nPulse®

Leveraging the Power of Digital Processes in Construction

HOW INDIA'S CONSTRUCTION INDUSTRIES CAN CREATE A STREAMLINED, HIGH ROI CONSTRUCTION PROCESS WITH DIGITALISATION

Bentley®
Advancing Infrastructure

How Digitalisation is Transforming Construction

The construction industry across the globe is rapidly evolving. As it evolves, digitalisation is becoming the key to unlocking value and delivering projects with higher efficiency. Digitalisation is using data and technology to create digital processes that often fundamentally change the way a business operates. This takes the form of digital services, products, workflows, and processes within a company. The benefits of digitalisation for India's construction industries are enormous, but the process of getting to a digitised construction process can seem daunting or complex.

In order to get to digitalisation, you first need to go through digitisation. Digitisation is the process of converting analog content into a digital format, creating a catalogue of data companies can then use to digitalise their business processes, workflows, services, and products. In its simplest form, digitisation may be converting an existing paper document into a digital one. This conversion serves as the building block for any future digitalisation a company might undergo, and it isn't a step companies can skip. The upfront effort digitisation requires is the reason many Indian CXOs have put off the digitalisation process, seeing it as not worth the cost in a country where construction costs are less expensive than the rest of the global market. But, the effort required to digitalise construction becomes a valuable investment when it is done with technologies that align with a company's needs and the needs of the market they operate in.

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The Current Construction Technology Landscape

Even at a global level, the construction industry is lagging behind other industries in both digital strategy and maturity. Digital tools such as automation, robotics, autonomous vehicles, and augmented reality are currently only being used by a select few construction companies. Digital maturity isn't the only way construction lags. A Deloitte study[1] found that the digital strategy horizon for construction companies is the most short-sighted among all the industries they studied. This short-sightedness is causing the industry as a whole to miss out on years worth of profit through the decisions we are making today.

Digitalisation in India

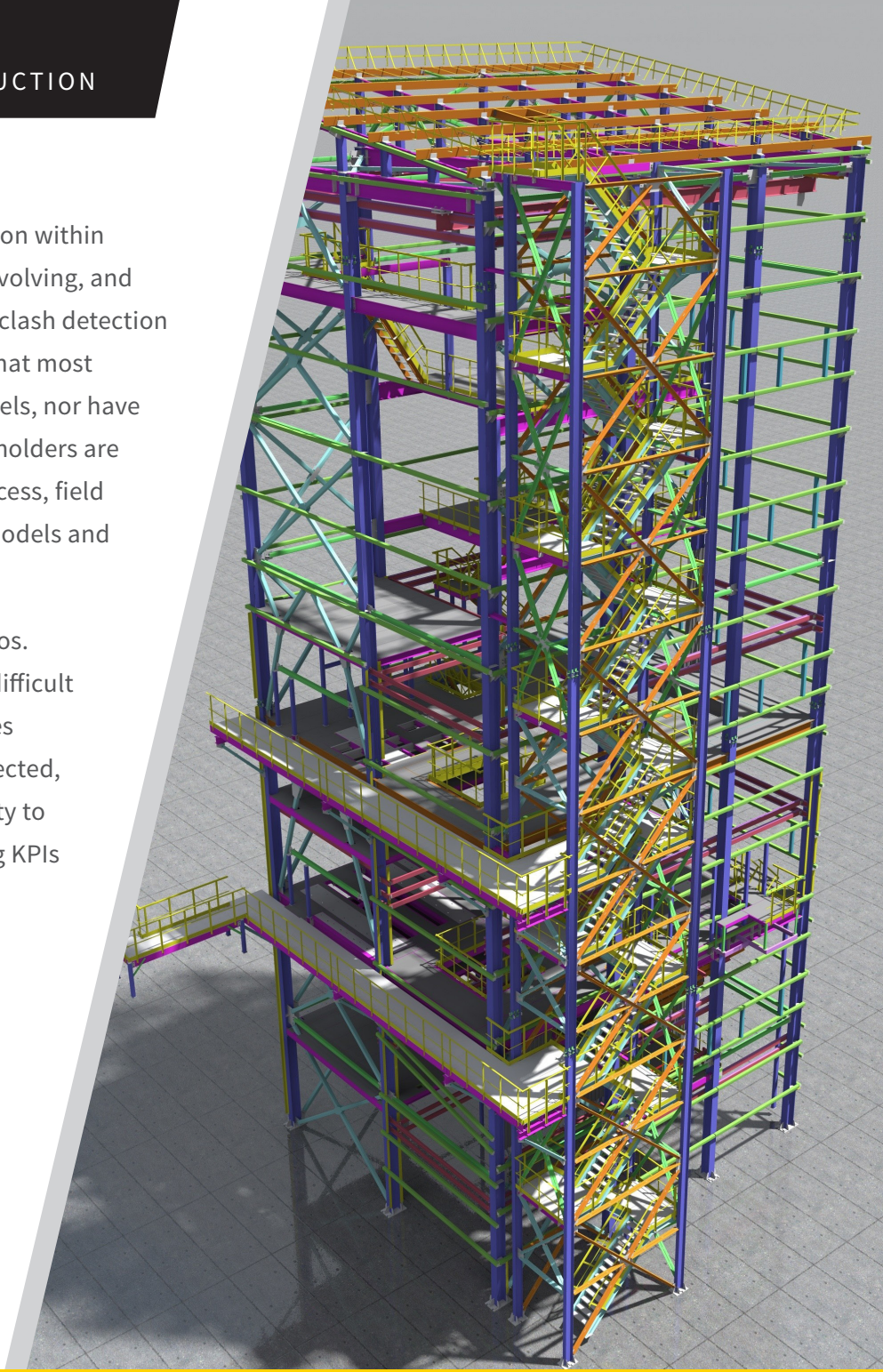
India has seen a lot of success in digital transformation in recent years. The Universal Payments Interface (UPI), for example, has helped level the playing field for businesses across the country. Unfortunately, the construction industry still lags behind when it comes to digitalisation. Digitalisation in India has taken on a piecemeal approach. Instead of working to create a more connected, streamlined construction process, most Indian companies have opted to digitise the individual parts of that process. This has resulted in disconnected short-sighted waves of adoption without a coherent long term strategy:

1. The first wave saw large and mid-sized companies implementing ERP systems and adopting scheduling systems to bring process discipline to accounting, finance, and planning
2. The second wave focused on adopting mobile apps focused on individual aspects of construction like quality, safety, and field progress capture; it also saw the integration of more collaborative communication systems

1. https://www2.deloitte.com/content/dam/Deloitte/us/Documents/manufacturing/digital-opportunities-in-engineering-and-construction.pdf

The use of 3D modelling within construction has seen increased traction within the past few years. Building Information Modelling (BIM) maturity is evolving, and companies are becoming more familiar with the use of 3D models for clash detection and documentation purposes. At the same time, it's becoming clear that most stakeholders are not yet able to use and take advantage of these models, nor have they been able to use them for planning and monitoring. These stakeholders are currently not able to keep up with the changes in both the design process, field progress, and the models themselves. Standards for the creation of models and process re-alignment are still evolving.

This adoption approach has left construction companies with data silos. Digitised pieces of data are disparate and fragmented, making them difficult to use except in extremely niche circumstances. This siloed data leaves companies missing out on the biggest benefits of digitalisation: connected, useable data. Even more importantly, they're missing out on the ability to take a more active position in managing projects—consistently hitting KPIs and navigating challenges before they become crises.



Overcoming India's Construction Industry Challenges

According to Construction Week,[2] by 2030, the construction sector in India is likely to be worth $1 trillion and comprise up to 10% of India's GDP. The industry isn't just real estate either. Residential and commercial real estate construction is matched by construction for infrastructure projects such as road, rail, bridges, metro, and energy infrastructure. Despite this projected growth, many challenges still hamper the industry's progress. Sustained growth and development need forward-thinking solutions that can overcome both current and future challenges. Digitalisation can make these solutions significantly more accessible.

Construction companies have historically been plagued with low-profit margins from cost and schedule overruns and long cash-conversion cycles, but these aren't the only problems the industry faces.

Challenges in India's Construction, with the following points:[3]

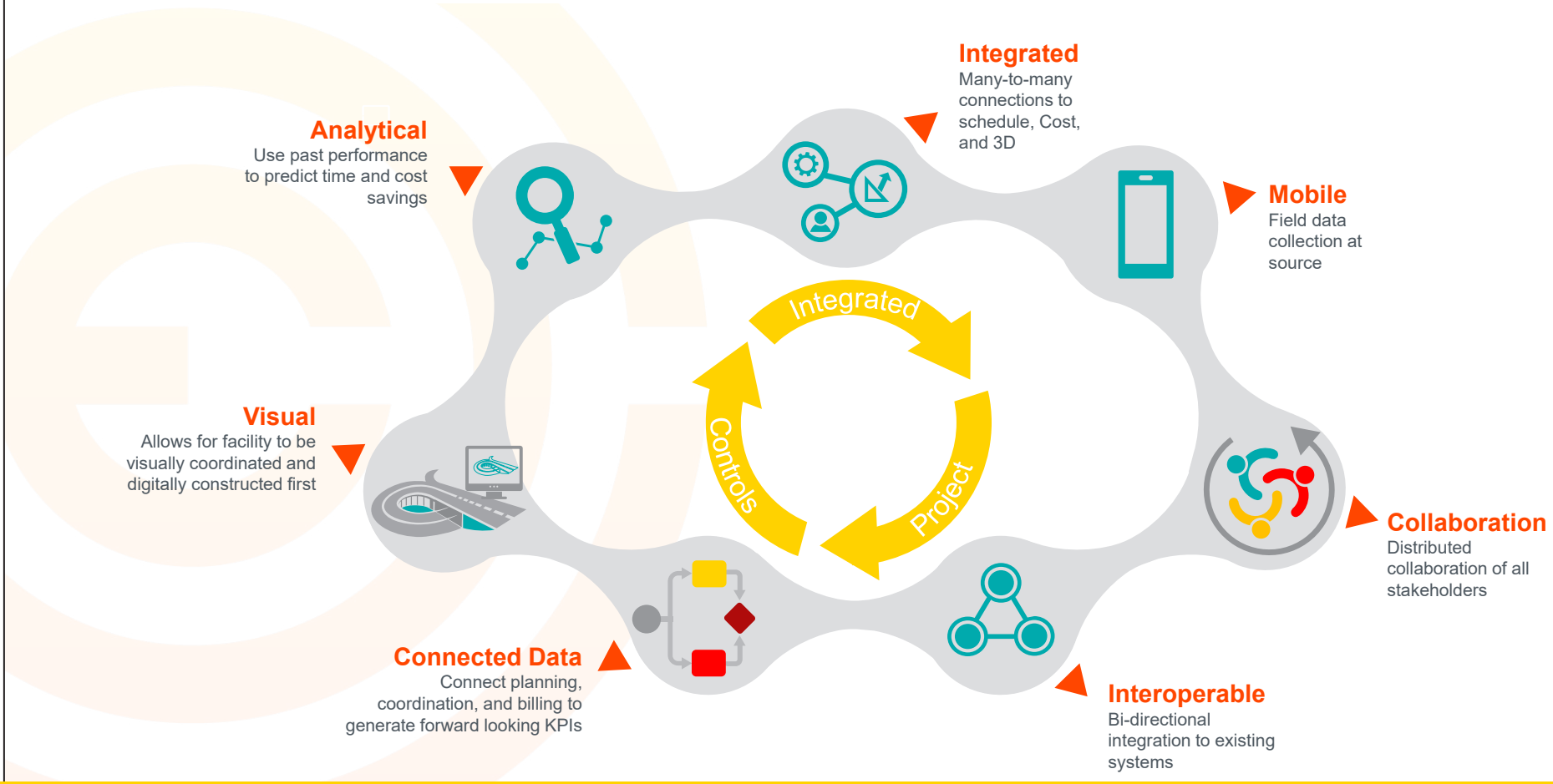
Cost	Time	Quality	Safety
• Project overtime cost • Payment delays • Resource/materials cost	• Added scope of work • Procurement of material inline with on-site work • Unavailability or shortage of labor	• Design changes during construction phase • Poor project management • Inadequate contractor experience	• Safety risks on construction site • Poor and unforeseen site conditions • Weather problems

As stated in *Indian Construction Industry: Challenges for the Construction Managers*[4] from the Journal of Business Management, "The success of a project is judged by meeting the criteria of cost, time, safety, resource allocation, and quality as determined by the owner." Digitalisation can make tracking, measuring, and planning for that success a seamless part of the construction process, so long as it is done with the right tools. Bentley nPulse® is a SaaS-based integrated project controls solution that creates a connected data environment designed for India's construction industry.

2. https://www.constructionweekonline.in/people/challenges-ahead-for-the-construction-industry
3. https://www.researchgate.net/publication/355445852_Identifying_Challenges_of_Construction_Industry_in_India
4. https://www.iosrjournals.org/iosr-jbm/papers/Vol16-issue4/Version-3/J016436569.pdf

Integrated Project Controls to Digitalise Construction Project Management

Integrated project controls can help companies make the most of digitalisation by bringing together disparate pieces of data into a common connected environment. This shared environment helps companies find valuable insights that can help drive projects forward. It connects all the pieces of the construction process to forecast and mitigate delays, makes projects more cost-effective, increases worker safety and construction quality, and keeps every project stakeholder connected at all times.



INTEGRATED: Time and cost have to be integrated with 3D models. Solutions should give you context and help alert you to problems by linking issues and documents to the model itself.

MOBILE: Construction is, and always will be, at the project site. Mobile-enabled solutions support this reality by letting you provide and collect data as things change on the ground.

COLLABORATION: Collecting and disseminating data to and from all stakeholders is the foundation of collaboration. Solutions should organise and enable use of that data to foster collaboration.

INTEROPERABLE: Solutions should be able to talk with your existing core systems, including ERP systems (cost), scheduling systems (time), and 3D authoring solutions (3D).

CONNECTED DATA: Connected data can be used to generate reports, assist in planning, and draw conclusions.

VISUAL: Visual platforms can help users draw insights from data more easily, allowing for enhanced decision-making throughout the project. Being able to see both project progress blockers and completion KPIs streamlines this process.

ANALYTICAL: Solutions should help you build on your successes and learn from your mistakes through analytics. This includes information on project, process, and stakeholder performance that can be used to further make future project planning and delivery reliable and efficient.

The result is a connected data environment that enables interoperability between core systems and establishes one platform for all stakeholders. Data entered once has multiple uses and can be called upon at any time, creating a single source of truth for every project. This creates a historical knowledge base construction companies can pull from to better outcomes on future projects as well.

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What a Digitalised Construction Project Looks Like

COLLABORATION: Collaboration is much easier when everyone is able to give data based on their role and responsibility and has access to critical project data and built-in communication at their fingertips. Instead of data being siloed within individual teams, sporadically transferred via a menagerie of disconnected messaging platforms, data is connected and accessible whenever it's needed. This allows teams to handle risk mitigation faster and easier, leading to faster and more reliable project delivery. nPulse also has built-in meeting scheduling, recording, and agenda/minute generation, keeping everyone in sync.

DOCUMENT MANAGEMENT: Document digitisation is an important first step in a digitalised construction process. Digitalised documentation processes lead to effortless access and friction-free collaboration on all project documents, from design to procurement to execution, with workflow integration. Linking documents to an ongoing project schedule also allows them to be on hand and align teams as they're needed. Digitalising documentation processes makes collaboration easier and ensures teams always have access to the documents they need, even if they're on-site via the mobile app.

EARNED VALUE MANAGEMENT: Track and analyse project costs with real-time earned value statistics. With the ability to link Bills of Quality (BOQ) and schedule in a many-to-many manner allows for the autoaggregation of physical and cost-based progress. Knowing what parts of your project are bringing you the most value can help with in-the-moment decision-making. This information can also inform future projects to make them even more cost-effective.

RISK AND ENVIRONMENT, HEALTH, AND SAFETY (EHS) MANAGEMENT: Digitalised construction projects can bring a new level of safety to everyone involved, from the workers to the end-users and the surrounding environment. Platforms like nPulse help manage safety inspections, permits, violations, and incident reporting. They also help pinpoint where worker safety standards may not be up to the expected level of quality and where increasing focus on EHS could even save money and time in the project lifecycle.

4D MODELLING: Digitalised projects can also leverage 3D models augmented with data for 4D for visual project controls. Models with integrated data like this help compare the project plan versus the actual construction. They pinpoint inefficiencies and spot project schedule hindrances before they happen—and they're especially useful for spotting schedule and construction clashes that might happen between different trades before they happen in the field.

QUALITY MANAGEMENT: Quality management, especially when integrated BOQ management, can help eliminate discrepancies within projects, through transparent processes and task accountability, and create that single source of truth. Quality inspections when integrated with quantity through BOQ on hand and further in combination with the project schedule and the elements of the 3D model of the project. These added reference points keep quality high and help stakeholders stay accountable at every step.

ENABLING INVOICING: Keep invoicing in-platform and tied to real-time project data for easier tracking and billing, even on complex projects with multiple subcontractors. Invoicing systems connected to daily data updates from field engineers ensure that Management Information System (MIS) reports, including detailed project reports, are distributed regularly. Month-end invoices can also be generated automatically and with reliable data as soon as they're due, reducing the turnaround time for reconciliation. This system reduces invoice clearing times, increasing cash flow for contractors. It also ensures a reliable audit trail with full history for teams to refer to.

How nPulse Brings Data Together

nPulse is made up of three suites, each composed of unique modules and functionalities which are designed to improve efficiency and manage construction projects at any stage of the life cycle.

Collaboration Suite

The Collaboration Suite connects stakeholders, including project owners, consultants, project management committees, and contractors, together to help manage getting decisions done in a timely manner on all project issues and/or documents.

Control Suite

The Control Suite eliminates data entry duplication across systems that manage time, cost, and geometry (3D models), serving as a distributed data entry solution across stakeholders to ensure that data is entered once but used multiple times.

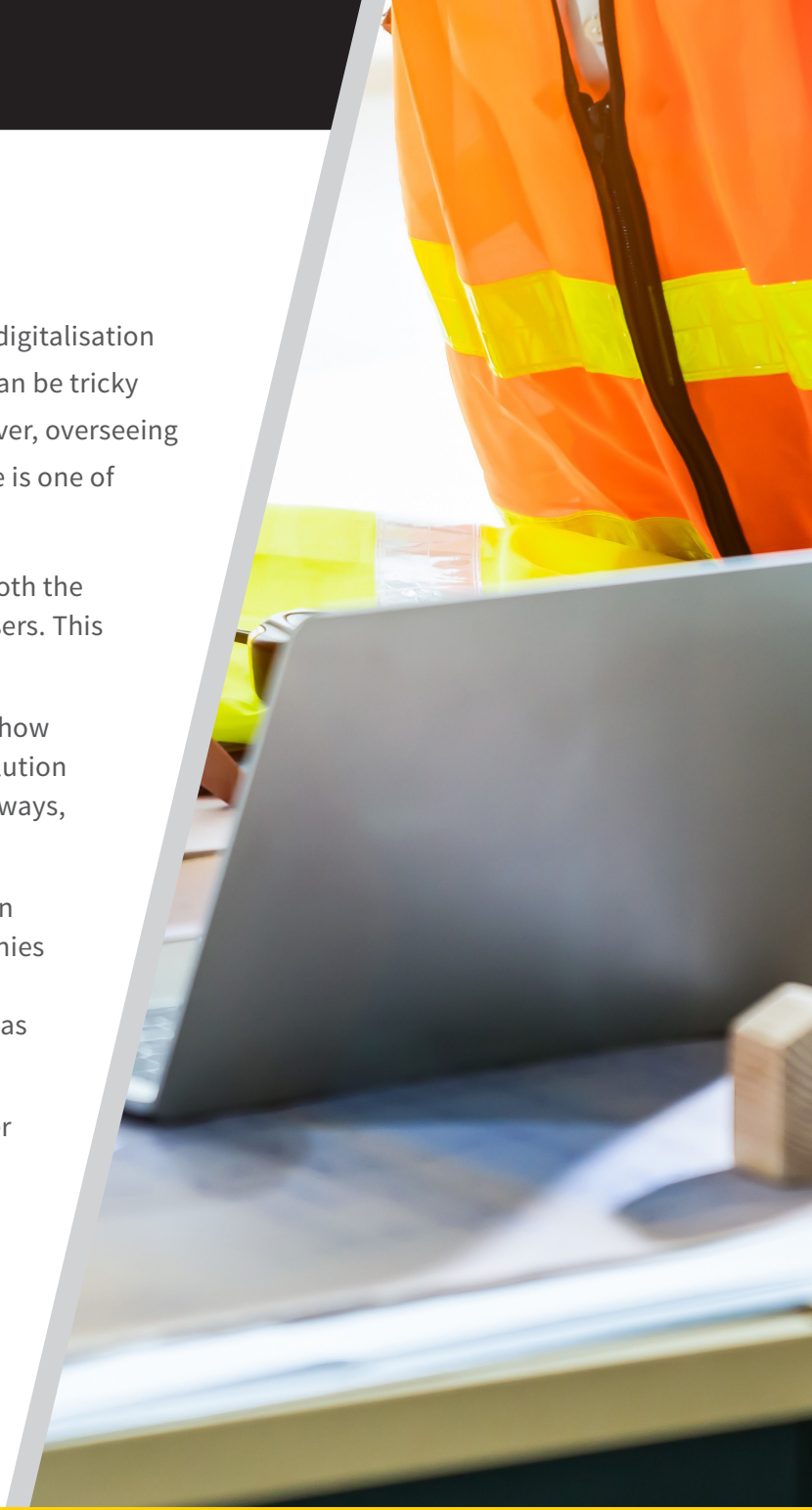
Work Suite

The Work Suite includes all the functionalities from both Collaboration Suite and Control Suite and integrates 3D BIM models to give a holistic picture of the project while using the data to generate forward-looking KPIs.

Overcoming Change Management

Change management is a very real challenge for companies looking to fully utilise digitalisation within their companies. Managing changes in workflows, processes, and systems can be tricky even without the change from analog to digital. With the right tools in place, however, overseeing and managing change can become an asset instead of feeling like a liability. nPulse is one of these tools. Here's how it works:

- Designed by a team heavily rooted in the construction sector, nPulse prioritises both the processes used by the Indian construction industry and the ease of use for end-users. This sets a familiar stage for users that better facilitates change.
- nPulse's implementation plan is designed to help companies quickly understand how the solution works, making the transition smoother. This includes prescriptive solution designs for each sector within the larger construction industry, such as roads, railways, commercial and residential real estate, and more.
- The software helps drive digitalisation across various functions of the construction process, including planning, billing, quality, safety, and design. This saves companies a significant amount of time and effort in ideating the digitalisation pathway for their organisation. It also helps manage change within each function individually as needed.
- The nPulse team trains designated members of client companies to become Super Users. This creates an in-house team capable of scaling implementation and helping other users adjust to changes.



The Results

Designed for India but used in more than 35 countries, 3 continents (South America, Africa, and Asia), 4000+ users, 300+ projects. The results are clear:

- Improve project management productivity by 20% and manage projects with leaner teams
- Reduce time needed to resolve project issues by 80%
- Achieve at least 50% productivity improvement in monthly MIS reporting and data reconciliation
- Greatly reduce data silos by connecting data with core systems to generate a single view that can replace 50+ Excel spreadsheets
- Run paperless projects with more than 150 daily quality and safety inspections for the project construction duration
- Automate monthly invoice reconciliation to within 5% variation
- Increase project governance by linking time, cost, and up-to-date models, giving management near real-time reports and dashboards

The need for multiple excel sheets to manage projects has been eliminated, making shuffling needed data around much simpler. The nPulse platform also consolidates data entry duplications, ensuring there is always a single source of truth for every project. This has helped companies increase project governance and have more control over each project in their portfolio.

These improvements have led to time and cost savings on digitalised construction projects. Digitalisation through nPulse has also helped companies shift to a more forward-thinking mindset. Companies can produce more defined KPIs upfront, driving decision-makers to manage projects proactively to these defined KPIs. Data from previous projects helps to better inform future projects as well.

Lead with Digitalisation

Digitalisation is a worthwhile investment for companies looking to maximise their long-term growth in India's construction industry. The oversight and insight that a well-managed platform, such as Bentley's nPulse, provides companies can be invaluable for their growth. Made-in-India by Indian construction veterans, nPulse can help if you're looking to:

- Have more control over the construction process, improving quality and safety along the way
- Increase visibility to proactively manage projects, helping predict and mitigate scheduling delays and easily adjust project materials and resources to match
- Analyse project costs, and get a clearer picture of which parts of the construction process are bringing you the most return on investment
- Foster collaboration across teams and stakeholders
- Connect scheduling, engineering, procurement, field activity, and other critical project data
- Create a single source of truth that is updated daily for all projects, eliminating data silos and making access to needed information seamless
- Automate reports, alerts, and reminders
- Visualise project details in an immersive 4D environment
- Make project management feel effortless, even in the face of our familiar industry challenges

We're here to help with the process. For more information or to schedule a demo of nPulse, connect with us today.

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Advancing Infrastructure

About Bentley Systems

Bentley Systems (Nasdaq: BSY) is the infrastructure engineering software company. We provide innovative software to advance the world's infrastructure – sustaining both the global economy and environment. Our industry-leading software solutions are used by professionals, and organizations of every size, for the design, construction, and operations of roads and bridges, rail and transit, water and wastewater, public works and utilities, buildings and campuses, mining, and industrial facilities. Our offerings include MicroStation-based applications for modeling and simulation, ProjectWise for project delivery, AssetWise for asset and network performance, Seequent's leading geoprofessional software portfolio, and the iTwin platform for infrastructure digital twins. Bentley Systems employs more than 4,500 colleagues and generates annual revenues of approximately $1 billion in 186 countries.

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