A DIGITAL CORE FOR EPC PROJECTS

The engineering, procurement, and construction (EPC) business is synonymous with delays - projects often exceed the original timeline and budget. An escalation in raw material and labor costs, lack of visibility across the value chain, and unavailability of labor at the right time contribute to haphazard planning and unpredictable execution. A McKinsey study of the state of the EPC industry reported that 98% of mega projects are delayed by an average of 20 months, and overshoot budget by an average of 80% of the original cost.

A suite of digital technologies can be the catalyst to orchestrate symmetry of people and processes for long gestation, capital-intensive, and resources-dependent EPC projects. Digital is the glue to bridge silos across the ecosystem, from the drawing board to operations at sites, spanning people, equipment, and materials. The era of digital-first EPC is a natural progression of how the industry has evolved from an analogue mode of planning and execution.

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In the formative stage, the EPC enterprise was confined to people within four walls drafting plans and collaborating over a drawing board . This human-intensive nature of work was pervasive across procurement, construction and project management. In the next stage, the enterprise adopted computer-aided design (CAD) systems to conceptualize and finalize design , and implemented enterprise resource planning and construction management systems. It reduced the complexity of global projects implemented by geographically distributed teams. The modern era of enterprise-wide digitization unifies people, aggregates systems, and streamlines processes for end-to-end visibility from concept to execution of projects.

The starting point of the digital journey for EPC enterprises is adoption of a data-oriented approach to projects. A leap from manual and paper-based processes to digitalization saves time and effort while boosting enterprise productivity. Engineers spend an estimated 50% of their project hours poring over and validating data. While project engineering is a critical component, it accounts for only 10% of the project cost, but engineering errors account for 14% of the total budget and contribute to delays in execution.

Single version of the truth

The complexity of moving parts and diversity of stakeholders in EPC projects paves the way for building information modelling (BIM). This system offers a comprehensive project view in real time spanning processes, functions, and stakeholders across the ecosystem. A golden record repository maximizes project efficiency based on updated design and construction modelling data. It allows architects, engineers, and project managers to collaborate, and enables realty and facility managers to take timely and informed decisions.

Significantly, BIM empowers managers with the ability to correlate datasets and make cost-effective purchases for procurement of materials. For instance, a procurement manager can view material and labour requirements of a project vis-a-vis estimates of vendors to make optimal pricing decisions. More importantly, BIM combined with digital fabrication using CAD systems enables project managers to visualize the sequence of phases leading up to project completion, thereby

avoiding conflicts across the journey. A connected ecosystem offers end-to-end visibility, with a change in one phase of the project reflecting in successive phases. This interconnectedness across the project continuum helps optimize time, materials, and resources.

BIM facilitates an ecosystem that aggregates people and processes with accurate data for a digital twin of the project. The digital representation of

a site enables diverse professionals to fulfil their respective functions based on real-world dimensions. Moreover, it allows professionals to complement each other rather than work in silos. During operations, a digital twin provides a real-time replica of the actual site, allowing troubleshooting and course correction at the source. A fine example of project orchestration is Jaibot, a semi-autonomous robot developed by Hilti, a manufacturer of leading edge construction tools. The robot leverages data from the BIM system to drill holes for mechanical, electrical, and plumbing requirements at a site. A technician manages the robot remotely and navigates it across the site based on data from the BIM system.

From real world to mixed reality and back

In the aftermath of the coronavirus pandemic, the EPC industry should adopt advanced automation to safeguard the health of professionals at construction sites. Drones provide real-world imagery, enabling professionals to gain a rounded view of sites: top-down, angular, as well as depth of field. Using photogrammetric detection and ranging (PhoDAR) technology, EPC enterprises can leverage a rich dataset and create a 3D point cloud of the site terrain.

By integrating BIM with augmented reality (AR) and virtual reality (VR), professionals gain a ring-side view for design review and suggesting iterations / course corrections during a work-in-progress project. Fologram, a mixed reality design platform company, developed an app for construction professionals to merge digital models with real-world sites to lay bricks efficiently. It integrates data from CAD systems and overlays it onto Microsoft HoloLens smart glasses. The precision of high fidelity digital design superimposed on a real world site enables masons outfitted with headsets to know the exact location for placing bricks with pinpoint accuracy all over the site.
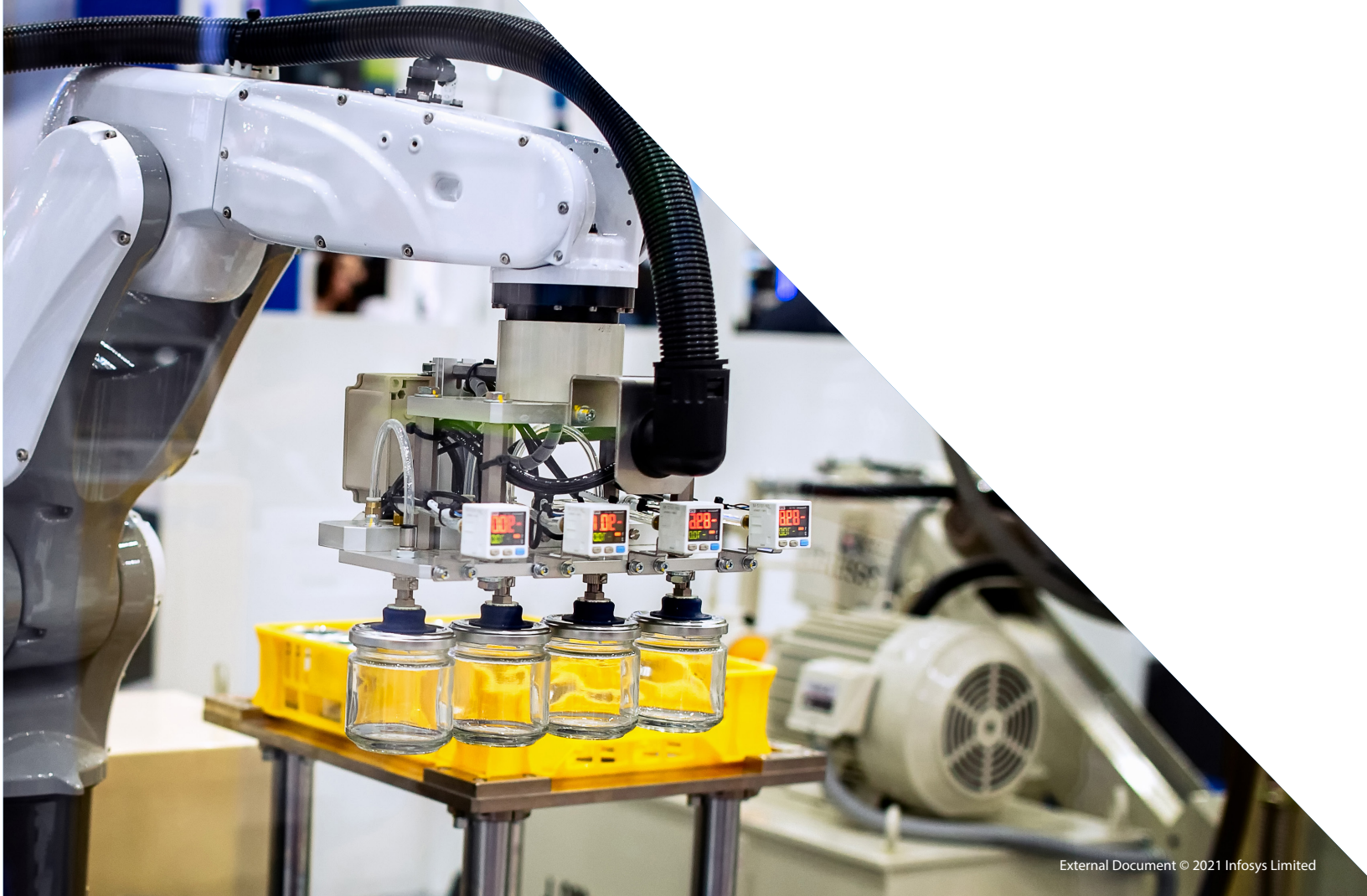
Distilling business intelligence

The EPC industry needs to capitalize on multiple streams of datasets that characterize a mega project. The scale of a project amplifies data that can be leveraged to ensure smooth and timely execution. A digital ecosystem facilitates adoption of artificial intelligence across the supply chain , from planning to delivery.

EPC enterprises can develop an artificial neural network to address budget and schedule overruns. Based on past projects, the system can assess or take proactive action to streamline work by incorporating parameters such as size and scale, procurement of materials, and skillsets required for a specific project.

During a project, the AI system can safeguard workers on sites by ingesting drone, IoT and sensors data, and flag potential safety hazards.

It is time for the EPC industry to shed its old economy tag and harness technology to attract and retain talent. According to the Associated General Contractors (AGC) of America, 81% of construction businesses find it difficult to hire hourly and salaried professionals.

The industry needs to cultivate digital learning and replace an aging workforce. Digital apps and bots can train new hires to operate equipment and machinery on sites. AI helps personalize learning and develop a rich pool of talent at EPC enterprises.

Typically, an EPC project involves diverse constituents and stakeholders with varying levels of technology capabilities and process maturity.

The good news: the ecosystem of platforms / products / device manufacturers are designing systems that are custom made for the EPC business. Enterprises should capitalize on this suite of digital technologies to effect a business transformation.

About the Author

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Nandi has over 25 years of experience, including two decades of leading and advising clients across several industries to enable business transformation powered by technology, platforms, operations, and outsourcing services. Nandi currently leads the business strategy, market making, client services, and growth for Business Services (which includes Engineering, Procurement & Construction and Waste Management) and the Education Industries, Americas.

He has extensive experience in building and managing high-performance teams responsible for client services, enabling the delivery of large-scale transformation programs and structuring and executing large outsourcing relationships. Nandi has a deep understanding of the sectoral value chain, technology trends and works closely with his client executives to advise and support their business priorities.

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