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NGO Connect

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Abstract: *NGO Connect is a complete web platform designed to make the day-to-day tasks of non-governmental organizations easier and more efficient by using the MERN stack—MongoDB, Express.js, React.js, and Node.js.*

This system brings together various functions like managing projects, handling volunteers, keeping track of beneficiaries, and recording attendance all in one place, which helps keep data accurate and the organization more transparent. The front end is built using React.js along with Tailwind CSS, Bootstrap, and JavaScript, offering a user-friendly and responsive experience that works well for different roles within the organization. On the back end, Node.js and Express.js help create secure RESTful APIs that link to a cloud-based MongoDB database, making data storage reliable and scalable.

The system also includes a secure authentication process that uses JSON Web Tokens (JWT) for managing user sessions and Firebase for enabling multiple login options like two-factor and social media logins.

There are reporting features that allow users to generate PDF and Excel files using PDFKit and ExcelJS, which helps staff and leaders create customized reports, audit trails, and compliance documents. The workflow is organized into modules that simplify project and volunteer approvals, enable real-time attendance tracking through calendar views, and manage beneficiary information—all from a user-friendly interface that's tailored to different roles. By automating routine tasks, supporting teamwork, and offering better analytics, NGO Connect helps improve the efficiency of processes, responsibility, and how stakeholders interact with the organization.

This platform allows NGOs to manage their resources more effectively, report on their results, and increase their impact while keeping detailed, secure, and auditable records of their operations..

Keywords: NGO management system, MERN stack, React.js, Node.js, Express.js, MongoDB, Tailwind CSS, JWT authentication, Firebase authentication, PDFKit, ExcelJS, Project management, Volunteer management, Beneficiary tracking, Attendance logging, Workflow automation, Data transparency, Reporting, RESTful API, Process efficiency

I. INTRODUCTION

Managing the complex operations of Non-Governmental Organizations (NGOs) involves a range of ongoing challenges, particularly when it comes to how well they run their operations, allocate resources, communicate across different groups, and provide accurate reports.

NGOs often work with tight budgets and teams that are spread out, which makes it easy for manual processes to lead to mistakes, delays, and a lack of clear information. As the need for accountability and up-to-date information continues to grow, there is a greater need for digital tools that can help NGOs improve their efficiency and streamline their work.

The MERN stack — made up of MongoDB, Express.js, React.js, and Node.js — is a great choice for addressing these challenges.

It offers a full-stack JavaScript environment that is flexible and can grow with the needs of an NGO. MongoDB's NoSQL database structure is ideal for managing different types of data in a dynamic way, which matches the changing

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data needs of NGOs. Express.js and Node.js are used to create scalable, efficient back-end services and RESTful APIs that can handle many users and complex tasks at once. React.js on the front end helps build responsive and reusable UI components, making it easier for non-technical staff and volunteers to use the system.

NGO Connect uses these technologies to bring together key functions of NGOs, such as managing projects, coordinating volunteers, tracking beneficiaries, and monitoring attendance.

An integrated dashboard helps increase transparency by offering real-time updates, access based on roles, and a record of all activities. To protect user data, NGO Connect uses a combination of JWTs for secure token-based access and Firebase for flexible login options and multi-factor authentication. It also includes reporting features using PDFKit and ExcelJS, which let NGOs create professional and customizable audit reports — essential for working with donors and meeting legal requirements.

The system's modular design allows it to work well with different sizes of NGOs and various workflows, and it supports scaling both in terms of data and users.

Automating project and volunteer approval processes, as well as using calendar-based attendance tracking, helps reduce administrative work. Feedback from users shows that the platform is easy to use and has good collaboration features, which increases engagement and helps ensure timely responses.

In short, NGO Connect provides a major improvement for NGOs dealing with broken or separate systems and tools.

The design and choice of technology make development more efficient, improve performance when handling large numbers of users, and offer strong security, matching the needs of modern NGO operations. By bringing all these functions onto one platform, NGO Connect helps NGOs make the most of their resources, improve transparency, and securely manage their work in a fast-changing environment.

II. LITERATURE SURVEY

The MERN stack has become increasingly popular for web development in recent years because of its flexibility, scalability, and efficiency in creating dynamic, user-cantered online platforms.

Many studies and real-world projects have shown how the stack's components—MongoDB, Express.js, React.js, and Node.js—work together to build comprehensive systems that handle complex needs like NGO management, educational platforms, charity ecosystems, and government reporting services.

One notable project is an NGO management system developed by Shambhu Raje Shakha in 2024.

This system uses the MERN stack to provide real-time updates, coordinate volunteers, and track projects. MongoDB's flexible document structure allows the system to adapt to changing NGO needs, while Express.js and Node.js are used to create RESTful APIs that communicate with React.js frontends. This study shows how the MERN stack can streamline processes, reduce database rigidity, and boost developer productivity by using JavaScript consistently across the stack [Shakha, IJIRCCE, 2024].

Another example is the Charity Connect platform by Akarsh Jain in 2023.

This platform connects NGOs, donors, and beneficiaries through a centralized system. React is used for the user interface, and Node.js handles server-side tasks, resulting in smooth interactions, automated reports, and real-time updates. Jain's work highlights the importance of integrating JWT-based authentication with MongoDB-stored data to improve security and scalability. Using tools like PDFKit and ExcelJS for generating real-time reports is a practical way to add reporting features within MERN applications [Jain, GitHub, 2023].

Amir Khan and J Jerone Gonsalvez (2023) have also explored the MERN stack's impact on nonprofit efficiency.

Their research discusses how React's dynamic rendering helps create interactive dashboards that boost volunteer engagement, while Node.js and Express make API creation simpler for backend management.

They highlight schema modelling with Mongoose in MongoDB, which lets NGOs manage evolving databases and complex relationships efficiently [Khan & Gonsalvez, IJGST, 2023]. Other studies focus on JavaScript architecture and its benefits for NGO management, particularly in areas like RESTful API design and authentication.

Some research points out the value of integrating Firebase authentication into MERN applications, offering flexibility through social logins and multi-factor authentication—important for NGOs serving diverse users [Firebase Docs, 2025].

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Using libraries like PDFKit and ExcelJS for generating audit-ready documentation is also recognized as best practice in many projects, helping with compliance and donor reporting [Hyperknot, 2023; Node.js Tutorials, 2023].

In practice, the MERN stack's real-time capabilities, combined with MongoDB's schema-less design, enable quick development and deployment of features like attendance tracking, beneficiary management, and project monitoring.

React's component-based approach ensures UIs remain maintainable and scalable, handling growing user numbers and data complexity without performance issues [ReactJS Docs, 2025; MongoDB Guides, 2024]. Comparative studies show that the MERN stack outperforms other technology options in full JavaScript development. This reduces the need for developers to switch between technologies, speeding up the development cycle. This advantage is particularly useful for NGOs needing fast digital solutions for time-sensitive projects and resource management [Aalpha, 2025; Algoxcale, 2025].

In conclusion, the research clearly supports the MERN stack as a top choice for NGO project management systems. Its ability to enable rapid development, secure authentication, dynamic interactions, and strong reporting makes it essential for meeting the evolving needs of nonprofit organizations.

III. METHODOLOGY OF THE SYSTEM

The NGO Connect application is built with a modular architecture that ensures clear separation of concerns, making it scalable and easy to maintain across all its modules.

The development process includes frontend technologies, backend APIs, database management, authentication systems, and reporting tools to simplify NGO operations and ensure smooth system interaction.

A. Frontend Development- The frontend uses React.js, which allows for the creation of reusable and component-based UI structures for managing features such as projects, volunteers, beneficiaries, and attendance tracking.

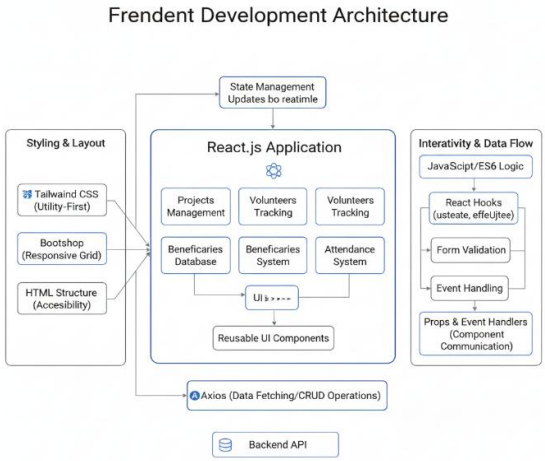

Fig-1: Frontend Development Architecture

React's state management helps update the user interface in real-time based on user input or data changes. Tailwind CSS is used for styling, offering a modern, utility-first approach that ensures the design is responsive and easy to customize. Bootstrap and HTML are also utilized to maintain consistent layout and accessibility across different screen sizes.

Interactive elements like form validation, data submission, and event handling are handled using JavaScript, along with React lifecycle methods and hooks such as use State and use Effect.

Each component is designed to work independently and communicates through props and event handlers. For instance, CRUD operations for volunteer or project records are handled through stateful forms that interact with the backend via Axios, providing a smooth and responsive user experience.

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B. Backend Architecture- The backend is built using Node.js and the Express.js framework, which allows for the creation of RESTful API endpoints for handling authentication and CRUD operations for various modules, such as projects, volunteers, beneficiaries, and attendance.

Middleware functions manage essential services like JSON parsing, CORS configuration, and centralized error handling.

Routes are organized by domain for clarity and scalability, such as /projects, /volunteers, and /attendance.

Authentication is managed through JSON Web Tokens (JWT), which secures routes and ensures that only authorized users can perform sensitive operations. Each token includes user role information to support role-based access control (RBAC).

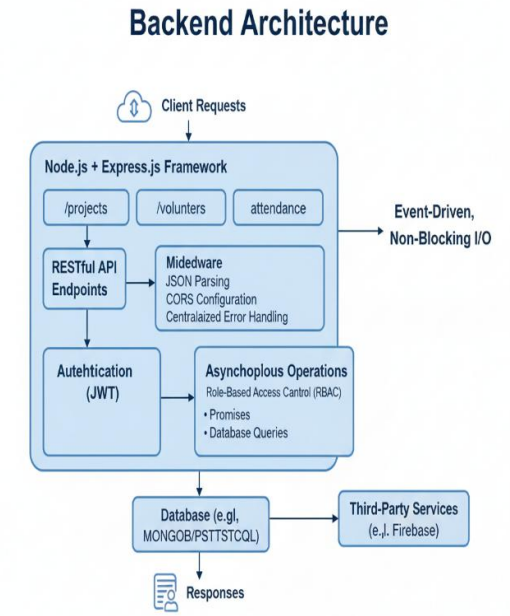

Fig-2: Backend Architecture

Node.js's event-driven and non-blocking model allows the backend to efficiently handle multiple client requests at the same time. Asynchronous operations and Promises are used for database queries and integrations with third-party services like Firebase, enhancing scalability and responsiveness.

C. Database Layer- The system uses MongoDB as its main database due to its flexible and document-oriented design, which is suitable for the dynamic nature of NGO data. Collections represent key entities such as users, projects, volunteers, beneficiaries, and attendance records, while Mongoose schemas define their structure.

The JSON-based document storage makes it easy to update data and integrate with API routes. Relationships between projects, volunteers, and beneficiaries are maintained using MongoDB ObjectIds, enabling efficient data retrieval and aggregation.

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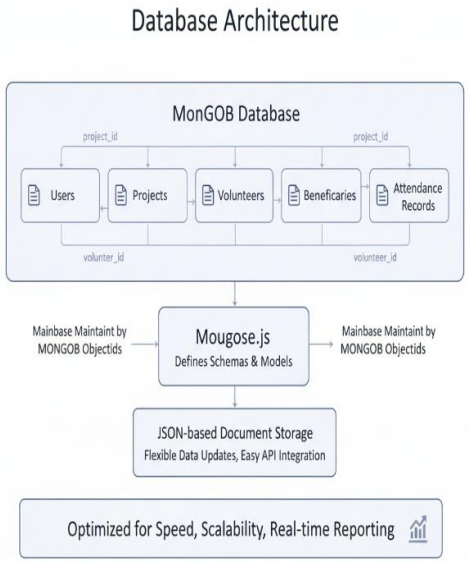

Fig-3: Database Architecture

The database schema is optimized for speed, scalability, and real-time report generation, ensuring smooth data handling across the platform.

D. Authentication and Security

Authentication uses a combination of JWT and Firebase Authentication. BJWT manages session tokens for stateless communication between the client and server, while Firebase provides options like multi-factor and social authentication (e.g., Google, Facebook) for broader accessibility. Firebase's OAuth features improve identity verification and enhance account security.

Role-based access control (RBAC) ensures that only users with specific permissions can perform actions like user management or project approval. The authentication system balances security, flexibility, and ease of access for all user roles.

Reporting and Exporting Modules

The reporting module in NGO Connect supports data transparency and audit readiness through automated report generation.

The backend uses PDFKit to create downloadable PDF files containing structured data like project summaries, attendance sheets, and impact assessments. These PDFs include custom headers, footers, and formatted tables. For spreadsheet-based reports, ExcelJS is used to generate .

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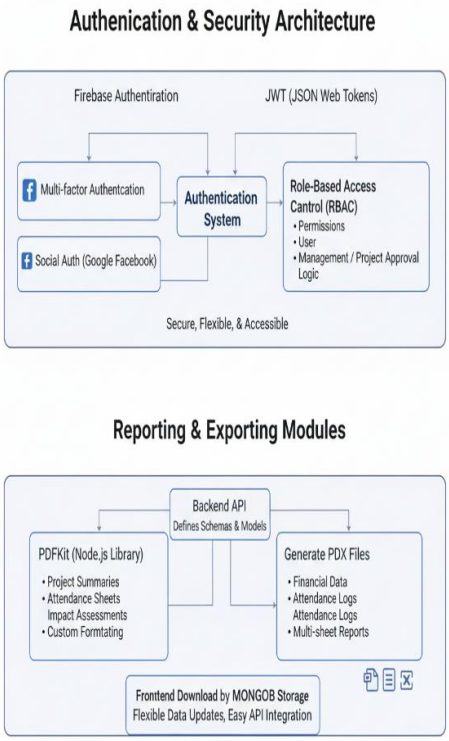

Fig-4: Authentication & Security Architecture

xlsx files that contain financial data, attendance logs, and multi-sheet reports with formulas and styled cells. Both export tools are accessible via secure API routes, and the frontend offers intuitive download options for administrators and users.

E. Workflow

Requirement Analysis – Core functions and user roles were identified through detailed studies of NGO workflows.
Frontend Setup – A React project was initialized using Vite, with modular UI components designed for consistency.
Backend Setup – A Node.js and Express server was configured with middleware for JSON parsing and CORS handling.
Database Design – Mongoose schemas were iteratively developed to represent NGO entities.
Authentication Integration – JWT was implemented for token-based sessions, and Firebase was integrated for OAuth and MFA support.
API Development – RESTful endpoints were created and secured with authentication middleware.
Frontend-Backend Integration – Axios was used for API requests, with responses managed through React state.
Testing and Validation – Unit and integration tests were conducted for both frontend components and backend APIs.
Report Generation – PDFKit and ExcelJS were integrated to generate exportable reports for users and administrators.
Deployment & Optimization – The application was deployed using MongoDB Atlas and optimized for performance and scalability.
Maintenance & Updates – The modular architecture simplifies future upgrades, bug fixes, and feature expansions.

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F. Algorithm (Pseudocode)

Project/Volunteer Approval:

```
FOR each submitted project/volunteer request:
   IF admin reviews and approves:
      Set status = 'approved'
      Notify requester
   ELSE IF rejected:
      Remove from pending list
      Notify requester
END FOR
```

Attendance Tracking:

```
FOR each volunteer, each day:
   IF attendance marked:
      Store 'present' with worked hours
      Update monthly summary
   ELSE IF unmarked after deadline:
      Auto-mark 'absent'
   END IF
END FOR
```

G. Flowchart

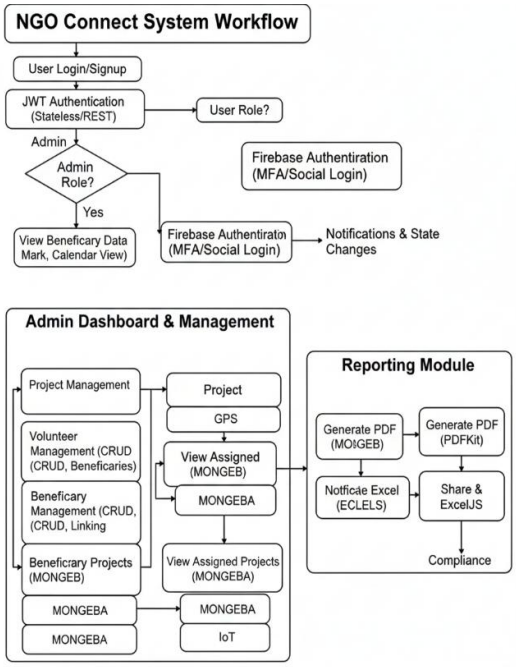

Fig-5 : Flowchart

IV. IMPLEMENTATION

The NGO Connect application is a modern, full-stack MERN project built with strong modularity, security, and user-focused efficiency throughout its design. On the front end, react components make up the user interface. Each main

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feature—like projects, volunteers, beneficiaries, and attendance—is handled by its own React component. These components use State and use Effect hooks to manage local states and keep in sync with the backend in real time. Axios is used for API calls, making it easier to connect with the backend. The user interface includes forms, tables, dashboards, and modals, allowing for interactive features such as live searching, filtering, and pagination. When users create or update projects or volunteers, Axios sends these actions to backend endpoints. The responses update the React state, offering immediate feedback on all CRUD activities. The design uses Material and Tailwind CSS, along with Bootstrap, to ensure responsiveness, accessibility, and a consistent appearance across all devices.

On the back end, Node.js and Express.js form the API layer. Each resource module—projects, volunteers, attendance, and beneficiaries—has its own router that handles HTTP requests, processes incoming JSON data, and enforces authentication through middleware. JWT tokens are used for secure access on protected routes, generated during login. These tokens help validate user identity and control access. Firebase integration provides additional secure login options like multi-factor and OAuth. Express error handling ensures that detailed error messages and proper response codes are returned, even in tricky situations.

MongoDB, managed through Mongoose, stores structured data for all major entities. Schemas are designed to capture all necessary details for NGO operations, including volunteer profiles, project milestones, attendance logs with timestamps and work hours, and beneficiary histories. Relationships between entities—like linking beneficiaries to projects or volunteers' attendance to events—are handled using MongoDB ObjectIds. This allows for complex lookups, aggregations, and projections that support advanced dashboard analytics and auditing.

One key innovation is the reporting module. The backend includes endpoints that generate downloadable PDF and Excel reports. PDFKit is used to create PDFs on the fly, embedding styled tables, dynamic headers, and custom summaries for donor and regulatory reports. ExcelJS is used for Excel exports, supporting formulas and styled workbooks for operational reviews and compliance. These endpoints are protected by authentication middleware, ensuring only authorized staff can generate and access sensitive reports. The system also has strong error recovery across all layers.

The backend uses try-catch blocks and error handlers to provide detailed error messages. The frontend includes user notifications, retry options, and context-aware error displays. Session security is maintained by handling token expiration gracefully, prompting re-logins, and clearing local storage upon logout or session invalidation.

In short, the NGO Connect application represents a highly modular, resilient, and scalable solution for NGO management. By integrating modern tools across the front end, back end, authentication, database, and reporting services, the system ensures a secure, efficient, and user-friendly experience that supports both daily operations and strategic management for NGOs.

V. RESULTS AND ANALYSIS

The NGO Connect application is a modern, full-stack MERN project built with strong modularity, security, and user-focused efficiency throughout its design. On the front end, react components make up the user interface. Each main feature like projects, volunteers, beneficiaries, and attendance is handled by its own React component. These components use use State and use Effect hooks to manage local states and keep in sync with the backend in real time. Axios is used for API calls, making it easier to connect with the backend. The user interface includes forms, tables, dashboards, and modals, allowing for interactive features such as live searching, filtering, and pagination. When users create or update projects or volunteers, Axios sends these actions to backend endpoints. The responses update the React state, offering immediate feedback on all CRUD activities. The design uses Material and Tailwind CSS, along with Bootstrap, to ensure responsiveness, accessibility, and a consistent appearance across all devices. On the back end, Node.js and Express.js form the API layer.

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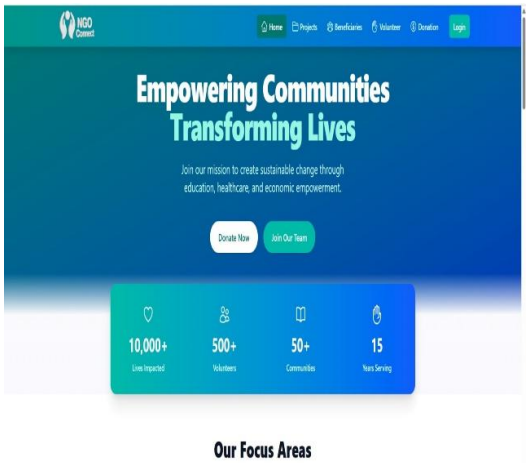

Fig-6 : Home page

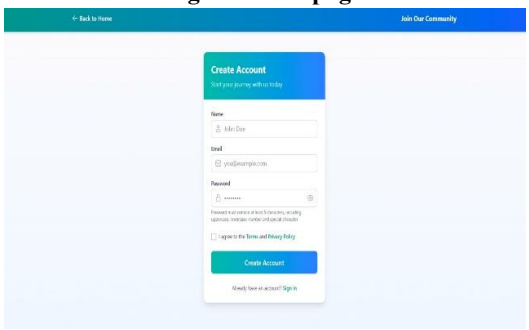

Fig-7 : Create Account

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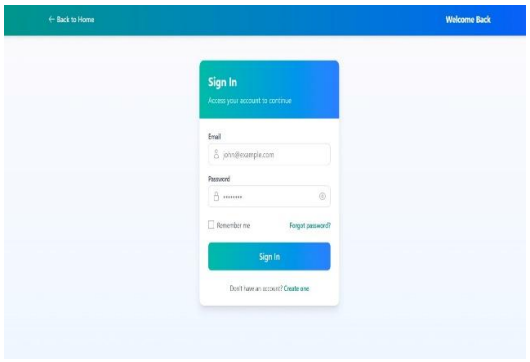

Fig-8 : Sign in

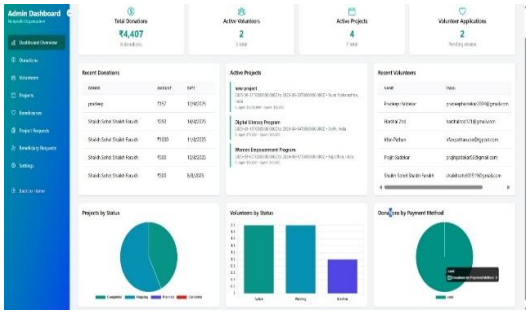

Fig-9 : Admin Dashboard

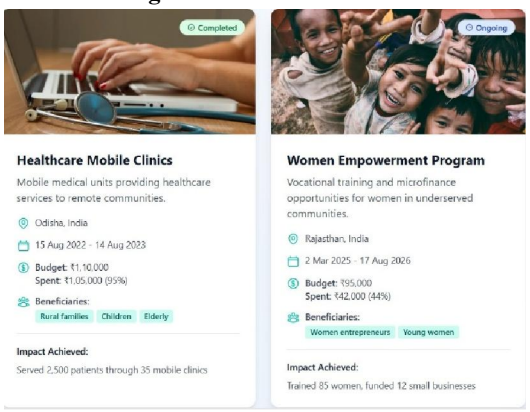

Fig-10 : Project Management.

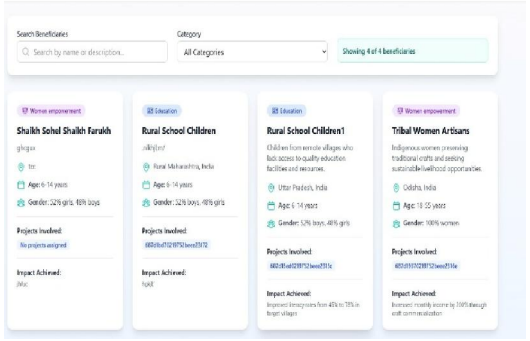

Fig-11 : Beneficiary page

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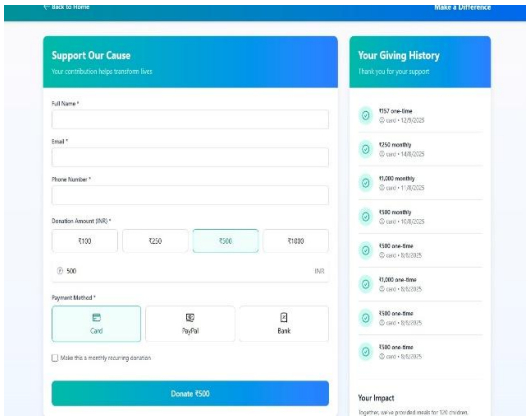

Fig-12 : Donation page

VI. FUTURE SCOPE

The future plans for NGO Connect aim to bring major improvements that will make the platform more useful, engaging, and efficient. One key part of this is creating advanced analytics dashboards. These dashboards will give NGO leaders and supporters easy-to-read, real-time views of important performance data. They will pull in data from many different sources, allowing users to track project results, volunteer efforts, money spent, and the impact on beneficiaries through tools like pie charts, heat maps, and trend lines. The system will let users rearrange dashboard elements and choose how they want to see reports, without needing any technical skills. This will make data clearer and more useful, helping NGOs make better decisions and use their resources more effectively, which in turn can boost their social impact. Another big change is using AI to better target beneficiaries.

Machine learning models will look at past and current data to find which groups need help the most or could benefit the most from support. This can help organizations send resources and personalized messages more effectively, making their programs run smoother and improving how satisfied beneficiaries are. AI can also help analyse written feedback from beneficiaries to get a better understanding of program success. These AI tools will cut down on the work needed to process data manually and make NGO actions more accurate, leading to better results.

In terms of connecting with other systems, NGO Connect will integrate with external donors and payment platforms like Stripe, PayPal, and bank APIs. This will make it easier to process donations, automatically match money to accounts, and send clear receipts and confirmation messages to donors. This integration will help NGOs get money from more sources, track campaigns in real time, and follow financial rules without extra effort. Also, a mobile app will be available for volunteers and beneficiaries, offering features like offline access, alerts, and GPS tracking. This mobile-first design will help collect data in hard-to-reach areas, organize volunteers better, and allow beneficiaries to get services and updates quickly. To make the platform more secure, there will be upgrades to login systems, including support for Single Sign-On (SSO) from providers like Google Workspace, Microsoft Azure, and OAuth 2.0.

This will make it easier for users to log in and reduce the hassle of remembering passwords. More login options, like social media and biometric sign-ins, will also be available, making the platform more convenient and secure for a wider range of users. The system will also use smart security features, like detecting unusual activity and automatically ending sessions, to protect data and ensure compliance with regulations. Together, these changes will turn NGO Connect into a full digital system that handles not just the daily tasks of NGOs, but also supports smart strategy, teamwork, and the ability to act quickly on important issues. This vision keeps up with the latest trends in nonprofit management tools, making sure NGO Connect stays a strong option in the world of social impact technology.

VII. CONCLUSIONS

NGO Connect uses the full MERN stack to create a unified and complete system designed to meet the varied needs of NGOs. Its modular structure makes the platform scalable and flexible, allowing it to work well with NGOs of different

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sizes and levels of complexity. By using JavaScript throughout the system—MongoDB for storing data without a fixed structure, Express.js and Node.js for handling server tasks efficiently, and React.js for creating interactive and fast-loading user interfaces—NGO Connect allows for quick development while keeping performance and ease of maintenance high.

The platform also uses up-to-date security features, including JWT-based token authentication and Firebase's multi-factor authentication along with social login options.

These features make the system more secure while making it easier for users to log in and access the platform. This security setup is important for protecting important data like volunteer and donor information, and it also helps meet legal and industry standards. The way the system handles user sessions and permissions ensures that different types of users, such as admins and volunteers, can only access what they are allowed to. NGO Connect also makes use of advanced tools like PDFKit and ExcelJS to help NGOs create and share professional reports.

These reports are essential for audits, communicating with donors, and staying compliant. These tools allow for detailed insights into how resources are used, the impact on beneficiaries, and the progress of projects, which helps NGOs show their effectiveness and build trust with stakeholders. The platform is built to be easy to maintain and expand, so future improvements like AI-driven analytics, mobile apps, or new integrations can be added without needing to rewrite large parts of the system.

The focus on user experience, fast responses, and clear data access helps NGOs run their operations more smoothly, allowing them to make the most of their resources and have a bigger impact.

In summary, NGO Connect is a powerful, secure, and feature-rich platform that uses the flexibility of the MERN stack and modern development techniques. It helps NGOs manage complicated tasks and data more effectively, offering a solid base for future growth and change in the social development field.

VIII. ACKNOWLEDGEMENT

The acknowledgment section is a detailed way of showing thanks to the open-source projects and communities that have been very important in creating the NGO Connect platform. This shows how valuable teamwork and open-source software are for making a positive impact in society. The main thanks go to the developers and maintainers of React.js, a popular JavaScript library for making websites that respond quickly and work well.

Reacts structure with components and tools like use State and use Effect allows developers to build websites that are easy to manage, expand, and keep up-to-date. The tools and resources around React help create websites that change in real-time, which is very helpful for managing NGOs. Node.js, along with the Express.js framework, forms the core of the system's back end.

Node.js works well with a model that handles many tasks at once, making it efficient for handling many requests at the same time, which is important for keeping the system fast and scalable. Express.js makes it easier to organize the back end by handling routes, middleware's, data processing, and security, which helps in creating APIs for different features like managing projects, organizing volunteers, keeping track of attendance, and creating reports.

MongoDB is used as the database, providing a flexible way to store data that doesn't need a fixed structure.

This is useful for the ever-changing needs of NGOs. MongoDB can handle a lot of data quickly, which is important for storing different kinds of information like project details, records of people helped, and attendance reports.

Using Mongoose, a tool that helps work with MongoDB, makes sure the data is consistent and helps developers interact with the database more easily. For making reports, PDFKit and ExcelJS are key tools.

PDFKit lets developers create styled PDF documents, which is useful for making reports such as summaries of projects, attendance records, and evaluations with custom designs.

ExcelJS helps in exporting complex spreadsheets that include formulas, formatting, and multiple sheets, which is important for financial reports and data analysis in NGOs. This section also thanks the open-source community for their ongoing efforts and willingness to work together.

Their contributions help developers build platforms that are effective, scalable, and secure for social causes. It highlights the importance of sharing knowledge, supporting each other, and using open innovation to create technology that brings about social change and improves how nonprofits work.

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These open-source tools and frameworks are the base of the NGO Connect platform, helping build a system that is flexible, strong, and transparent, supporting the goal of using technology to help people and create positive change.

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