THE ESSENTIAL GUIDE TO
MOBILE TECHNOLOGY
FOR HEAVY CIVIL CONSTRUCTION

3 Reasons Why Mobile Offers the Perfect
Platform for Field Operations

Why 3 Out of 4 Heavy Contractors are
Already Investing in Mobile

Mobile Technology: Driving the Need to Change Heavy Civil Construction

Heavy Civil Infrastructure projects are getting larger and more complex, and as a result, over 50% of projects fail to meet budget and schedule. This increasing complexity is driven by many factors including...

- *No two projects are the same.* Each project has its own unique set of existing circumstances. Also, conditions on the job are always in flux, and someone needs to manage these changes. Often the key is delivering a project without disrupting the surrounding environment (underground utilities, roads, structures, etc.)

- *Increasing expectations.* Owners and the public are increasingly expecting more work to get done for less, while maintaining safety, quality and project transparency. Recent infrastructure failures, such as the 2007 I35W bridge collapse in MN and the ASCE's D+ grade for America's overall infrastructure, have brought these issues to the forefront. Additionally, owners are driving programs like the FWHAs e-Construction Initiative which is, focused on digitizing construction processes and eliminating paper on the jobsite.

- *Large spatial regions.* Horizontal projects that span large geographic areas drive complex logistics that need to be managed. Imagine coordinating resources over a 10 mile highway project: it requires multiple crews and sets of equipment spread out over several miles. You have to manage the storage and movement of materials as efficiently as possible, all while minimizing the impact the project has on existing traffic.

- *Increasing size and scope of projects.* As we defer asset maintenance and infrastructure demand rises, so does the size and difficulty of infrastructure projects.

Slow adoption of new technology and automated processes continues to be the status quo for heavy construction. In fact, according to a recent McKenzie Report, it is one of the last industries to digitize its workflows (only ahead of agriculture and hunting). This results in flat productivity while other industries are experiencing productivity gains of nearly 2X.
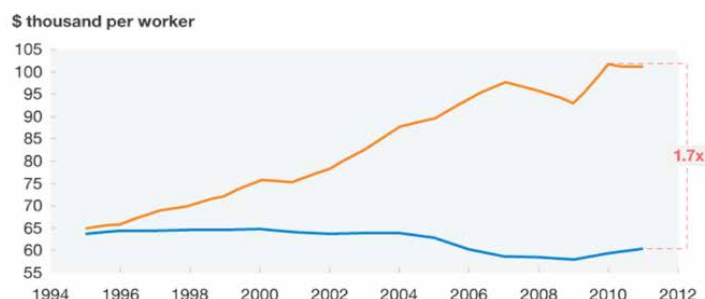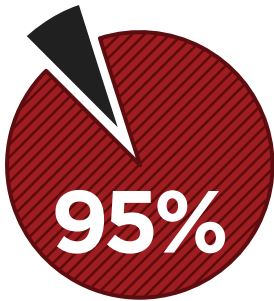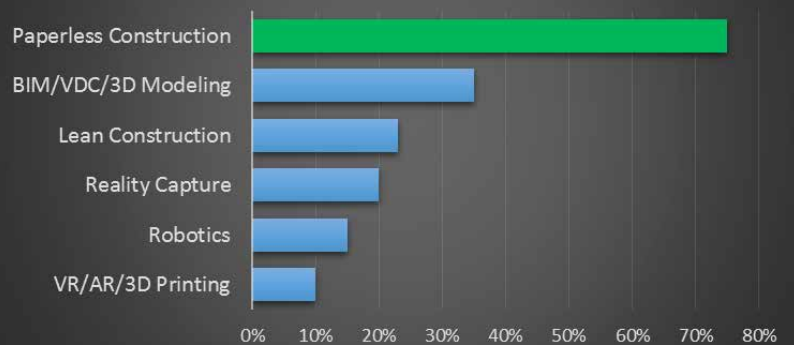
75%

are investing
in mobile

95%

believe mobile is
critical to business

Technology to the Rescue – Mobile is the New Platform

The industry needs to transform the way it works. While technology has made its way into the office to automate workflows like accounting, estimating and planning, its biggest impact could be in the field, where most operations still rely on paper and spreadsheets. The rise of mobile introduces a new technology platform that perfectly aligns to the needs of construction field operations. It is poised to transform how field operations are performed to drive greater efficiencies and successful project outcomes. The evidence is building to support these claims...

- *There are now more mobile devices than people.* Most field employees are familiar with mobile devices and apps through use in their daily lives. They are no longer afraid of technology, and have developed expectations around technology experiences that translate to their work life.

- *Increasing smart phone and tablet capabilities.* GPS location, sensors and cloud access make mobile devices more powerful than ever.

- *People spend more time on mobile devices than PCs.* This not only represents a change in platform, but also consumer behavior.

- *Beyond the smart phone and tablet.* Tying mobile applications to other machines including drones, equipment telematics and machine automation increases the value of the platform.

- 95% of heavy civil contractors say mobile is critical to their business. 75% say they are investing in mobile technology. Heavy contractors are more aware of the necessity for mobile than ever before. Stay competitive – don't get left behind!

What Technology Investments Are You Making?

Paperless Construction	
BIM/VDC/3D Modeling	
Lean Construction	
Reality Capture	
Robotics	
VR/AR/3D Printing	

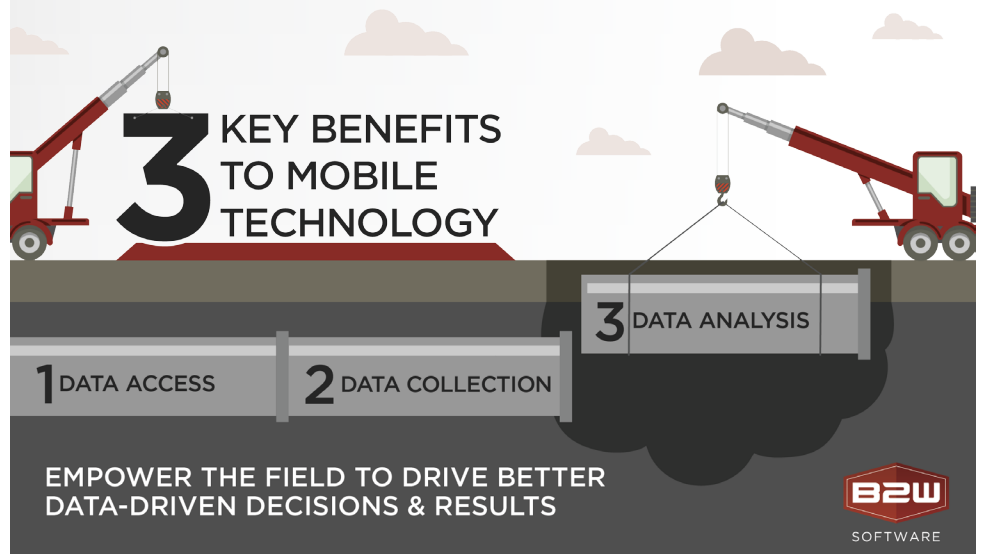0% 10% 20% 30% 40% 50% 60% 70% 80%

The Value Proposition for Mobile in Heavy Construction

Heavy civil construction projects need to carefully manage logistics to ensure success. As previously mentioned, these projects' complexities are driven by large amounts of resources over huge geographic regions. Three key resources need to be optimized in order to drive efficiencies and overall project success:

- People
- Equipment
- Materials

The new mobile platform is well aligned to address the field operations requirements associated with optimizing people, equipment and materials. The following framework demonstrates the advantages of web and mobile technologies on heavy civil projects.

3 KEY BENEFITS TO MOBILE TECHNOLOGY

1 DATA ACCESS   2 DATA COLLECTION   3 DATA ANALYSIS

EMPOWER THE FIELD TO DRIVE BETTER DATA-DRIVEN DECISIONS & RESULTS

B2W SOFTWARE

1. Data access means putting the right data in the hands of the right people at the right time so they can be empowered to deliver the best results. Some of the problems we see with current field processes include lack of access to data in disparate systems, time lag associated with finding information and lack of collaboration between the field, office and shop. These problems are compounded when the information is not structured or is captured in a paper format. Leveraging the right mobile solution unifies data in a single source of truth that is purpose-built for the specific user and addresses these problems...

- Automating data access by taking advantage of GPS enabled mobile devices in order to deliver the information to the right people based on their location.

- Enabling real-time access and collaboration with mobile connectivity to the cloud unites the office, field and shop.

"Real-time information is the future. If you are not capturing and accessing real-time information, then you are behind, and we want to stay ahead"

David Lebreton, *Barriere*

2. Data collection in the field is key to ensuring that managers have the information needed to make the right decisions to ensure projects adhere to budget and schedule, all while minimizing risk due to safety and quality requirements. Today this data is often collected with paper processes that result in data that is unstructured, error-prone and untimely. Additionally, the time it takes to collect this information distracts employees from their primary responsibility – getting work done. Moving to mobile technology based processes has the following benefits...

KEY MOBILE CAPABILITIES

- Data Access
- Data Collection
- Data Analysis

- *Real-time.* When the field is equipped with the right mobile software they are able to rapidly capture data that can be accessed by all stakeholders shortly after submission. Mobile solutions are easy to use and very portable, so whenever an issue arises, data is captured with a formal process that effectively turns your field staff into a crowd-sourced big data provider. Gone are the days when a foreman sees an issue, makes a note on scrap paper because the proper form is back in the truck, and puts the note in his pocket, where it will eventually make its way back to an admin in the office for data entry (if it can be deciphered).

- *Structured.* Mobile solutions present the user with a digital form that organizes the way information is collected. The base expectation is a digitized paper form, but because the information is collected digitally, mobile solutions can drive data entry consistency and accuracy. Reports and forms can automatically be augmented with metadata including location, project, time of day, user, process, etc. Field data becomes smart and gets linked directly to a structured database for easy retrieval and analysis. This expands beyond the written note, sketch or photo – it can include digital notation, structured lists, linked media, electronic signatures, sensor feed data, etc.

"We receive more accurate and timely information to adjust our operations. The real-time data provides us the ability to adjust work items anytime and have the field personnel review and react to situations before it's too late,"

Turner state, Dave Turner,
C.A. Hull (2015)

FIELD DATA CAPTURE

- Realtime
- Structured
- Automated

- *Automated.* Most data collection activities are repetitive, so a mobile technology approach can save significant time through automation. This includes...

  - *Starting with a previously completed form.* For example, most daily logs include redundant information. A mobile solution allows users to access an archive of daily logs so that they can duplicate the previous day's inputs and only adjust items that have changed.

  - *Leveraging pre-populated fields.* Pre-populated dropdown lists are either generated as an administrative function (in which case they need to be manually updated) or are directly connected to another data source such as an operational database or financial ERP system (in which they are always up to date). This is advantageous for quick data selection and alignment with backend office systems.

  - *Device sensor or cloud connected inputs.* Other real-time populated fields can come from connected devices or cloud-based feeds, including GPS location, site conditions, time/date and telematics feeds.

3. Data analysis is key to leveraging all of the information from the field in a way that will help drive better decisions around project operations and offer greater insight into the performance of the project portfolio. Moving this data to a single, digital source of truth enables better project reporting and business intelligence that helps managers quickly analyze project performance and make empowered, data-based decisions.

- Reports. Reports can be generated quickly in any form or template using software applications that leverage field data.

- Dashboards. Web and mobile dashboard views of project performance are powerful tools for managing field operations. They provide the office and field with the same views so they can get aligned on daily project performance. This allows teams to uncover trends and minimize reaction time when issues arise. Real-time dashboards can also motivate the field team as they track performance against the planned progress.

- Business Analysis. The sheer quantity of data being collected is both a problem and an opportunity. Leveraging an analysis tool allows managers to pull insight from the historical or project data so that they can make better decisions to ensure better project outcomes. This analysis can impact ongoing project execution, but also has significant relevance when planning new projects. For example, cost management is a field-centric activity, but often the learning curve of a project is not captured

back in the office by those who bid and plan future jobs. Capturing quality progress and production rate information in the field for analysis means better estimates, budgets and schedules created at the project start, resulting in better planning and execution.

Business Problems and Solutions

We have discussed three key reasons why heavy contractors are (and should be) deploying mobile technology for field operations. Let's take a step back and look at the specific business problems that contractors face and the impact that the mobile value proposition has on them.

The current business issues that frequently come up include...

- *Missed deadlines and budget.* Various obstacles contribute to projects missing time or budget, but lack of productivity and inefficient processes are heavy hitters.

- *Limited access to data needed.* Without the right information readily available, making the best decision on the job becomes difficult and can lead to errors or omissions during execution. If field staff are not empowered with the right data, they are unable to optimize their crews, which occupies them with busy work instead of revenue-generating work.

- *Inefficient paper processes.* Paper processes have been around since the dawn of civilization, but just because the pyramids were built this way does not mean it is the most effective way to work in today's environment. Paper is slow, static, prone to error, not easy to retrieve and unstructured.

- *Low quality data with time lags.* If information is not captured digitally, it becomes subject to errors at every step of communication, storage and retrieval. For example, when a field employee captures an issue in the field on paper, he carries it with him until he delivers it to an admin. The admin is responsible for transcribing the note to digital or files it away in a paper folder, from which it is eventually retrieved.

- *Poor coordination.* Issues arise when stakeholders are not aligned, specifically when there is poor communication across the field, office and shop.

- *Idle resources.* If the field is not empowered with the data they need, the result could be idle resources with no value-add. An extreme example is one in which a project manager requested a piece of equipment be moved from one project to another. Unfortunately, the process used to communicate, plan and execute this move was manual, resulting in a water truck
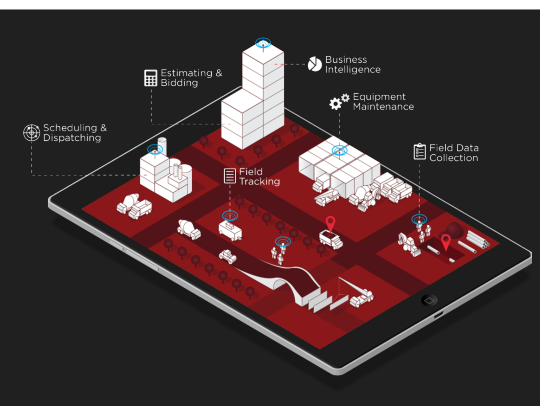
"We were getting data from the field two weeks and sometimes four weeks after the fact, and it's too late to make project management decisions by then."

Benson Thoudsanikone,
Kitsaki Projects

MOBILE SOFTWARE
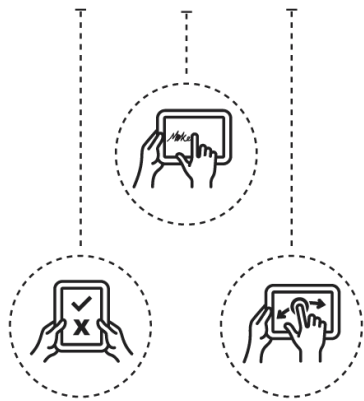
Replacing paper and legacy processes

being moved instead of the dozer that was needed. The dozer of interest sat idle for 9 months (becoming overgrown with vegetation) until it was eventually discovered.

As mobile technology is deployed in the field we see a much different set of outcomes...

- *Projects that make money.* They are run more efficiently with optimal resource utilization, resulting in projects that are delivered on budget and on time.

- *Anywhere, anytime data access.* People that need to access information have it available to them in real-time from their mobile devices. With today's tablets and smart phones, anytime, anywhere data access is the expectation. Mobile apps are deployed for this purpose in regard to construction operations.

- *Automated workflows.* Construction applications are purpose-built to solve specific workflows for specific personas, including daily logs, safety and quality inspections.

- *Real-time, high quality data.* Data is collected in a consistent and structured manner.

- *Coordination between the field, shop and office.* Thanks to mobile applications and web connectivity, all stakeholders have access to the same information, resulting in better alignment and collaboration.

- *Optimized resource utilization.* Knowing the status and location of all resources in real-time allows you to deploy them to the most critical revenue-generating tasks.

Contractors are achieving these results by deploying mobile technology to digitize specific workflows. The following are field operations workflows that lend themselves well to mobile...
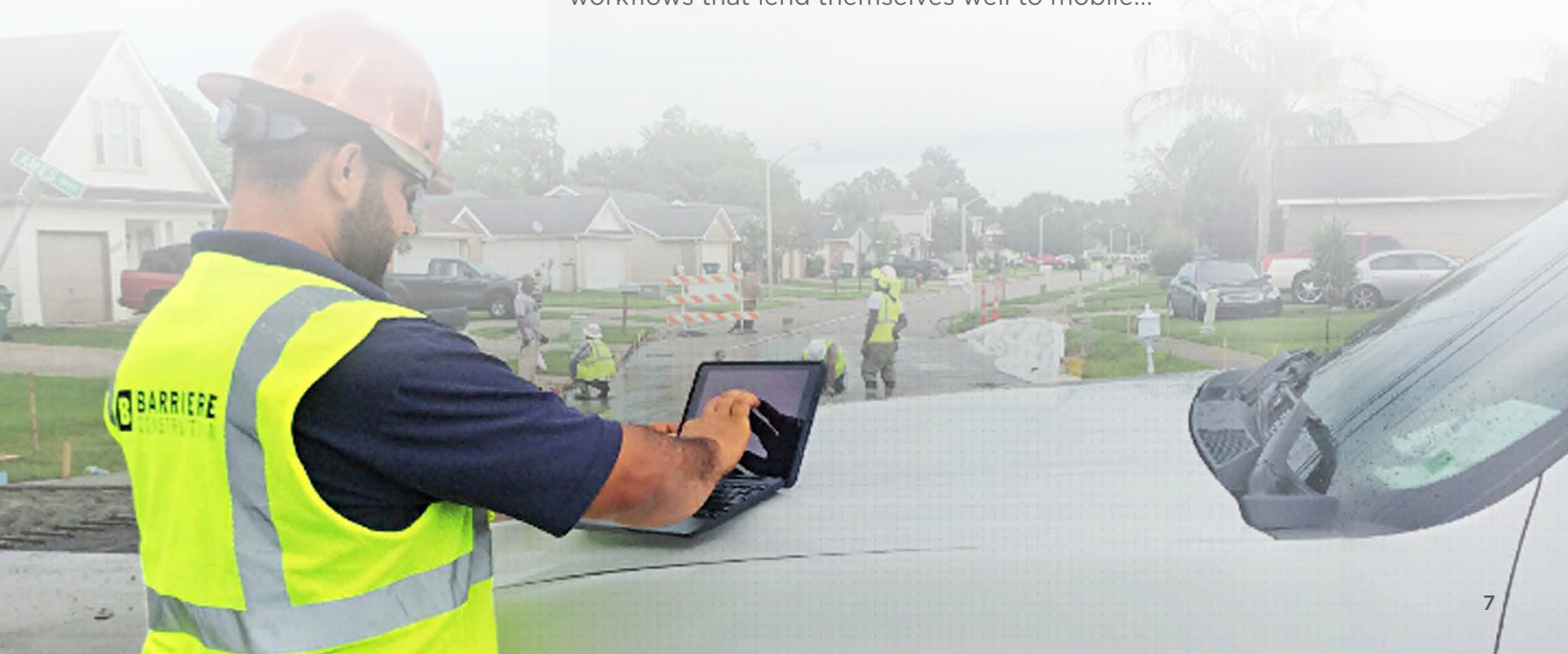
Field Progress Tracking & Daily Logs

Courtesy of M.A. Mortenson Construction
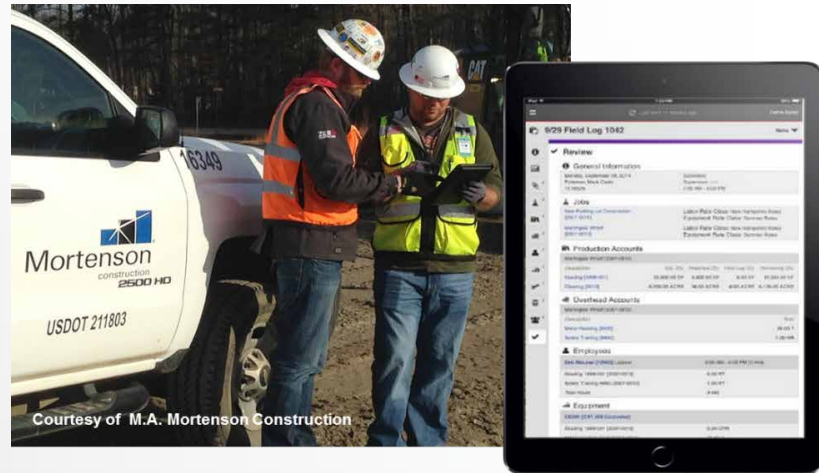
Field progress tracking is crucial to understanding whether your jobs are making or losing money. The data captured during this process includes daily logs, time sheets, work completed, issues discovered and more. The right mobile solution is key to field-centric cost management because it provides all stake holders with visibility into project performance and helps the field drive project efficiency and control. Key capabilities of a mobile field tracking solutions include the following...

- Easy, immediate capture and communication of field progress, including productivity, labor, materials and equipment data

- Central system to structure enterprise data and standardize processes for data capture

- Customizable electronic field logs

- Tablet functionality for job reports, timecards, electronic sign-off and dashboards

- Unified with estimating, equipment maintenance & scheduling solutions

The following outlines the specific value added to each function that one contractor is realizing...

- Administration/Payroll - No translation and re-entry from paper timecards to accounting system

- Project Managers - Real-time, up-to-date information for financial projections

- Superintendents - Daily job cost reports for better decision making

- Engineers – No longer have to maintain a library of paper and spreadsheet files

- Foremen - Less time filling out paper time cards and reports, more time supervising work

Safety and Quality Inspections

Courtesy of Barriere Construction
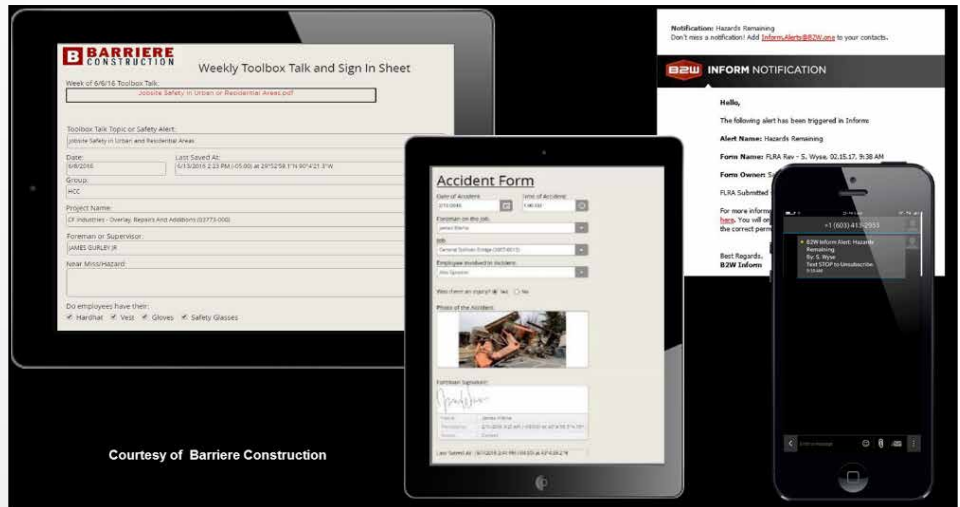
Safety and quality control happens in the field. Mobile solutions can…

- Deliver safety and quality information to the field more reliably
- Improve safety and quality inspection processes
- Automate issues around data capture and response

The net impact of mobile solutions for these workflows include…

- Reduced risk associated with safety and issues
- Reduced costs associated with quality rework or safety down time
- Greater field staff efficiencies (i.e. data capture)
- Increased project outcomes (time, money, quality) due to decisions based on accurate and timely data

Key capabilities of mobile solutions include

- Easy to use mobile user interface
- Configurable field forms
- Reporting and dashboards
- Connection to other operation systems
- Alerts and notifications

"There was a little expected resistance among some employees comfortable with existing systems. That disappeared almost immediately, as they saw how easy the software was to use and how it made it much easier for them to be even more productive."

Gerhard Ens,
Steed and Evans Limited

EQUIPMENT MANAGEMENT

Equipment Maintenance and Tracking

Courtesy of Trotter & Morton Construction

Empower the equipment shop and field technicians to better manage asset repairs, preventive maintenance and fleet scheduling in order to...

- Drive shop efficiencies and reduce maintenance costs
- Track assets in real-time
- Maximize fleet uptime, utilization and productivity

Key solution features to look for include...

- Work order planning and scheduling
- User-defined preventive maintenance plans
- Warranty tracking
- Equipment repair request portal
- Equipment inspections
- Parts and inventory management
- Telematics integration
- Scheduling and dispatching

If done correctly, foremen, equipment schedulers, shop managers and field technicians have access to the same information around equipment status and become empowered with purpose-built field solutions. The image above is an example of the benefits one contractor has experienced after introducing web and mobile solutions to his field and shop.

Project and Document Controls
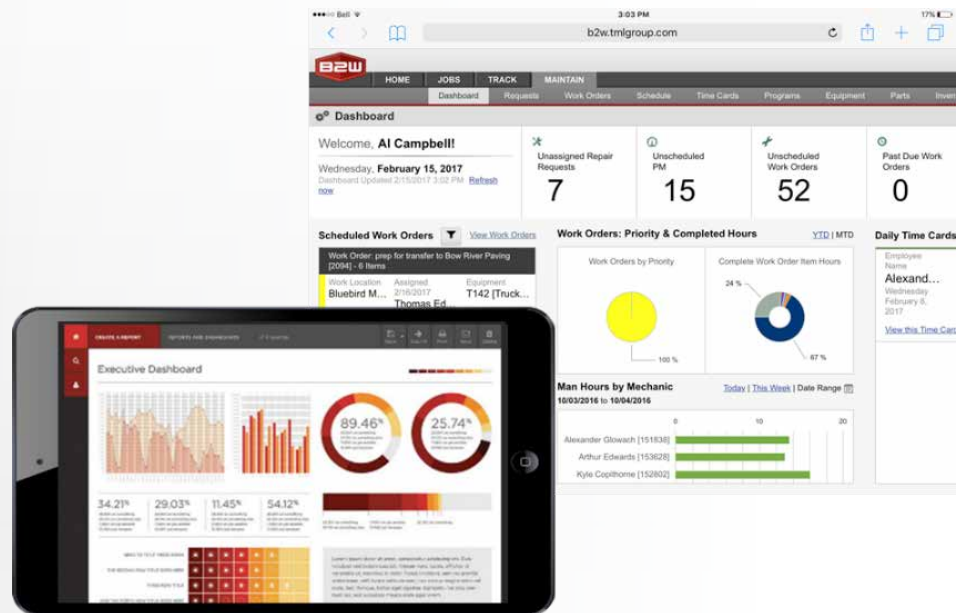
Delivering the right information between the field and office guarantees project success. This data can include safety and inspection programs, warranty information, specifications, plan sets, estimates/bids/budgets, performance dashboards and project controls documentation (contracts, submittals, RFIs, COs and WOs). Mobile technology can deliver this information to the field whenever it is needed, resulting in better project outcomes (increased profits and efficiencies, reduced risk and higher quality).

Implementation Best Practices

Some of the resistance to mobile technology adoption include…

- *Generation gap.* There is clearly a divide between the younger and older generations when it comes to technology adoption, with veteran field employees often more resistant to the change. The key is to present tools with user-friendly mobile experiences – if employees see the value new technology brings to their existing roles, they are less likely to return to outdated processes.

- Technology acceptance in the field. This issue is well-aligned with the generation gap, as many field employees use processes from years and years ago, citing the logic, "If it isn't broken, then don't fix it."

"Cultural resistance to change, and the attitude, 'If it isn't broken don't fix it' are barriers to adoption."

**Eric Sellman,
M.A. Mortenson Co.**

BEST PRACTICES FOR ROLL-OUT & PROJECT PILOTS

MULTI-DEPART. TEAM

- Accounting & Payroll
- IT
- Field Ops
- Estimating

ESTABLISH SUPER USER

- Champion of the pilot project

PHASED ROLL-OUT

- Start with 1 foreman and crew on 1 project
- Expand to entire project
- Add multiple projects

- IT deployment challenges. Setting up backend software solutions, moving legacy data, connecting to legacy systems, acquiring mobile devices and training field staff are barriers that may seem impossible to overcome. However, the best mobile solutions will mitigate these obstacles by providing implementation and training services, out of the box back-end system integrations, intuitive user interfaces and options for low deployment SaaS/Cloud based solutions.

- Connectivity at the jobsite. This issue often arises at heavy civil projects that are either remote or underground. Strong mobile solutions will have the ability to work offline, in addition to when connected.

- Lack of strategy. It is critical to have full support from the management team to overcome all aforementioned adoption obstacles. There have been instances when progressive project leaders have deployed technology to the field with great results and the rest of the organization followed suit, but that ground up approach is not strategic and accompanied by many risks.

The best approaches to overcoming these obstacles include...

- Team approach. Ensure that the field staff understands that they are part of the process improvements and that their feedback will be leveraged. A successful adoption may require you to set up pilot projects with a manageable scope that will illuminate early success, identify unforeseen issues and demonstrate best practices before rolling out a solution more broadly to the organization. It may also be useful to generate some friendly competition between teams (especially among the superintendents). Construction is a competitive industry, so leverage that!

- Grow IT to support new solutions. To address IT deployment concerns, ensure that the best solutions are selected and current resources are supplemented with dedicated IT champions and trainers who will have a significant impact on success.

- Get support from management. Dedication and commitment to the technology strategy from the management team is critical. One approach is to select an executive sponsor for a project to ensure this commitment and support.

- Vision, strategic plan and budget. Communicate a clear strategy and budget that is aligned to management's support.

- Measure and report on compliance. Many technology deployments have been well conceived and rolled out to the field only to lose momentum. Mobile devices and software and distributed and trained on, only to be abandoned a month later. Leverage reporting and data analysis capabilities of new tools in order to monitor progress and keep this from happening.

Heavy contractors face many challenges in order to meet current infrastructure demands and drive profitable projects. To overcome these challenges, the industry needs to transform the way it works by leveraging technology to digitize and automate processes. The rise of mobile solutions introduces a new platform that is positioned to transform how field operations are performed, driving greater efficiencies and successful project outcomes.

Stay ahead of the competition and don't get left behind. Learn how B2W Software provides purpose-built web and mobile solutions for heavy civil contractors to realize all of the advantages outlined in this paper.

Quotes throughout this guide are from B2W Software clients utilizing B2W Software for heavy civil construction.