

Digital Twins Transforming the Infrastructure Industry

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The world is different today than 5 years ago



Unprecedented demand

- Sustainability and resiliency
- Demographic shifts
- Stimulus packages



Work has changed

- Remote work
- Material supply chain
- Industrialization

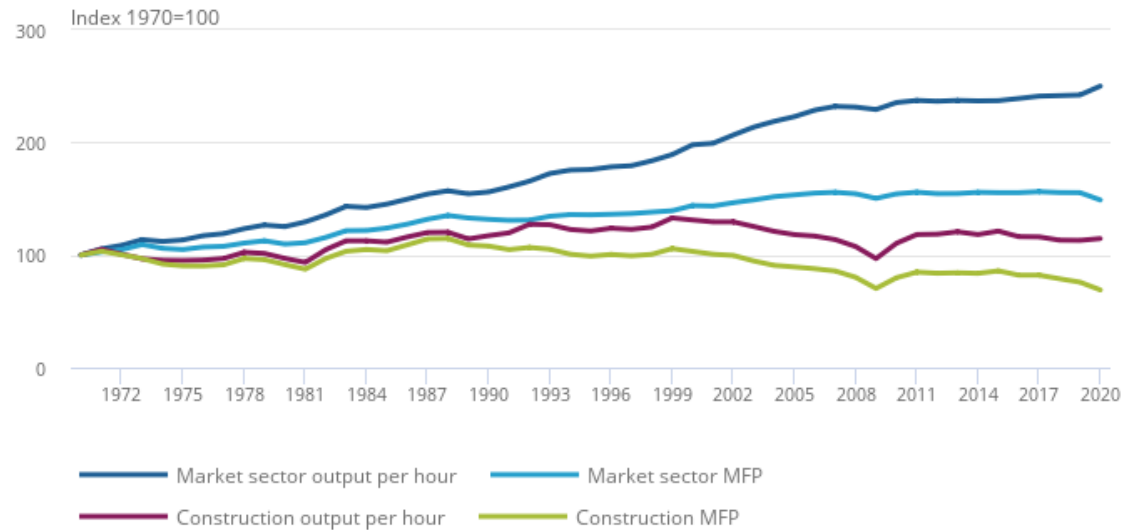


Accelerated Digitalization

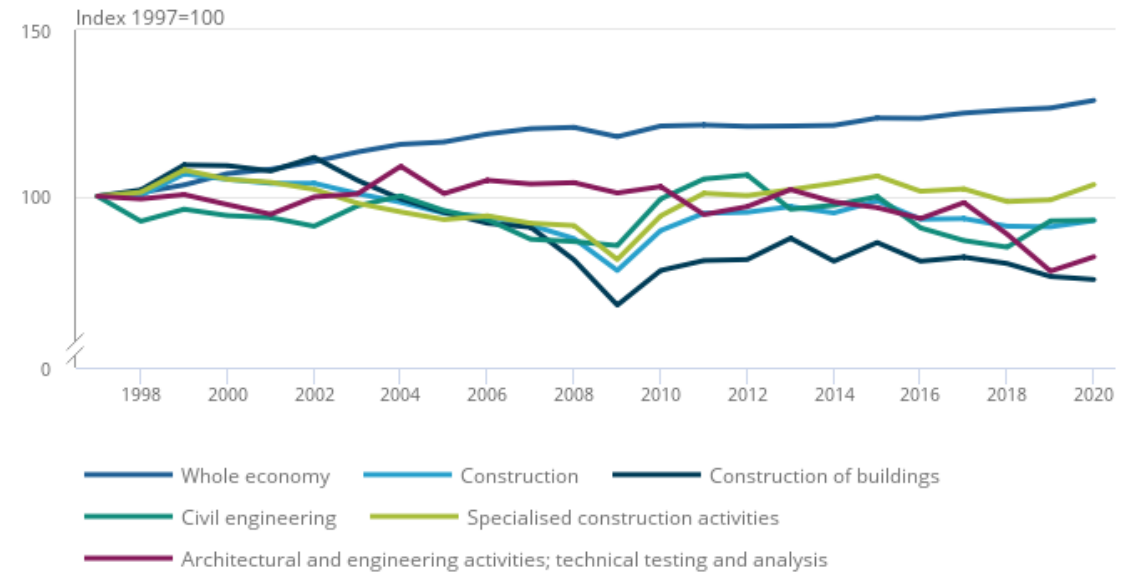
- Data and tool explosion
- Digital twins requested by owners
- Automation and Generative AI

DIGITAL TRANSFORMATION

Productivity has not changed in 50 years



Source: Office for National Statistics - Labour productivity and multi-factor productivity



Source: Office for National Statistics - Labour productivity

95.5%

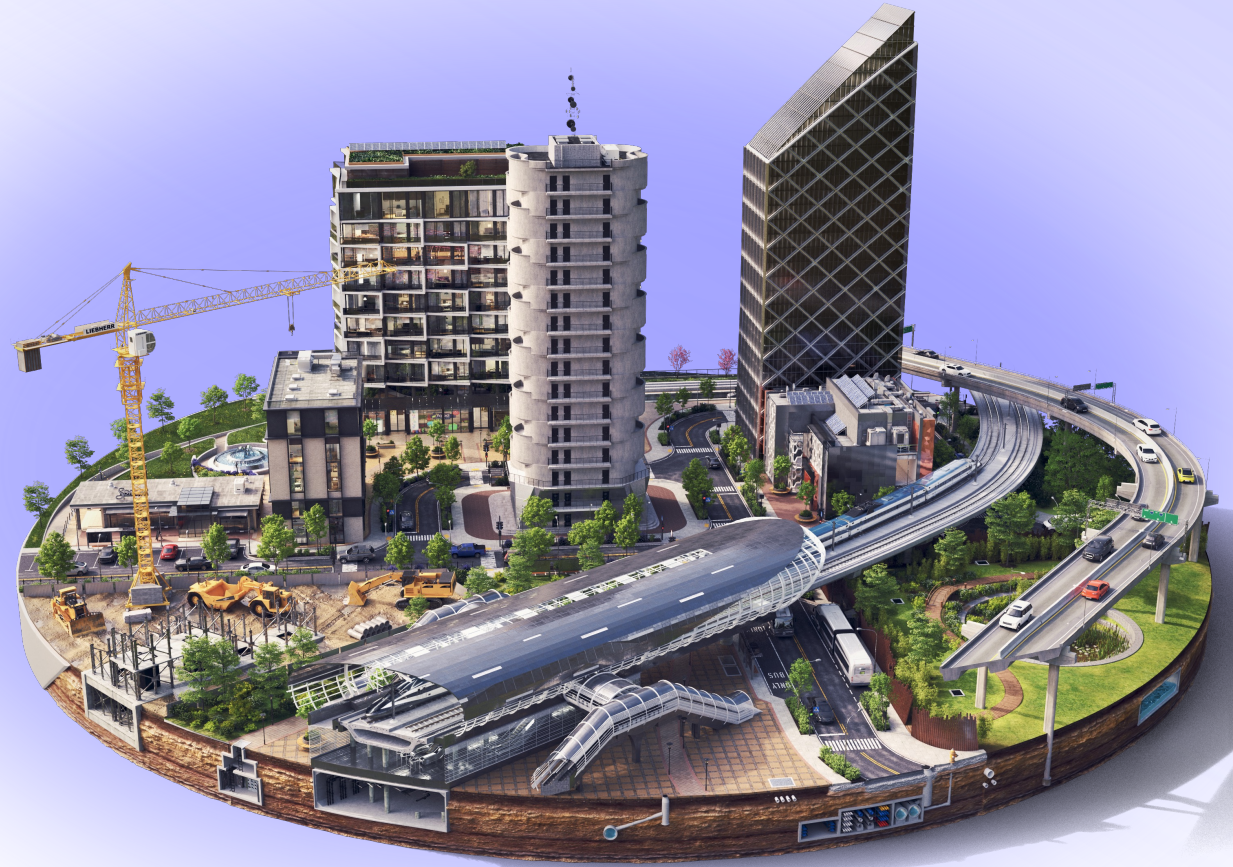
of data goes unused in
engineering & construction ⁽¹⁾

58%

of owners said they've used or
plan to use **design-build** ⁽²⁾

81%

of **owners** want to drive better
decisions from data ⁽³⁾

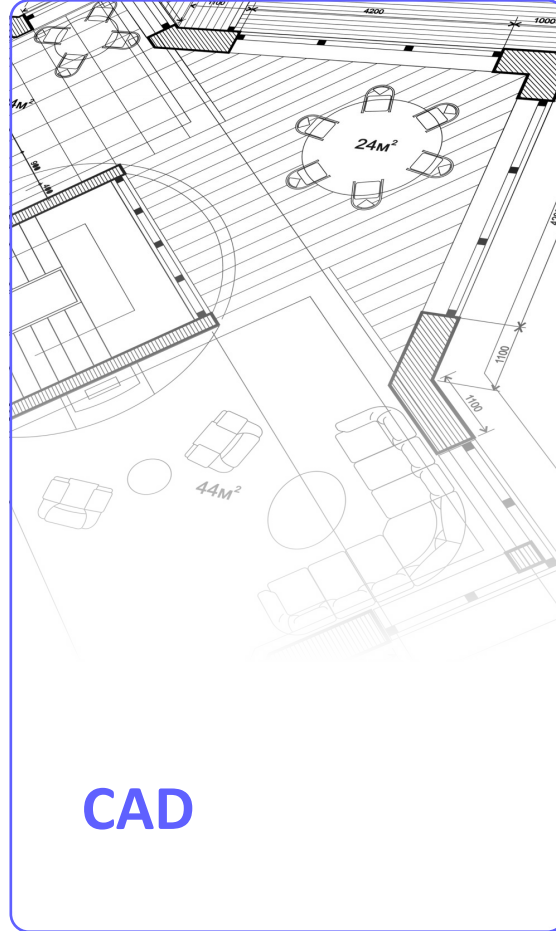


¹ Source: *Big Data = Big Questions for the Engineering and Construction Industry*, FMI Report

² Source: *Design-Build Utilization*, FMI Combined Market Study

³ Source: *Global Corporate Survey : Smart Building Technology Budgets, Priorities & Preferences* Verdantix Study

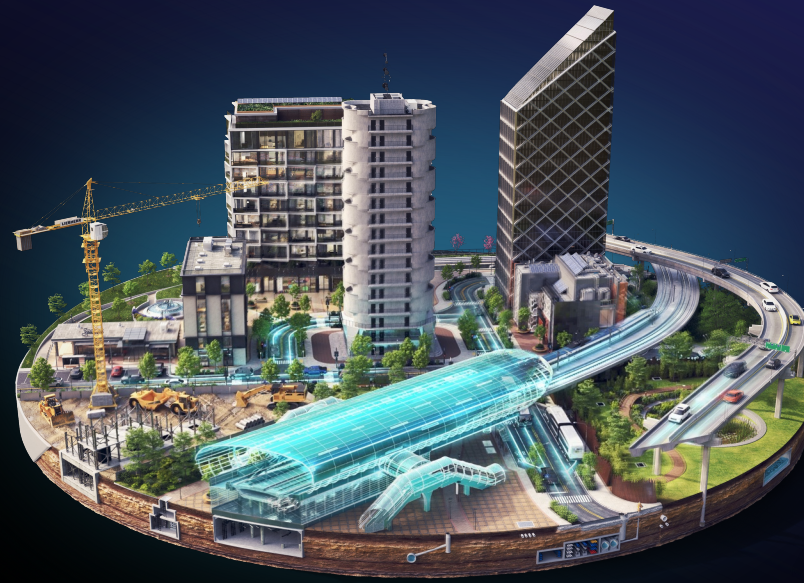
AEC Digital Transformations



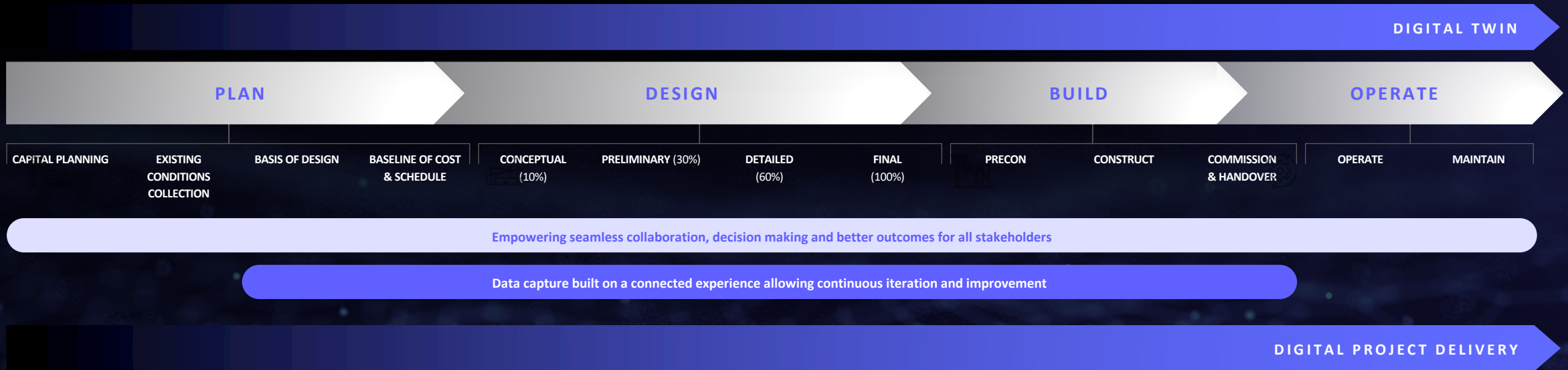
40 YEARS OF TECHNOLOGY INNOVATION



BIM is the Backbone of Digital Transformation

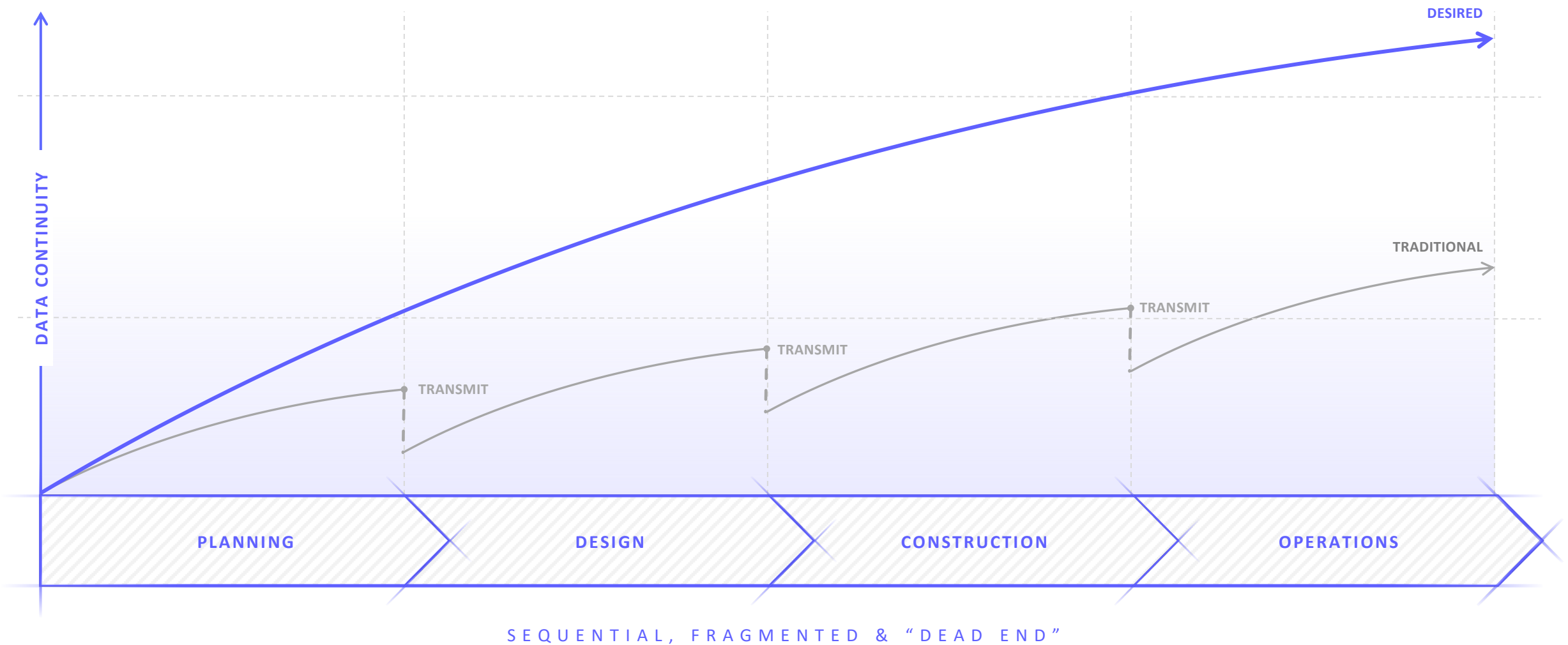


Digital Twin is the outcome of the BIM process

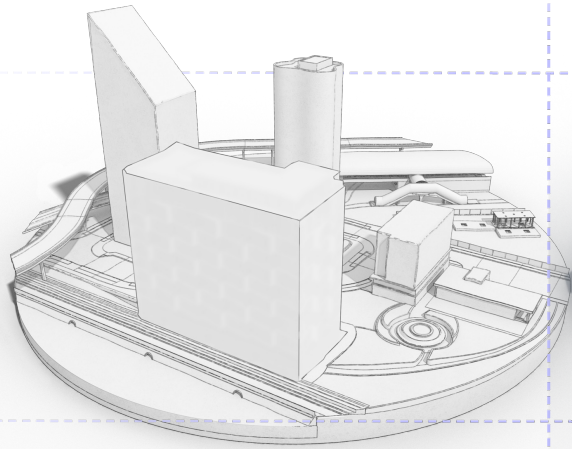


DPD is how we deliver this experience today

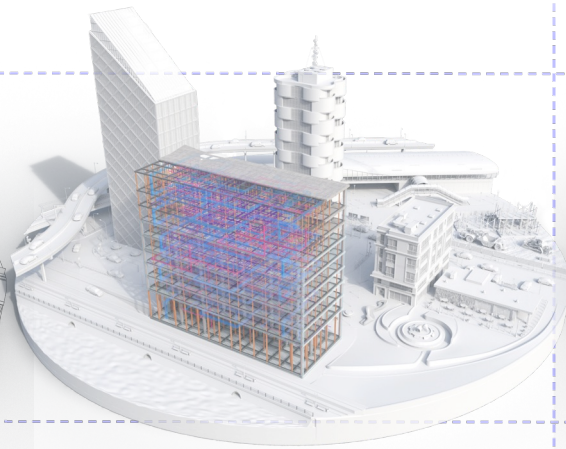
Traditional process loses information and logic when shared between phases and personas



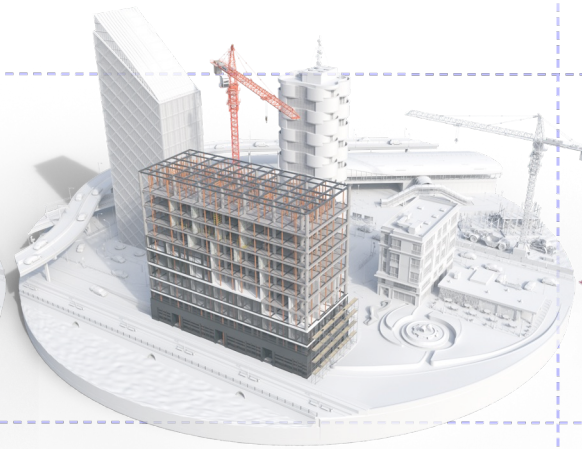
BIM Today



PLANNING



DESIGN



CONSTRUCTION



OPERATIONS

SEQUENTIAL, FRAGMENTED & "DEAD END"

BIM as we know it must evolve to meet industry needs



Increased project size and complexity generates an explosion of **data**

95%

of all **data** goes unused in engineering & construction due to siloed collaboration



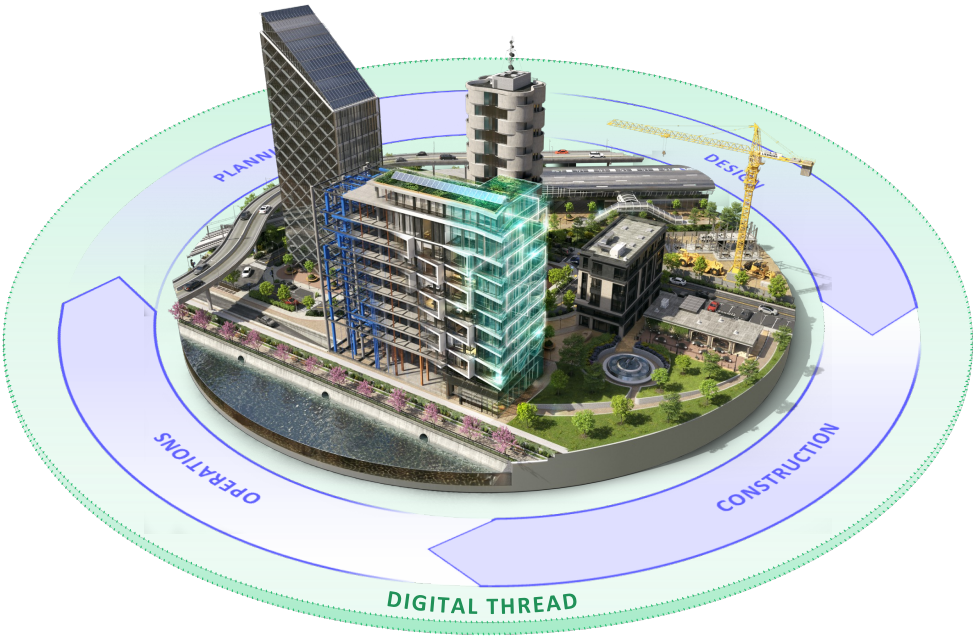
Lack of real time world context **data** to improve decision support

81%

of owners and operators want to drive better decisions from **data**

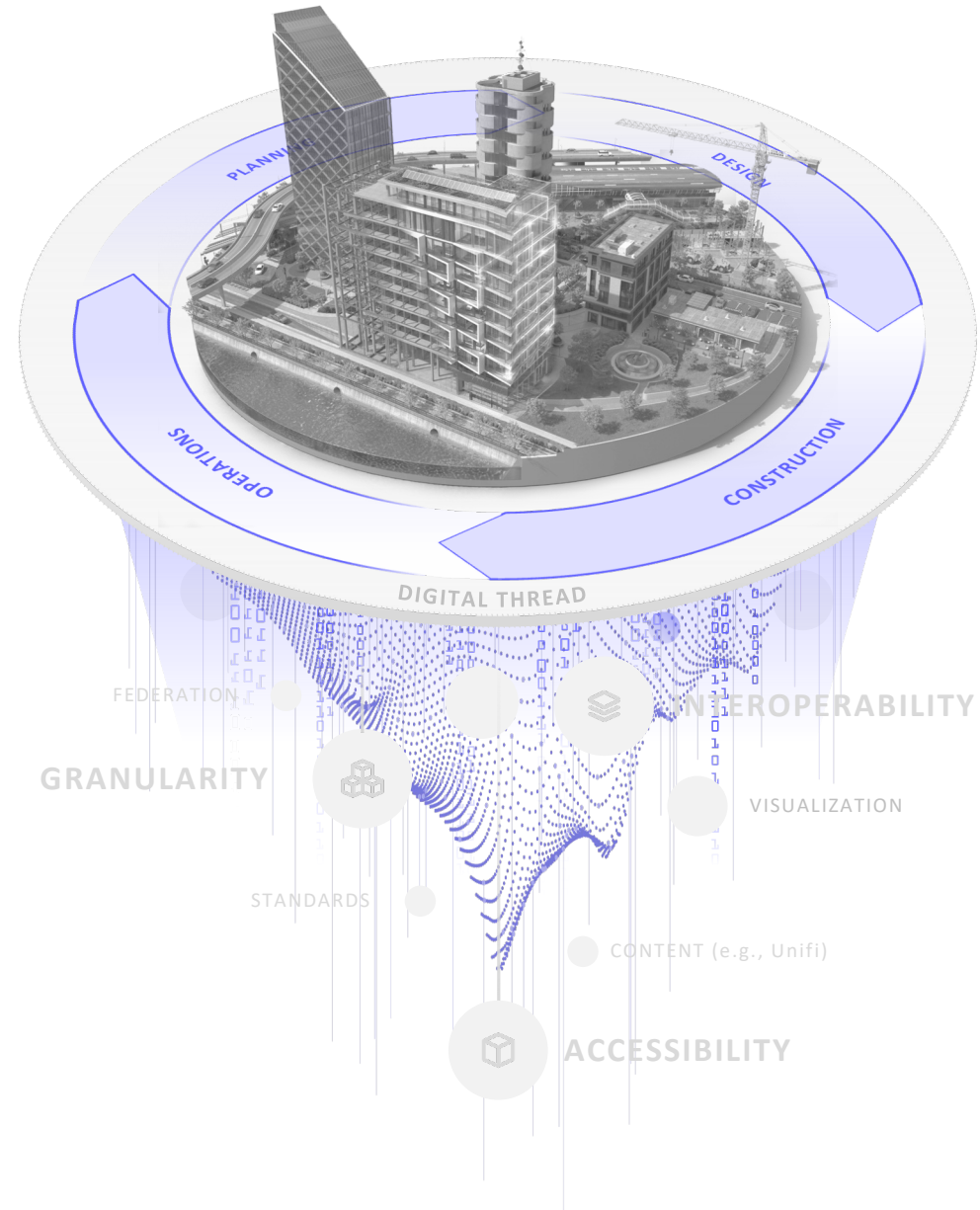


The Future of BIM is Powered by Better, Connected Data

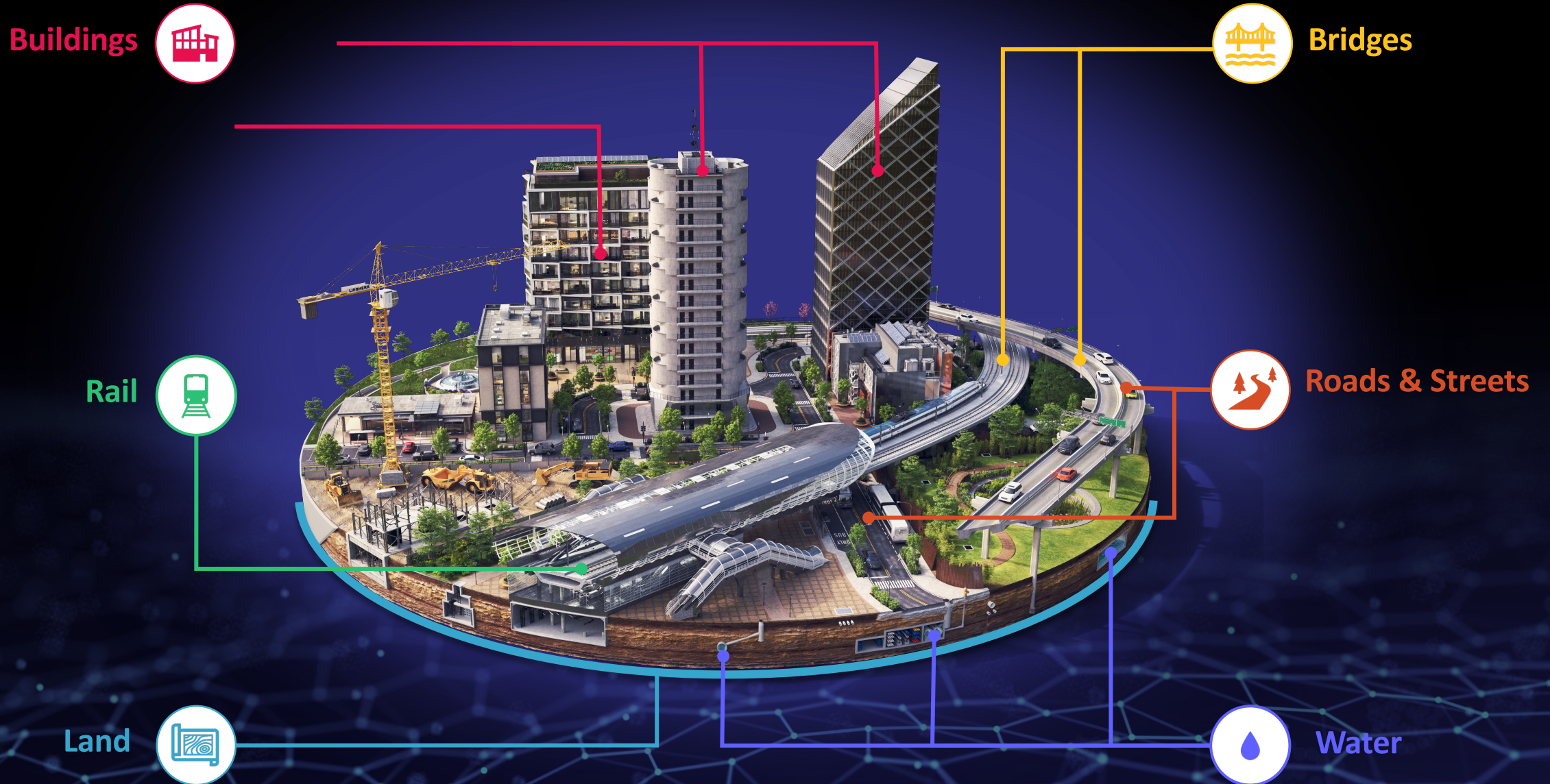


Better, Connected Data is an Enabler

- ✓ Frictionless connectivity
- ✓ Effortless collaboration
- ✓ Secure access at anytime, from anywhere
- ✓ Real time and on demand insights
- ✓ Better, informed decisions
- ✓ Generative AI
- ✓ Reuse knowledge from prior projects
- ✓ Rich and vibrant 3rd party ecosystem of apps & services



AEC Projects are often a system of systems





REALITY CAPTURE

GIS

BIM

IoT

Requirements for making digital twins an AEC industry reality

Source: ENR – Digital twins: An essential technology for infrastructure projects, 2022

Increased investment in technology

Common standards for data sharing

Incentives for risk sharing & innovation

Updated contracts and procurement processes

Stakeholders need to adopt a long-term mindset

Better knowledge transfer between projects

Digital Twins: Disrupting the status quo in the infrastructure industry



- Moving from a project-by-project basis to integrated suites of tools and industry clouds
- Annuity revenues for AEC firms to manage and maintain digital twins for their clients
- Value-added digital services such as predictive maintenance



- Helping infrastructure become more efficient, resilient, and sustainable
- Worker safety – moving field tasks into the office
- Supports retrofit and reconfiguration of infrastructure assets to achieve zero-carbon economies



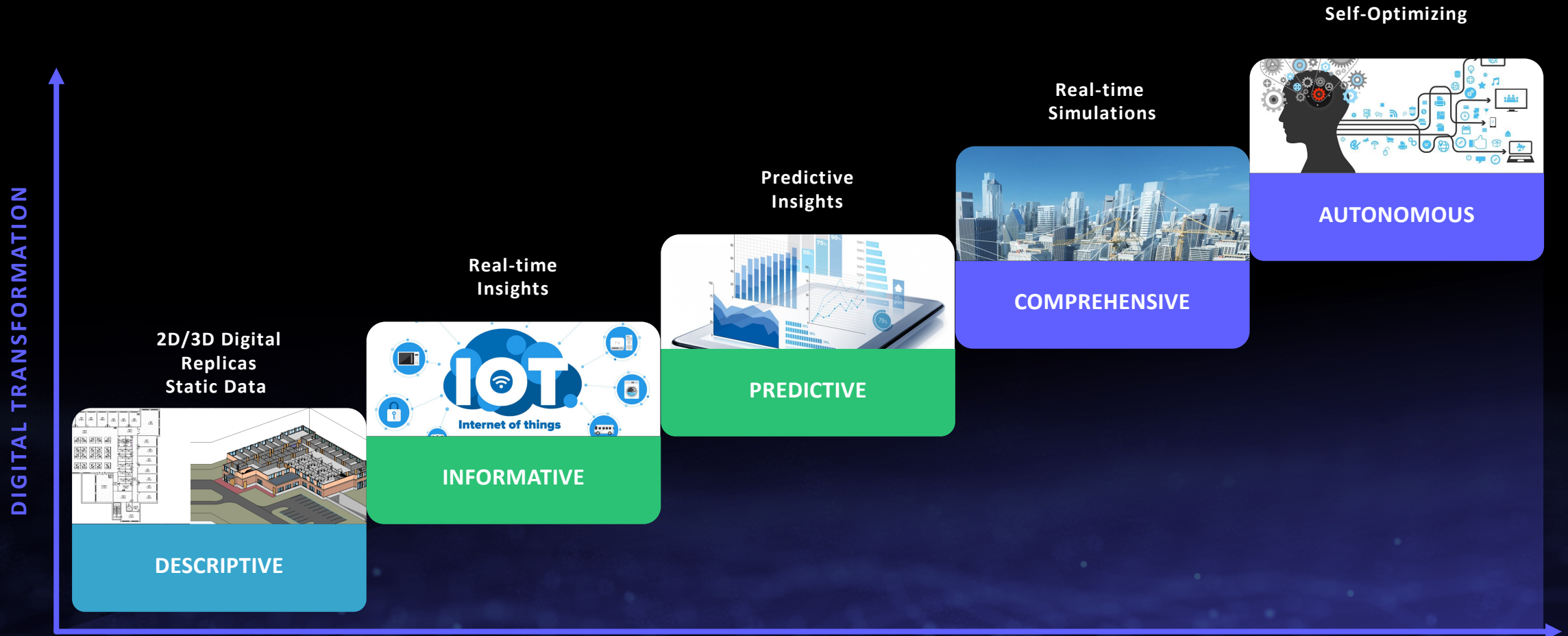
- Full lifecycle single source of truth for all parties involved.
- Living visual and geometric representation of the physical asset
- Provides visibility into how assets are performing including past, present, and future indicators



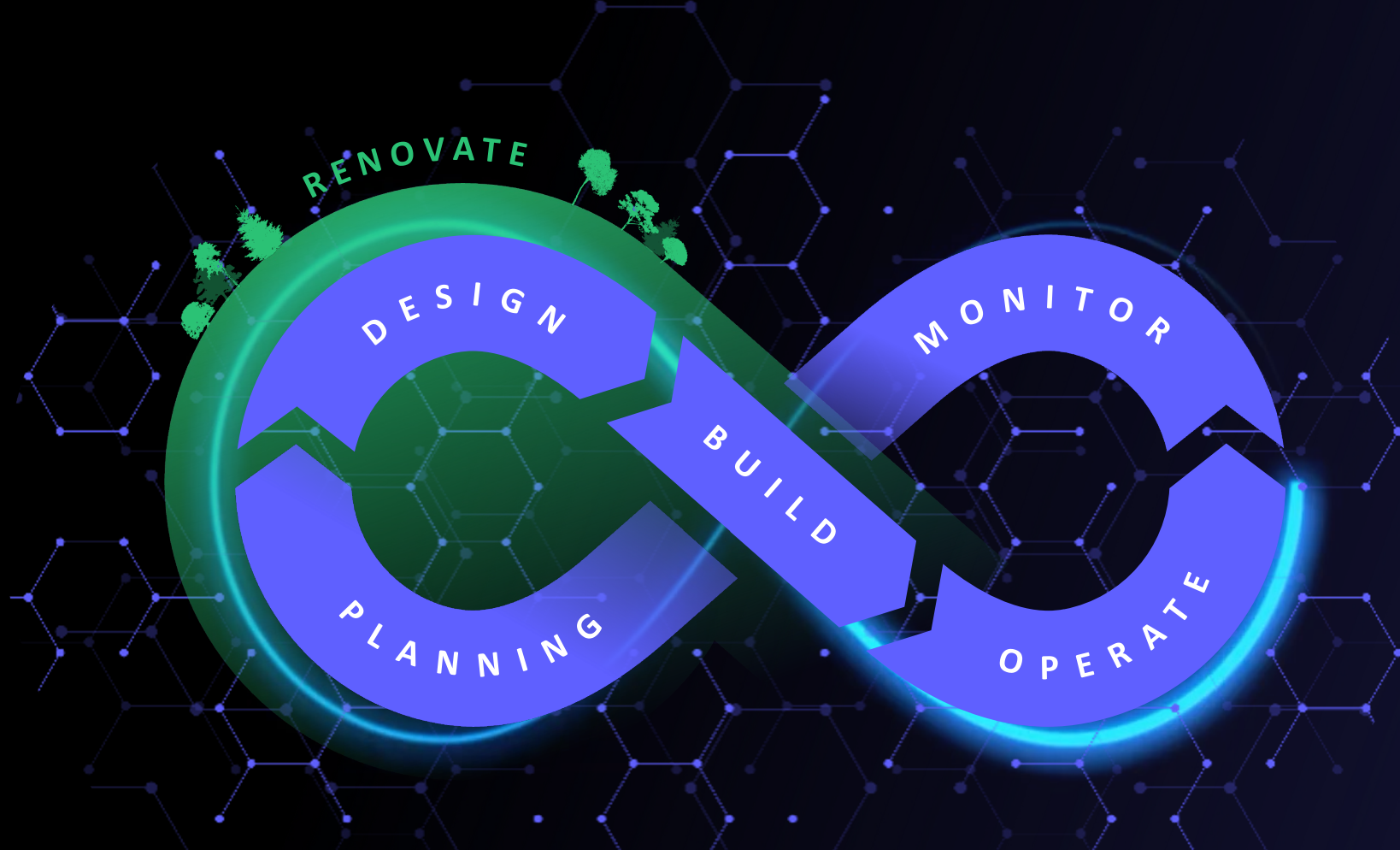
- Visualization unlocks the benefits of digital twins by communicating plans and ideas
- Enhancing the way capital projects are planned, built, and operated. Model for sustainability, then execute
- Integrated infrastructure assets allows for outcomes simulation
 - e.g., traffic prediction

Source: CIO – Digital twins are primed to revolutionize the infrastructure industry, 2022, Forbes – Can digital twins change our world, 2022

Digital Twin Maturity



Source: Verdantix - Smart Innovators: Digital Twins For Buildings, June 2020



Spatial data is enabling the digital transformation

Accelerating Digital Twin creation for the full project lifecycle with BIM and GIS



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