



Invention Disclosure Form (HIVE)

Office of Intellectual Property Management (OIPM)

Name of the Department:

Computer Science and Engineering

1. TITLE of Invention:

MediVault.AI: A System and Method for Unified Health Record Management and Interpretation using QR-Based Access and Generative Artificial Intelligence

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4. Description Of the Invention:

This invention, MediVault.AI, is a comprehensive digital healthcare ecosystem designed to consolidate a patient's fragmented and longitudinal health records into a single, secure, and interoperable cloud-based repository.

The core of the system is a novel method for data access where each patient is assigned a unique, encrypted Quick Response (QR) code that functions as a universal, patient-controlled key to their entire medical history.

The system comprises a multi-tier software architecture that includes a frontend client for user interaction, a backend server for business logic, a secure database, and an integrated Generative AI engine. Upon an authorized request initiated by a QR code scan, the AI engine performs real-time analysis of the patient's stored data. Its primary functions are:

For Clinicians: To synthesize years of unstructured data (physician's notes, lab reports) into a concise, clinically relevant summary, highlighting significant trends, anomalies, and potential areas of concern.

For Patients: To translate complex medical terminology, diagnostic findings, and treatment instructions into simple, understandable language, available in multiple local languages to enhance health literacy and patient engagement.

This invention creates a closed-loop information system where patient data is not merely stored but is actively interpreted to support clinical decision-making and empower patients.

5. Field of the Invention:

Healthcare, Digital Health, Artificial Intelligence, Health Informatics.

6. Main Objective:

The primary objective of this invention is to establish a novel system and method for providing instantaneous, secure, and universally interoperable access to a patient's complete, longitudinal medical history. This is achieved through the implementation of a unique, patient-controlled QR code that serves as a universal access key.

The uniqueness of this objective, distinguishing it from prior art such as traditional Electronic Health Records (EHRs), lies in three core areas:

- **Instantaneous Access in Critical Situations:** The system is designed to provide immediate access to life-saving information (e.g., allergies, blood type, chronic conditions) in emergency scenarios where the patient may be unresponsive. This immediacy, facilitated by a simple QR scan, overcomes the delays inherent in logging into multiple, disparate hospital portals.
- **Patient-Centric Universality:** Unlike provider-locked EHRs, this system's objective is to create a truly universal record that is controlled by the patient. The QR key works across any healthcare setting—from

a local clinic in Ghatkesar to a major hospital—ensuring that the data is always available, regardless of the provider.

- **Ensuring Continuity of Care:** The objective is to create a single source of truth for a patient's entire medical journey. This directly addresses the problem of fragmented records, ensuring that every healthcare provider has a complete and consistent history, which is fundamental to accurate diagnosis and effective long-term treatment.

7. Secondary Objective:

- **To Reduce Redundant Medical Procedures and Associated Costs:**
A key objective is to mitigate the significant financial burden caused by repetitive diagnostic tests, which often result from a clinician's lack of access to a patient's prior records. By providing a single, universally accessible source of truth for a patient's entire medical history, this invention aims to provide a
- **verifiable mechanism** for eliminating such redundancies. This is unique because, unlike siloed systems that inadvertently encourage repeated tests, this system's architecture is designed to **proactively prevent** them, leading to direct and measurable cost savings.
- **To Empower Patients Through Enhanced Health Literacy:** The invention aims to fundamentally change the patient's role from a passive

recipient of care to an active, informed participant. This is achieved through its unique

- **AI-powered interpretation layer**, which translates complex medical jargon into simple, understandable insights in the patient's native language. This objective of democratizing health information and bridging the knowledge gap between patient and provider is a significant departure from traditional patient portals that merely present raw, unexplained data.
- **To Provide Active Clinical Decision Support:** The objective is to elevate the system from a passive data repository to an **active clinical decision-support tool**. By leveraging AI for automated summarization and trend analysis, the invention aims to provide a
- **Cognitive offload** for healthcare professionals, enabling them to quickly identify long-term patterns and make more informed decisions. This is a novel approach compared to the manual and time-consuming process of reviewing scattered paper records or disparate digital files.
- **To Ensure Scalability and National Integration:** The system is purposefully designed with an objective of seamless integration with large-scale national digital health frameworks, such as India's Ayushman Bharat Digital Mission (ABDM). Unlike proprietary, "walled-garden" systems that resist interoperability, this invention is intended to serve as a

- User-friendly bridge to national platforms, thereby accelerating the nationwide transition away from paper-based records and promoting a cohesive digital health infrastructure.

8. Background of the Invention:

- In the current healthcare landscape, particularly in India, patient health records are severely fragmented, scattered across numerous hospitals and clinics in both physical and disparate digital formats. This creates information silos, preventing the formation of a holistic, longitudinal view of a patient's health. Clinicians often lack access to a complete medical history, making it difficult to identify long-term health trends or make fully informed decisions. This information gap frequently leads to redundant and costly diagnostic tests, and in emergency situations, the absence of critical information like allergies or chronic conditions can be life-threatening.
- Existing systems, including traditional Electronic Health Records (EHRs), are predominantly provider-centric and lack the necessary interoperability to communicate with each other. A universal, patient-controlled access mechanism that works seamlessly across different healthcare providers is notably absent.

9. Drawbacks in them:

The current methods and systems for managing patient health records, including both traditional paper-based files and existing Electronic Health Records (EHRs), suffer from several fundamental drawbacks that impede the delivery of safe, efficient, and equitable healthcare.

- **Systemic Data Fragmentation and Siloing:** Patient data is currently confined to proprietary, non-communicating digital "silos" within individual hospitals or clinics. This architectural flaw makes it impossible to form a longitudinal health record that provides a complete, chronological view of a patient's health journey. As a consequence, clinicians are often forced to make critical decisions without a full understanding of pre-existing conditions or past treatments, which is particularly dangerous for managing chronic diseases.
- **Lack of True Interoperability:** The absence of a standardized, effective protocol for data exchange between different healthcare providers is a critical failure of the current digital health infrastructure. Even when records are digital, this lack of interoperability means there is no seamless way to transfer information, forcing a reversion to unreliable manual methods like printing records. This negates many of the potential benefits of digitization.
- **Inefficiency and Increased Cognitive Load on Clinicians:** Healthcare professionals are forced to spend a significant amount of

valuable time manually gathering and attempting to synthesize scattered patient information from various sources. This not only reduces the time available for direct patient care but also increases the cognitive load on the clinician, which can contribute to burnout and elevate the risk of diagnostic errors.

- **Inherent Unreliability of Manual and Paper-Based Systems:**

Manual, paper-based records are highly susceptible to physical damage, loss, and misinterpretation due to illegible handwriting, leading to potentially catastrophic medical errors. These systems lack version control, audit trails, and backup capabilities, making them a fragile and inadequate medium for storing life-critical information.

- **Information Asymmetry and Lack of Patient Empowerment:**

Existing systems promote information asymmetry, where patients possess records but lack the ability to comprehend them. Medical reports are filled with complex jargon, leaving patients disengaged and unable to participate meaningfully in their own healthcare. This lack of understanding is a major barrier to treatment adherence and patient empowerment.

10. **Applications of the Project :**

The novel system and method of this invention have wide-ranging applications across the healthcare ecosystem, creating unique value for

various stakeholders by leveraging its core features of universal access and AI-powered interpretation.

- **Hospitals and Clinics:** In both outpatient and inpatient settings, the invention can be used to dramatically accelerate patient onboarding and improve clinical decision-making. For a new patient, a single QR scan provides an instant, AI-summarized medical history, saving critical time during consultations. This is a unique advantage over the current time-consuming process of manual history-taking or attempting to consolidate scattered records.
- **Emergency and Acute Care Services:** This is a primary application where the invention can be life-saving. For an unresponsive or incoherent patient, emergency responders and ER physicians can use the QR key to gain immediate access to critical information such as blood type, known allergies, chronic conditions, and current medications. Unlike static medical alert bracelets, this system provides access to a dynamic, complete, and up-to-date health record.
- **Chronic Disease Management:** The platform serves as a powerful tool for patients with chronic conditions (e.g., diabetes, hypertension). They can use it to aggregate their records from various specialists, track lab results over time, and understand their health trajectory through AI-generated trend analysis. The unique AI-powered interpretation layer

empowers patients to better self-manage their condition, a feature absent in simple record-storage applications.

- **Health Insurance and Claims Processing:** The invention can be applied to streamline the insurance claims verification process. With patient consent, insurers can access a trusted, chronological, and auditable record of a patient's treatments and diagnoses. This unique access to a single source of truth can significantly reduce administrative overhead, mitigate fraud, and accelerate claims settlement.
- **National Digital Health Ecosystems:** The system is designed to function as a "last-mile" solution and an accelerator for national health initiatives like India's Ayushman Bharat Digital Mission (ABDM). It can serve as a highly user-friendly interface for citizens to manage and share their health records linked to their national health ID. Its uniqueness lies in its role as an enabling technology that can drive adoption of government platforms by offering a superior and more intuitive user experience.

11. **Description of the Components/Machinery/Process:**

The invention is a software-based system comprising a unique combination of components and a novel process flow.

I. System Architecture and Core Components

The system is architected as a multi-tier, cloud-native client-server model designed for security, scalability, and interoperability.

- **Presentation Tier (Frontend Client):** This tier consists of the user-facing applications:
 - **Mobile application** for patients (compatible with Android/iOS), which serves as the primary interface for profile management, document uploading, and displaying their unique QR code.
 - **Web-based dashboard** for authenticated clinicians and healthcare facilities, which includes the functionality to scan QR codes and visualize patient data and AI-generated insights. These clients are developed using modern frameworks like React or Flutter.
- **Logic Tier (Backend Server):** This is the central nervous system of the invention, responsible for all business logic. It manages secure API endpoints, handles user authentication, orchestrates the data encryption and decryption processes, and serves as the intermediary between the frontend clients, the data repository, and the AI engine. This tier is built on robust technologies such as Python or Node.js.
- **Data Tier (Secure Data Repository):** This is a cloud-based secure storage system composed of:
 1. A primary database (e.g., PostgreSQL) that stores structured data, user metadata, and pointers to health records.

2. A secure object storage solution (e.g., Firebase Storage or AWS S3) where all patient documents (PDFs, images) are stored in an **end-to-end encrypted** format.
- **Intelligence Tier (AI Engine):** This is a modular component that interfaces with one or more external **Generative AI models**. Its sole purpose is to receive de-identified health data from the backend server and perform specific computational tasks, including:
 1. **Summarization** of long medical histories.
 2. **Translation** of medical terminology into simple, local languages.
 3. **Trend detection** from time-series data (e.g., lab results).
 - **QR Code Generation and Management Module:** This unique component is responsible for generating a **unique, non-reversible, and encrypted key** for each patient upon registration. This QR code is not merely a link but a secure token that initiates the authentication and data access protocol.

II. Process Flow (Method of Operation)

The operational process of the invention is a novel method that distinguishes it from existing systems. The flow is as follows:

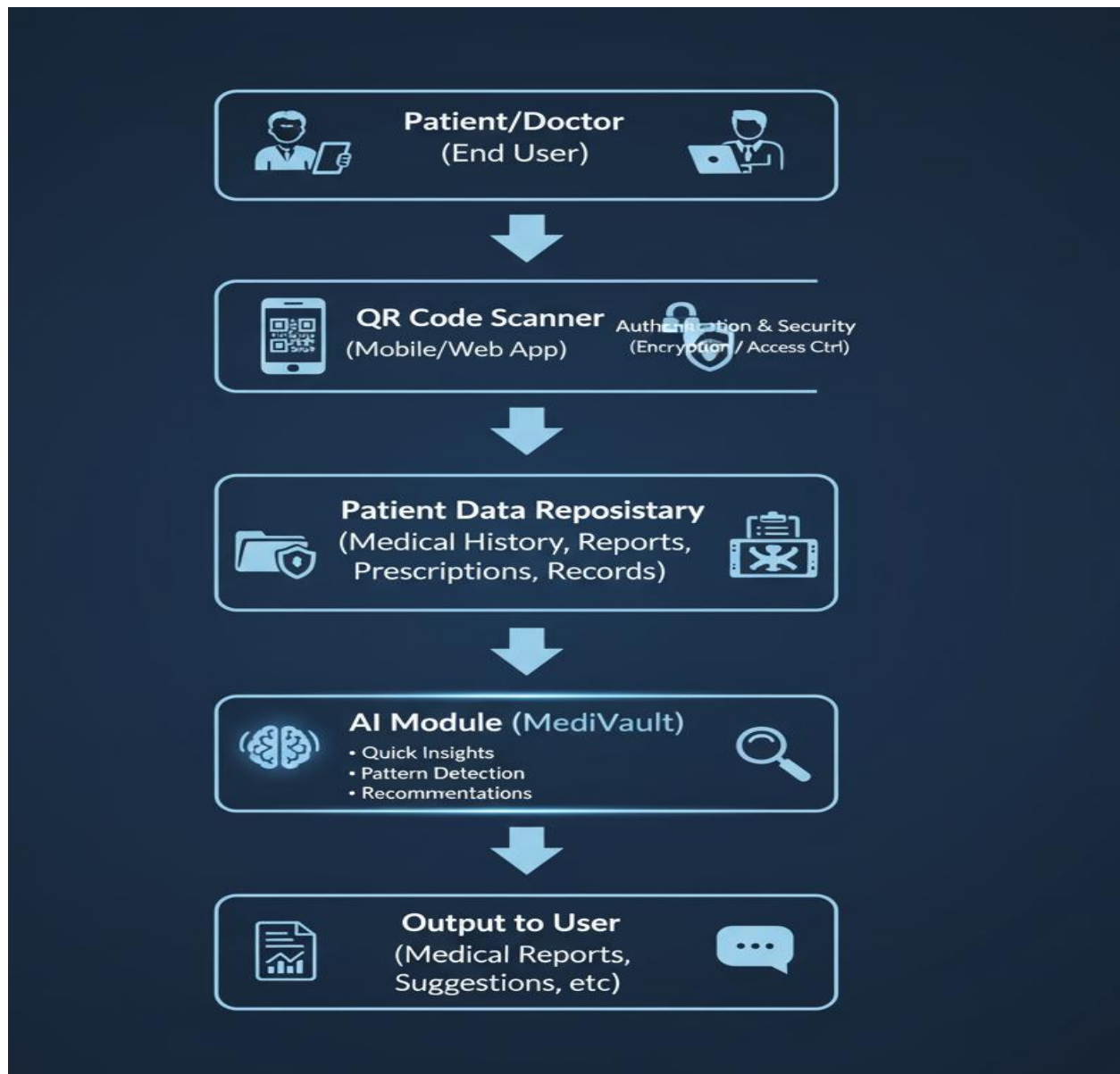
- **Patient Onboarding and QR Key Generation:** A new patient registers through the mobile application. Upon successful identity verification, the

- **QR Code Generation and Management Module** creates a unique, secure QR key and links it to the patient's newly created, encrypted digital vault.
- **Data Aggregation:** The patient uploads their historical medical records. The system uses Optical Character Recognition (OCR) to digitize these documents, which are then encrypted and stored in the secure data repository.
- **Access Initiation and Consent Protocol:** A clinician, using the web-based dashboard, initiates an access request by scanning the patient's QR code. This scan acts as a unique trigger for the system's secure
- **consent protocol.** The backend server sends a real-time authentication request (e.g., a One-Time Password or a push notification) to the patient's registered mobile device. Access is only granted upon explicit patient approval.
- **AI-Powered Data Synthesis:** Upon successful consent, the backend retrieves the relevant encrypted data. The data is decrypted in a secure, transient environment and the textual information is passed to the
- **AI Engine.** The AI processes this data to generate a concise summary and trend analysis.
- **Secure Information Delivery:** The backend combines the original data with the AI-generated insights and transmits it via a secure channel to the clinician's dashboard for viewing. The information is presented in

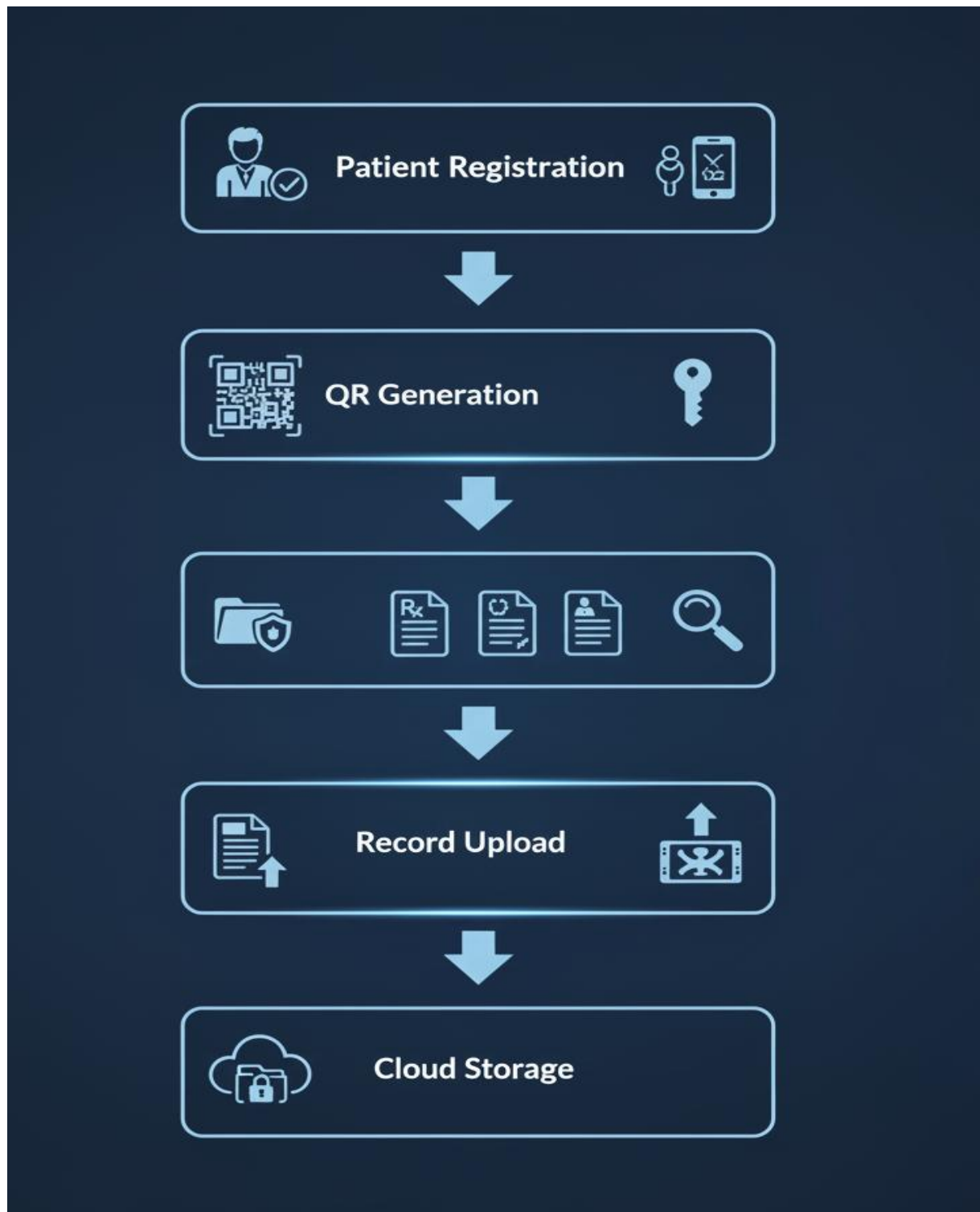
an organized, intuitive manner, enabling quick and informed decision-making.

12. Drawings and their Description:

12.1 Block Diagram of the Setup:



12.2 Flow Chart 1 (System):



12.3 Flow Chart 2 (Process):



13. Novelty of the project:

The inventive step of this system lies in the unique and synergistic integration of three technological concepts to form a novel method for health data management and interpretation, which distinguishes it from existing EHRs.

- **Method for Universal Data Access:** The core novelty is the use of a **persistent, patient-controlled QR code as a universal key**. This initiates a secure, real-time, consent-based protocol for accessing a longitudinal health record that is independent of any single healthcare institution. This method fundamentally solves the problem of cross-provider interoperability by making the patient the point of integration.
- **AI-Powered Semantic Interpretation Layer:** Unlike existing EHRs that are passive data repositories, this invention introduces an active semantic layer. The novelty is in the AI's
 - It translates vast, unstructured medical data into concise, structured clinical insights for providers.
 - It translates complex clinical jargon into simple, localized, and actionable information for patients.
- **bidirectional translation capability:**
 - This layer transforms raw data into meaningful knowledge for all stakeholders.

- **Patient-Centric Interoperability Architecture:** The entire system is architected around the patient as the single point of data exchange. This is a paradigm shift from traditional provider-centric models that rely on complex, brittle, and expensive institution-to-institution integrations to solve the interoperability challenge.

14. Advantages over Existing ones:

- **Frictionless and Universal Access:** The novel QR-based method provides seamless access to a patient's complete history at any point of care, eliminating the need for complex logins or provider-specific portal credentials.
- **Enhanced Clinical Efficiency and Accuracy:** The AI-generated summaries provide a cognitive offload for doctors, allowing them to rapidly assimilate a patient's history and focus on critical decision-making, thereby reducing the risk of errors and improving the speed of care.
- **Democratization of Health Information:** By providing explanations in simple, local languages, the system breaks down literacy and language barriers, promoting health equity and empowering individuals from all backgrounds to actively participate in their own care.
- **Verifiable Cost Reduction:** The immediate availability of a patient's complete diagnostic history provides a verifiable mechanism to

eliminate redundant tests and scans, leading to significant cost savings for both the patient and the healthcare system.

- **Inherent Scalability and Integration:** The patient-centric architecture is inherently scalable and designed for seamless integration with emerging national digital health ecosystems, such as India's Ayushman Bharat Digital Mission (ABDM)

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Date of Submission of Form:

22 August 2025

***Enclosure:**

1. Few photos of the project at the time of Tejas/Hacakthon/Project Expo's.
2. Supplementary technical report (If Any)