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INNOVATION BOOT CAMP IN CIVIL ENGINEERING

Building Bharat Sampaark - National Civil Engineering Hackathon

Problem Statement :

Improving Formwork Cycle Time Variability in High-Rise Construction

Theme : CONSTRUCTION TECHNOLOGIES

INITIATIVE PARTNERS

AICTE

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1. BACKGROUND

India is witnessing rapid growth in **high-rise** residential, commercial, mixed-use, healthcare, hospitality, and infrastructure projects as urban density increases and land availability becomes more constrained. In this context, **floor cycle time**, often referred to as formwork cycle time, has become one of the most important determinants of project performance because even a **one-day reduction** in slab cycle duration can produce **substantial savings** in project duration, overheads, equipment rentals, labour deployment, financing cost, and time to delivery.

Despite the use of advanced formwork systems and digital project management tools, contractors still face considerable variability in formwork cycle performance. This variability is driven by a combination of **planning inefficiencies, labour productivity fluctuations, material and equipment constraints, rework** caused by quality defects, **delayed inspections and approvals**, and **weak coordination** between engineering and site teams, all of which contribute to **schedule overruns, cost escalation, idle resources**, and **reduced profitability**.

Accordingly, the industry requires **innovative, data-driven**, and scalable solutions that can **predict, monitor**, and **improve** formwork cycle performance across high-rise projects.

2. PROBLEM STATEMENT

Participants are invited to develop an innovative solution that **reduces variability** in formwork cycle time for high-rise buildings by combining construction engineering principles with **digital technologies, automation, analytics, artificial intelligence, or process innovation.** The proposed solution should **improve planning, execution, monitoring, coordination, and decision-making** so that floor cycle performance becomes more **consistent, predictable,** and **efficient.**

Students are encouraged to propose solutions that can be deployed on live construction projects and adapted to different project scales, structural systems, and construction methodologies.

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3. OBJECTIVE

- The objective of this challenge is to help project teams **reduce floor cycle duration** while improving schedule predictability and controlling delays caused by coordination gaps and execution inefficiencies. A strong solution should also demonstrate the potential to improve **labour productivity**, **optimize resource utilization**, **reduce rework**, **strengthen quality compliance**, **improve safety outcomes**, and support faster, **better-informed decision-making** on site.
- Ultimately, the problem invites students to show how **engineering insight** and **digital innovation** can together improve **project profitability** and **delivery performance** in high-rise construction.

4. CORE EXPECTATIONS

- Participants should first **identify the key bottlenecks** in floor cycle time, then propose **targeted interventions** that improve overall reliability rather than simply speeding up individual activities. Teams may choose a single solution pathway or combine several approaches, depending on the scope and maturity of their concept.
- Possible directions include a **digital planning platform**, **AI-based predictive scheduling**, **digital site dashboards**, **smart formwork tracking with maintenance monitoring**, **construction analytics**, **digital inspection workflows**, and **BIM-linked tools** for progress visualization, clash detection, and coordination enhancement.

- Students are expected to **move beyond conventional project management tools** and propose innovations that demonstrably improve **execution reliability** on live projects. Any innovation should be **purposeful and technically justified**, with a clear link to **cycle-time reduction**, **better coordination**, or stronger **decision support**.

- The prototype should illustrate a **robust**, **scalable technical architecture** that can realistically operate in construction environments. Where relevant, teams may incorporate **machine learning**, **deep learning**, **computer vision**, **time-series forecasting**, **reinforcement learning**, or **predictive analytics**. The overall system should exhibit **clear data flows**, the ability to **scale across projects**, and credible potential for **practical deployment**.

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5. EXPECTED DELIVERABLES

- Each participating team should submit a concise but well-structured package that explains the industry problem, presents the proposed solution, and demonstrates how the concept can function in practice. This should include a **problem analysis** covering current practices, root-cause analysis, stakeholder mapping, literature inputs, and industry benchmarking, followed by a clear **solution description** addressing innovation, technical approach, value proposition, and expected impact.

- A **functional prototype** is expected to demonstrate the core workflows, key user interfaces, data visualization elements, and any major algorithms. Teams should also provide **technical documentation** covering system architecture, database design, APIs, AI models where applicable, data flow, cybersecurity considerations, and scalability strategy, together with **UI/UX material** such as user personas, wireframes, screen designs, navigation flows, and dashboard layouts.

- In addition, teams should outline a **business model** identifying target customers, revenue logic, commercialization strategy, implementation cost, return on investment, and scalability across projects. A **demonstration video** of approximately five to seven minutes and a **pitch deck** of up to ten slides should communicate the problem, solution, prototype, innovation, and future direction clearly and professionally.

6. EVALUATION CRITERIA

- Submissions will be evaluated on understanding of the construction problem, engineering innovation, technical feasibility, practical applicability, prototype functionality, scalability and industry adoption potential, business viability, and the quality of presentation and demonstration.
- Teams should therefore aim for solutions that are not only technically impressive, but also practical, clearly communicated, and deployable in real project conditions.

Parameter
Understanding of Industry Problem
Innovation and Originality
Engineering and Technical Feasibility
Quality Improvement and Structural Safety Impact
Scalability and Industry Readiness
Business Viability
Presentation and Demonstration

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7. EXPECTED IMPACT

A successful solution should contribute to **faster project delivery, lower construction cost, higher labour productivity, improved planning reliability, better resource utilization, stronger quality control, safer execution, reduced project risk,** and **improved contractor profitability.**

More broadly, such solutions can enable **data-driven decision-making** for project teams and accelerate the **digital transformation** of high-rise construction in India.

- FASTER PROJECT DELIVERY
- LOWER CONSTRUCTION COST
- HIGHER LABOUR PRODUCTIVITY
- IMPROVED PLANNING RELIABILITY
- BETTER RESOURCE UTILIZATION
- STRONGER QUALITY CONTROL
- SAFER EXECUTION
- REDUCED PROJECT RISK
- IMPROVED CONTRACTOR PROFITABILITY

By improving **schedule reliability** and **engineering efficiency** while remaining practical for live deployment, the proposed innovations can also support more **efficient** and **sustainable high-rise construction** in line with the broader vision of **Viksit Bharat 2047.**

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Thank You!

TO ALL PARTICIPANTS, MENTORS & PARTNERS

"Desh को बनाना है। कुछ कर के दिखाना है।"

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