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INNOVATION BOOT CAMP IN CIVIL ENGINEERING

Building Bharat Sampaark - National Civil Engineering Hackathon

Problem Statement :

Development of a Digital Learning Application for On-Site Construction Workmen

Theme : CONSTRUCTION TECHNOLOGIES

INITIATIVE PARTNERS

AICTE

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1. BACKGROUND

India's construction industry employs more than **60 million people** across many trades such as bar benders, carpenters, electricians, masons, plumbers, welders, painters, equipment operators, helpers, and others. Most of them learn on the job by watching others, trying things out, or relying on quick instructions from supervisors. This informal learning often leads to **uneven workmanship, mistakes in reading drawings, incorrect use of tools and machinery, and weak knowledge of quality and safety practices.**

At the same time, engineers and supervisors typically have formal technical education and access to codes, standards, and digital tools. There is a **clear gap between what is designed and what is executed on site.** There is also a strong need for **simple, visual, and multilingual learning tools** that can reach workers directly on the construction site and help them learn in small, practical steps.

This hackathon problem invites students to use their **creativity and technical skills** to help close this gap.

2. PROBLEM STATEMENT

Design and prototype an innovative, **mobilefirst digital learning platform** (Android / iOS / web) for construction workmen. The platform should:

- Offer **tradespecific learning modules** (for example, bar bending, carpentry, electrical, masonry).
- Be **easy to use** for people with limited literacy, using visual and audio content.
- Help workers **learn independently** on site, in short sessions.
- **Improve productivity, workmanship quality, and safety**, and support better employability.

Your solution should translate engineering standards, drawings, and site procedures into **simple, engaging learning experiences** that workers can access whenever they need them.

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3. OBJECTIVE

This challenge encourages student teams to **understand real on-site problems** and respond with a **practical digital solution** that improves how construction work is learned and performed. The app should help **reduce errors, rework**, and **material wastage** while supporting **better workmanship**, a **stronger safety culture**, and more **standardized construction practices** across projects and regions.

The solution should also support **continuous skill development** for workers and junior site staff while giving supervisors, contractors, and trainers a more **structured way to guide and monitor learning**. At a broader level, the problem aligns with the goal of building a more **skilled** and **technology-enabled construction workforce for India**.

4. TARGET USERS

You can choose to focus on **one trade** or **multiple trades**.
Typical users include:

Workmen:

- Bar Benders
- Carpenters
- Electricians
- Plumbers
- Masons
- Welders
- Tile Layers
- Painters
- Scaffolding Workers
- Concrete Workers
- Survey Assistants
- Equipment Operators
- Helpers

Site leadership: site supervisors, contractors, and skill trainers.

Clearly state which users you are targeting and explain how your design **meets their needs** (for example, language choice, device type, typical workday, common tasks).

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5. CORE EXPECTATIONS

The app should provide clear learning paths for each selected trade. For example, a pathway for bar bending may start with basic reading of bar bending schedules and drawings, then move to steel identification, hooks and bends, lapping and anchorage rules, cover blocks, and correct reinforcement placement in beams, columns, slabs, and footings, finishing with simple quality checks that workers can perform themselves. Similar structured paths can be created for carpentry, focusing on formwork components, assembly and alignment, and safe removal, or for electrical work, covering wiring standards, conduit installation, earthing, and fundamental electrical safety.

Learning in the app should be driven mainly by **visual and audio content** rather than long text. Short animations, illustrated graphics, step by step images, and simple videos can make concepts easier to understand. Voice instructions and local language narration can guide users through tasks and lessons. The platform should support more than one **Indian language**, and the overall design should make it **easy to add new languages** over time. **Clear icons and visuals** are important so that users can navigate even if they are not fluent in the main language.

Since construction sites often have **low cost Android phones** and **uneven internet connectivity**, the app must be designed with these constraints in mind. It should run smoothly on basic devices, allow users to **download modules for offline use**, and **synchronize learning progress** when the device is online again. **Efficient handling of data and battery usage** is essential, as is an interface that **works well outdoors**, including under bright sunlight. **Large buttons**, **simple menus**, and navigation that can be used with **one hand** will improve usability.

Safety learning should be a **central part** of the app. Basic topics include proper use of personal protective equipment, safe working at height and on scaffolding, electrical safety, excavation and lifting operations, fire safety, emergency response, and daily toolbox talks. The app should also encourage **short daily learning sessions** of a few minutes, offering tips, safety reminders, and quick quality checks that fit around normal work activities.
If feasible, the system may provide **simple certificates, digital badges**, or **supervisor verified skill records** that workers can use to demonstrate their competencies.

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6. INNOVATION AND TECHNOLOGY

Students are encouraged to bring in new ideas and technologies, provided they remain **realistic for use on construction sites**. For example, **augmented reality overlays** could help workers understand what a correctly placed reinforcement looks like when they point their camera at a drawing or element. **AIbased chatbots** could answer common questions in local languages, and **basic computer vision** could help identify tools or check visible safety conditions. **Game-like elements** such as points, levels, and leaderboards could motivate workers to learn regularly and practice safe behaviour.

The technical design should be **sound and scalable**. Teams may choose familiar technologies such as **Flutter, React Native, native Android**, or **progressive web apps** for the frontend, and frameworks like **Node.js, Django**, or **Spring Boot** for backend services. Suitable databases, whether relational or NoSQL, should be used for storing user data and content. Deployment on a widely used **cloud platform** will help illustrate how the solution could grow to serve many sites and users. AI functionality can be built with **opensource tools** and standard **APIs** for speech, vision, OCR, and translation, with basic attention to privacy, security, and performance.

7. SUBMISSION REQUIREMENTS

Each team should submit a concise **problem understanding note** describing the key site-level challenges, target users, and any observations or research that informed the proposed approach. This should be accompanied by a clear **solution description** explaining what the app does, why it is useful, and how its features work together to address the identified problem.

A **working prototype** is strongly encouraged, even if limited to the main user flows. Teams should also include representative **interface designs**, simple **system architecture**, a short **technical note** on the **technology stack** and major components, and a brief explanation of how the platform could be **deployed and scaled** for practical adoption by contractors, training agencies, or public programs.

A **demonstration video** of approximately **five to seven minutes** and a **pitch deck** of up to **ten slides** should communicate the concept clearly to the jury.

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8. EVALUATION CRITERIA

Submissions will be assessed on how well they demonstrate an **understanding** of real site conditions and the needs of construction workers and supervisors. The jury will look for **originality and relevance** in the proposed solution, especially where it goes **beyond a simple elearning app** to offer genuinely helpful interactions or features. **Technical soundness and scalability** of the architecture and implementation will be considered, along with the **simplicity and accessibility** of the user experience.

The potential for **real-world adoption and impact** will be an important factor: solutions that can realistically improve **quality, safety, and productivity** on actual projects will be rated highly. **Clear, engaging communication** of the idea through the written submission, prototype, video, and pitch will also influence the evaluation.

Parameter	What We Look For
Understanding of Industry Problem	Depth of understanding of real site challenges and user needs.
Innovation and Originality	Creativity, uniqueness, and relevance of the proposed solution.
Engineering and Technical Feasibility	Soundness of technology, system design, and implementation.
Quality Improvement and Structural Safety Impact	Potential to improve quality, reduce defects, and enhance safety on construction sites.
Scalability and Industry Readiness	Ability to scale, integrate, and adapt for wide industry adoption.
Business Viability	Sustainability of the model and value for stakeholders.
Presentation and Demonstration	Clarity, effectiveness, and impact of submission, prototype, video, and pitch.

9. EXPECTED IMPACT

A strong solution will show how the proposed app can gradually **improve construction quality and safety** on the ground, help workers **learn faster**, and **reduce rework and wastage.** It will demonstrate how supervisors and contractors can use the tool to **build a more skilled and reliable workforce** and how workers can gain **better recognition and opportunities** through more visible and documented skills.

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Thank You!

TO ALL PARTICIPANTS, MENTORS & PARTNERS

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