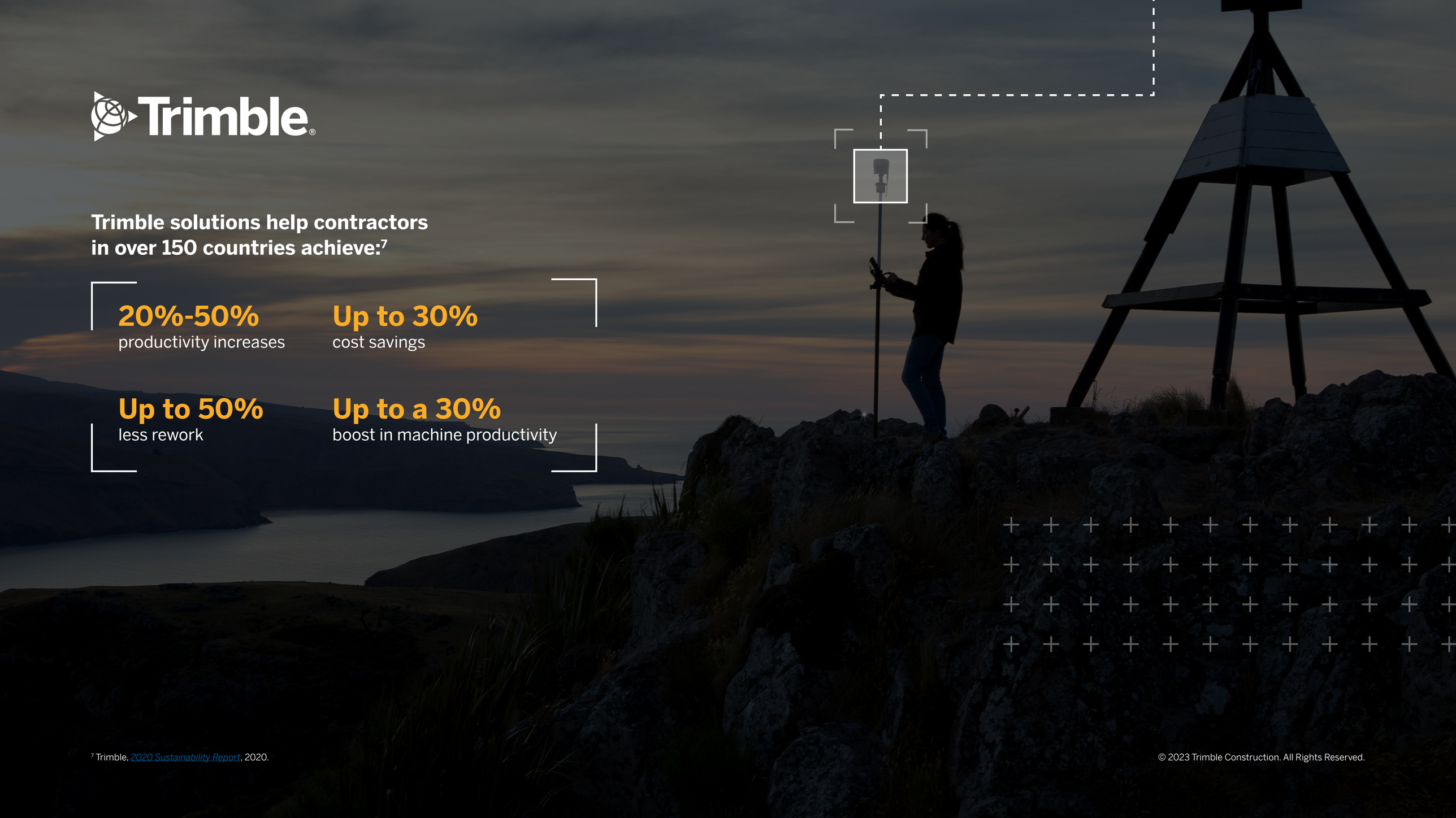

Trimble solutions help contractors in over 150 countries achieve:[7]

20%-50%
productivity increases

Up to 30%
cost savings

Up to 50%
less rework

Up to a 30%
boost in machine productivity

[7] Trimble, *2020 Sustainability Report*, 2020.

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