Marwadi University Marwadi Chandarana Group NAAC A+	**Marwadi University** **Faculty of Technology** **Department of Information and Communication Technology**	
Subject: Capstone Project (**01CT0715**)	**Aim**: Ideation and stakeholder need analysis - Intermediate Review	
Project Documentation	**Date:**- 25-09-2025	**Enrollment No:-** 92200133030 92310133007

1. Stakeholder Identification and Needs Analysis

For the CodeArena platform, two primary stakeholder groups have been identified: the students who will use the platform for practice, and the faculty members who will manage the content and monitor student progress. An analysis of their distinct needs was conducted through informal interviews with a sample group of students and professors within the university.

1.1 Primary Stakeholder Group 1: Students

Students are the end-users of CodeArena. Their primary goal is to improve their coding skills to secure internships and full-time employment in the industry.

Identified Needs and Challenges:

- Need for Guided Practice: Students often feel overwhelmed by the vast number of problems on public platforms. They need a structured path that helps them progress from easy to difficult topics, rather than a random assortment of questions. They are often unsure "what to practice next."
- Need for Relevant, High-Quality Content: Students are most motivated when they know the practice material is directly relevant to their coursework and the hiring processes of companies that visit the campus. Access to a repository of previously asked interview questions is a high-priority need.
- Need for Motivation and Engagement: Learning to code can be a frustrating and isolating experience. Students need motivational drivers beyond simple problem-solving, such as peer competition, recognition for achievements (gamification), and a sense of community.
- Need for Instant, Constructive Feedback: While getting a "Correct Answer" verdict is good, understanding *why* a solution is wrong ("Time Limit Exceeded," "Wrong Answer," "Memory Limit Exceeded") is critical for learning. The feedback loop must be immediate and clear.

1.2 Primary Stakeholder Group 2: Faculty Members

Faculty members are the administrators and content curators. Their goal is to effectively teach practical skills and efficiently measure student competency.

Identified Needs and Challenges:

- Need for a Centralized Management Tool: Faculty currently lack an efficient system to upload, categorize, and assign coding problems. The process is often manual and scattered across different platforms or documents.
- Need to Reduce Manual Grading Overhead: Manually checking and grading dozens or hundreds of programming assignments is incredibly time-consuming and prone to inconsistency. An automated judging system is a critical need to free up faculty time for more impactful teaching activities.
- Need for Actionable Analytics: To provide targeted help, faculty need to understand class-wide performance. They need a dashboard that can answer questions like: "Which topics are students struggling with the most?" or "Which students are falling behind in practice?"
- Need for Curriculum Integration: Faculty require the ability to link practice problems directly to their course syllabus. For example, creating a problem set for "Week 4: Dynamic Programming" that students can complete as a lab assignment.

2. Problem Statement

Existing competitive programming resources offer a one stop shop experience that fails to address the specific needs of university students and faculty. Students lack personalized guidance and engaging motivational structures, while faculty lack the tools for seamless curriculum integration and data-driven insights into student performance. This results in a disconnected and less effective learning process for preparing students for the demands of the industry.

3. Ideation of Creative Solutions

3.1 Solution Idea 1: Learning Path

This solution includes creating a specialized learning path tailored to a specific course or a specific company. This enables the students to prepare for a specific role, company or a specific programming language. It helps faculty and the organization to maintain a repository of questions based on the company / course.

- How it Works: The system allows faculty to curate role- or company- or course-specific question sets. Students then follow customized learning paths aligned with these requirements, practicing and improving their problem solving skills.
- Alignment with Needs: This ensures students gain role-relevant and academics relevant expertise, faculty maintain an updated repository, and companies get candidates pre-trained on their exact skill demands—creating a seamless integration of academics and industry.

3.2 Solution Idea 2: Gamified Leaderboards and Peer Collaboration

This solution focuses on boosting user engagement through competition and community-building features.

- How it Works: The platform would feature dynamic leaderboards (overall, weekly, topic-wise) to foster healthy competition. Students would earn points and badges for solving problems, maintaining streaks, and solving problems from different categories. A "Challenge" feature would allow students to challenge a peer to solve a specific problem within a time limit.
- Alignment with Needs: This directly addresses the student's need for motivation and engagement, transforming solitary practice into an interactive and rewarding experience.

3.3 Solution Idea 3: Deep Curriculum Integration and Analytics Dashboard

This solution empowers faculty by making CodeArena an integral part of the academic curriculum.

- How it Works: Faculty would get a dedicated dashboard to create "courses" or "assignments" within the platform. They could bundle a set of problems, set deadlines, and link them to their official course syllabus. The platform would auto-grade submissions and present the faculty with a powerful analytics dashboard showing class-wide statistics, individual student progress, and common points of failure on specific problems.
- Alignment with Needs: This directly meets all faculty needs: a centralized management tool, automated grading, actionable analytics, and deep curriculum integration.

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4. Relevance to ICT Domain

The problem and proposed solutions are deeply embedded in current trends and technologies, ensuring the project is both relevant and impactful.

- **Big Data and Analytics:** The platform will generate a significant amount of data on student learning patterns. Analyzing this data (as proposed in Solution Idea 3) to provide insights to faculty is a classic Big Data problem. These insights can even be used to refine the university's curriculum over time.
- **AI and Adaptive Learning:** Solution Idea 1's specialized learning paths can leverage AI algorithms to recommend problems or modules tailored to each student's skill level, learning speed, and role-specific requirements, creating a personalized learning experience.
- **Gamification and Real-Time Interaction:** Solution Idea 2 applies tracking achievements, maintain dynamic leaderboards, and enable peer challenges. Real-time updates, point calculations, and streak management use interactive web technologies and event-driven programming.
- **Cloud Computing and Platform Integration:** All three solutions require scalable cloud infrastructure to handle multiple users, store large question repositories, maintain dashboards, and ensure accessibility from any device or location.
- **Automation and Intelligent Feedback Systems:** Auto-grading (Solution Idea 3) and progress tracking use automated evaluation algorithms to reduce faculty workload and provide immediate feedback to students, enhancing learning efficiency.