infotech

WHITE PAPER

A Phased Approach to Building Digital Infrastructure: Bidding, Inspection, and GIS

Introduction

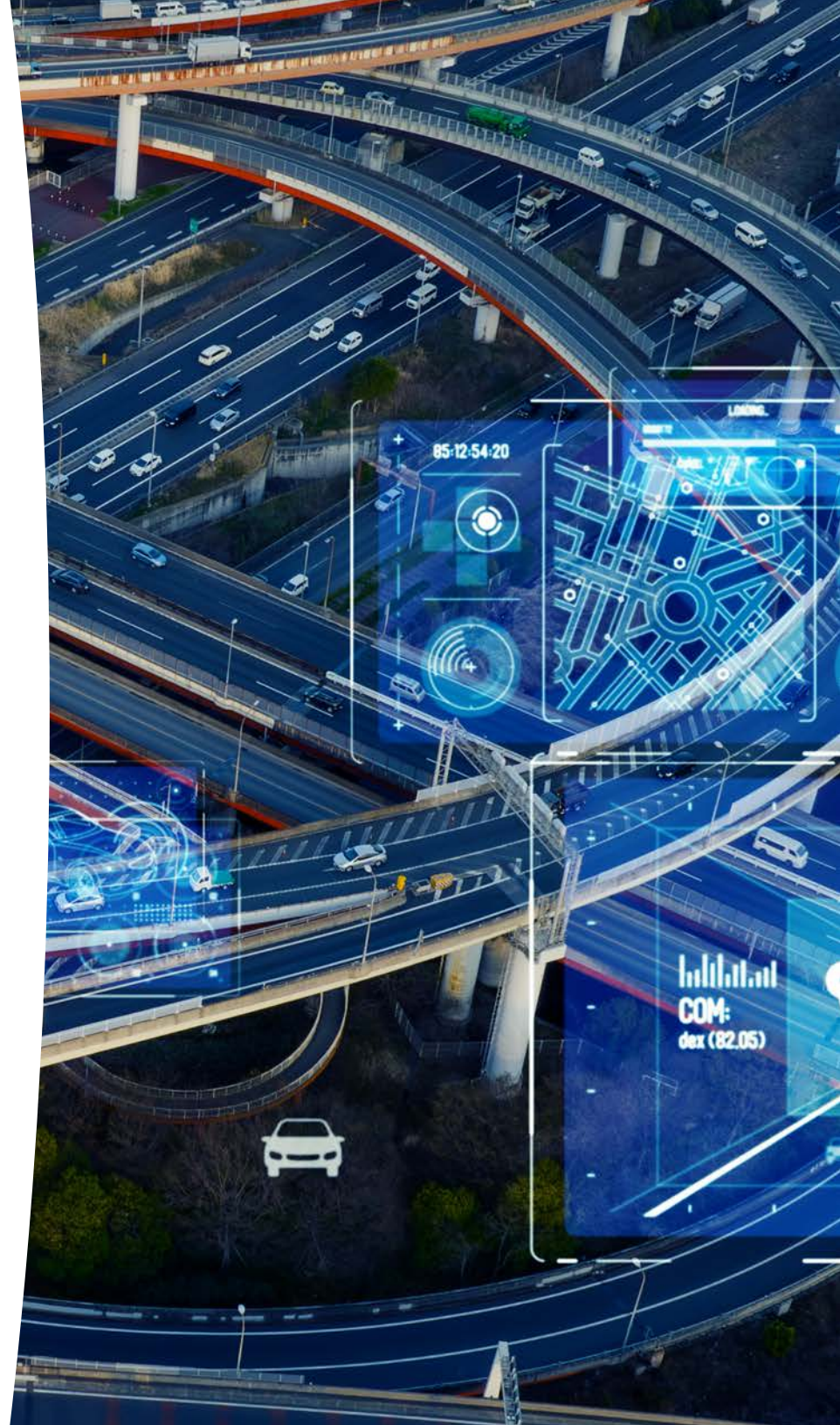## How are you building your digital infrastructure?

Technology is available for construction projects to be entirely supported by digital solutions that capture and communicate project data throughout various project phases and departments.

It's now on owners to raise the bar and change their specifications to require better data and reporting on their projects. How are you building out your digital infrastructure? Is your first step the right step?

In this e-book, we'll outline a phased approach to building digital infrastructure, beginning with the bidding process and ending with software tools that lay the foundation for asset lifecycle management. By the end, you'll get a clear picture of benefits, best practices, and relevant statistics for the technologies that can spark digital transformation for your organization.

Start at the beginning, or jump to the section that's most relevant to your goals:

e-Bidding

Implementing e-Bidding in the Preconstruction Phase

The first step to building digital infrastructure is straightforward: ensure the data starts in a digital format. The easiest way to do this is to not only use an e-bidding platform to collect bid submissions, but to mandate it. Prior to the COVID-19 pandemic, these sort of mandates existed, but were rare. When the U.S. government instituted new federal requirements around social distancing, many organizations had no choice but to adopt and even mandate the use of an electronic bidding platform. Soon, more organizations than ever before were experiencing the benefits of electronic bid submission.

Primary e-Bidding Benefits

An e-bidding platform enables organizations to collect all the necessary information that would be typically included in a physical bid packet through an online, secure digital submission. This process comes with several benefits for agencies and vendors alike.

First and foremost, vendors no longer need to deal with traffic, inclement weather, or the postal service when submitting their bid. They can make adjustments up until the last minute and still feel confident that their bid will arrive on time, which typically results in a higher quality bid for the agency. In a similar vein, most e-bidding platforms will come with automatic error-checking and omission alert functionality, vastly decreasing the number of non-responsive bids an agency receives. The ability to template bids of a similar format also improves the efficiency of the overall bid preparation process.

There are other benefits - saving paper, better communication with vendors, etc. - but these are the primary reasons an organization makes the switch to an online bidding process. Still, they don't capture the full potential of e-bidding when it comes to starting the journey of digital transformation.

e-Bidding

Standardization & Analysis

Let's back up a bit to the core focus of this e-book: building out a digital infrastructure that both supports and reflects physical infrastructure projects. How does e-bidding contribute to this goal? As we mentioned in the introduction to this section, e-bidding ensures project data starts in a digital format. How? Through the wonderful world of integrations, Industry Foundation Classes (IFC), and open data standards.

Many of the benefits of e-bidding are on the front side of the process; accepting digital submissions. But when it comes to building out digital infrastructure, the most relevant functionality happens after the bid is awarded. Once the bid is awarded, most e-bidding platforms will enable you to instantly export the bid tabs for analysis, making it easy to examine whether the bid is balanced or not (unbalanced bids attempt to take advantage of a government estimate by manipulating item pricing). From there, depending on whether the data is structured in an IFC format or the platform is directly integrated, agencies can import a bid into their preferred construction project management system. From there, items, quantities, and all relevant information can be tracked, with no data lost between the bid award and the project set-up.

This process is great when it's just one organization requiring it, as it ensures the project data begins in a digital format and continues in that uncompromised format throughout the next phase of the project. But, can you imagine the potential for improving efficiency and collaboration if an entire state were to require this process? The Ohio Department of Transportation (ODOT) did exactly that when they made the decision to mandate e-bidding for their Local Public Agency (LPA) program.
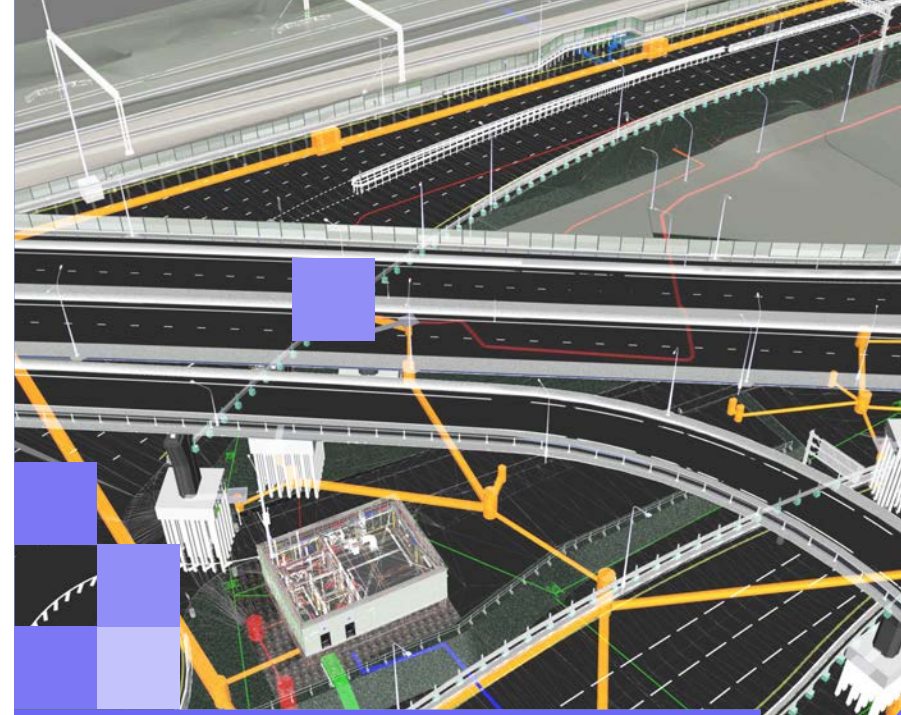
Wait, what's IFC again?

IFC is an open data standard that was created to define all the data related to buildings and infrastructure, including construction processes, product information, 3D shapes, etc. It's essentially a way of structuring data so two disparate systems can talk to each other. Remember in the early days of cell phones, when you could only text someone if they also had Verizon? That was before service and hardware providers worked together to institute open data standards. With IFC, the construction industry is trying to accomplish the same thing.

e-Bidding

Rolling out Mandated e-Bidding for LPAs

In order to meet federal reporting requirements when bidding with locals and create a centralized bidding database, ODOT set out to spread e-bidding across the state of Ohio. By rolling out online bidding for their LPAs, they were able to standardize the bid forms that are used across the state, so all project data is in the same digital format.

"From our department's perspective, it gives us data we don't currently have. There are a lot of things we can build on by having that information digitally," said Tina Collins, IT Consultant. Having that data digitally makes it easy to transfer information for their bidding platform into AASHTOWare Project Construction & Materials™ when it comes time for the construction phase of the project.

e-Bidding Fast Facts

e-Bidding usage grew by 7% from 2020 to 2023, with 29% of civil engineers expecting to expand their use in the future

e-Bidding softwares increases the quantity of bid submissions by an average of 55%

e-Bidding software can reduce bid preparation time by up to 90%

THE CONTRACTOR ANGLE

How do contractors respond to a sudden shift in process? Most love it, and some even ask for it! This quote sums up the many reasons why contractors are clamoring for an e-bidding solution:

"Online bidding has increased the efficiency of bidding for contractors. It standardizes the procurement process which assists in the minimization of the risk of errors. It also minimizes the amount of paperwork required with bids which saves costs for paperwork, postage, and photocopying."

MICHAEL D. KILLILEA II, P.E.
THE RIGHTER CO., INC.

Digital Inspection

Requiring a Modernized Inspection Process

The theme of collecting data in a digital format continues into the project management phase of construction. Now that you've imported the data from the winning bid into a project management system, you can begin collecting the as-built construction data digitally, which is a crucial step to future asset lifecycle management efforts.

Of course, when we say "project management system," we don't mean a melange of spreadsheets and email. To effectively capture precise inspection data in an efficient manner, organizations need to rely on software solutions built specifically for the infrastructure construction industry.

Primary Digital Inspection Benefits

Digital inspection offers a way to boost efficiency today while establishing an accurate database that can be referenced in the future operations and maintenance phases of the project. Usually, digital inspection software enables the inspector to capture daily report information on their mobile device whether online or offline. This flexibility means inspectors don't need to bring clunky laptops out for inspection. Once an internet connection is available via WiFi or hotspot, most digital inspection platforms will seamlessly sync and integrate back with the project management software in the office. Ultimately, this means more time in the field for inspectors and a truly accurate project dataset for owners and project managers.

Your digital inspection platform can act as a hub for your other inspection tools - even physical hardware. For example, our own Mobile Inspector® platform integrates with both Trimble® Access™ and Leica Captivate, so ultra-precise rover data can be captured by the platform. Even your mobile device's LiDAR capabilities can be used to capture more accurate data than the human eye. Having a well-organized, searchable database of job site data is boon to all project stakeholders, and can even make a potential audit go smoothly.

Digital Inspection

Raise the Bar by Requiring Digital Data Capture

Similar to the case with e-bidding software, the burden falls on construction project owners to raise the bar and require a digital inspection process on their projects.

While many engineering consultants have embraced the benefits of cloud-based construction administration software, LPAs nationwide are still using a mix of outdated spreadsheet and paper-based processes to manage their projects. Not only does this introduce increased risk of error and inefficiency, it fails to help establish digital infrastructure that can be relied on throughout the project lifecycle. One way for organizations to force a leap forward is to mandate e-Construction technology on their projects.

For example, in 2018, the Iowa Department of Transportation's Office of Local Systems announced that it would require the use of Appia on all local projects. This mandate provided Iowa with a single solution for all local construction contract administration and enabled localities to effectively manage daily reporting, funding, items, change orders and payments with multiple role types for controlled, real-time collaboration. "The Iowa Department of Transportation Office of Local Systems' mission is to work with our transportation partners and provide guidance in the development and implementation of projects to ensure compliance with state and federal requirements. In line with this goal, the Office of Local Systems is implementing Infotech's Appia® service as our solution which will allow all local public agencies to manage all construction contracts with state and/or federal funds, as well as their local or privately funded contracts," announced the agency at the time. After adopting Appia, the agency reported significant time savings in areas like duplicate data entry (6 hours a week, per employee) and traveling from offsite to office (1 hour per week, per employee).

DOTs EMBRACING DIGITAL INSPECTION

The Minnesota Department of Transportation recently piloted an integrated digital inspection solution that combined Infotech, AASHTOWare Project, and Trimble software with Trimble rovers. As a result, they were able to reduce a process that took 600 hours down to 73 hours and build a reliable database of project information. The process was as follows:

+ Capture precise project data on Trimble Access via Trimble Rovers
+ Seamlessly sync project data with daily reports in Infotech's Mobile Inspector
+ Push reports to the AASHTOWare Project Construction & Materials database

"For years we didn't have this data collected... assets get lost over time. This gives us the actual coordinates of every asset we have in the field which will be tremendously helpful in maintenance and future design as we move forward."

PAUL RASMUSSEN
ASSISTANT DISTRICT ENGINEER

Digital Inspection

Digital Inspection Fast Facts

Digital inspection software enables inspectors to spend 75% more time in the field

Access to digital inspection data can reduce file research time by up to 95%

Digital inspection software can make the process of collecting data 87% more efficient

GIS

Leveraging GIS-Powered Project Management

Digital inspection and cloud-based construction project management go hand-in-hand - at least, there's little point in having one without the other. As you implement these software solutions, you'll begin to see how your digital infrastructure is built out to support efficiency, collaboration, and accurate data collection through each phase of the project. Your digital bid data helps create the project file, while your digital inspection data populates it. And the project management platform itself? That's your central hub where you can organize, find, and share project information - including essential GIS data.

Quick - what's GIS again?

GIS stands for Geographic Information Systems - it's a system used to store, analyze, and present geographical data in visual form. With this combination of database technology, GPS, and software, professionals from a wide range of industries benefit from GIS. GIS is used in industries ranging from public health for trend analysis of diseases within communities to marketing for market segmentation. In the construction industry, GIS is used for various purposes including site selection, surveying land, tracking building permits and zoning regulations, plotting proposed projects on existing infrastructure maps, and environmental risk assessment. It is a way to provide context to the construction site.

GIS

Primary GIS-Powered Project Management Benefits

A GIS-powered project management process enables organizations to capture the precise location of completed work, assets, equipment, personnel and more. Access to such a clear picture of project progress and completed as-built work makes it easier on project managers to mitigate risk by avoiding hazardous conditions and responding to issues quickly through access to real-time data.

When it comes to the financial side of project management, access to accurate as-built data that's tied to a specific location, quantity, and fund package makes it easier to expedite payments and change orders. All in all, there are a number of day-to-day benefits of geo-enabled construction management – but the true value is in building a database of geo-located asset data that can inform maintenance and operations for years to come. Over the long term, asset owners will continue to integrate an increasingly wide range of data sources and applications that rely on GIS data.

Improving Transparency, Collaboration, and Reporting

Once each layer of GIS data is connected to some sort of mapping dashboard provided by a company like Esri, organizations can easily collaborate with different stakeholders, conduct further analysis, and improve decision-making all before starting a project.

Here are some examples of construction teams leveraging GIS technology for benefits in reporting, transparency, and collaboration:

With the help of GIS technology, the City of Muscatine found a solution that enhances collaboration and transparency. By implementing dashboards that display project information from their project management system, all stakeholders from the city can view each project's progress and how each project can impact their day to day. Rather than spending time digging through files to answer questions, construction project managers can refer to a visual dashboard that captures the geographic area, expected completion date, remaining working days, and the total budgeted amount.

"Most of the time people ask about the budget and the schedule. How far are we into it? Are we under budget? All of that information is readily available in the system," said Mark Yerington, the GIS/CAD Manager for Muscatine Power and Water.

Similarly, the Maryland Department of Transportation State Highway Administration has a website that uses GIS technology to increase transparency and communication with the residents of Maryland. Residents can view real-time updates on ongoing roadway projects and any roadblocks that may impact their day. Their Project Portal includes an event calendar, drone imagery of the updated work, a searchable map, and project information. With the calendar feature, residents can even access virtual meetings about specific projects. As you can see, GIS can support transparency, collaboration, and reporting for public and private stakeholders alike.

GIS

Bridging the Gap between GIS & Construction

Full utilization of GIS construction applications remains limited to early adopters. Preventing widespread adoption are disparate data silos and a lack of standard workflows, nomenclature, and operating procedures to enable collaboration. Bridging the gap between GIS and construction requires stakeholders to embrace and support changes, including:

+ Integrations and interoperability to enable data sharing between systems
+ Encouragement of open communication between people and departments
+ Adaptation of processes and mindsets to support innovation and collaboration

The full vision of applying geo-enabled construction data will not be realized overnight. To start building that bridge, agencies and engineering firms need to start with relatively small, practical steps, such as bringing more GIS data into field inspection reports or sharing your construction data with your GIS department

GIS Fast Facts

GIS technology is currently used by ~40% of civil contractors on ~50% of their projects

88% of GIS users report process improvements, reduced risk, and more sustainable performance

87% of non-users have a positive outlook on GIS

We Can Help Build Your Digital Infrastructure

As a leading infrastructure industry solutions provider, we have extensive experience covered in each section of this e-book. We're the developers of Bid Express, the e-bidding platform trusted by 44 state DOTs and hundreds of LPAs. Through our Appia construction management and Mobile Inspector solutions, we're integrating with GIS experts like Esri to provide our clients with geo-enabled construction data.

While no one can perfectly foresee the evolving demands of our industry, Infotech remains focused on delivering solutions that help construction crews, asset owners and other stakeholders work together efficiently to create value for their communities.

How can we help you get started?

EXPLORE OUR SOLUTIONS

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