

Construction Connect

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Abstract: Construction sites are usually have many stake holders involved with a very dynamic work flow and demanding a high degree of accuracy in coordination and real-time monitoring. Traditionally, construction management has relied heavily on paperwork, oral conversations, and the annoying multitude of fragmented reporting channels, eventually leading the contractors, in most cases, to miscommunication, delays, additional costs, and lack of transparency. Further, the digital solutions available currently appear to be costly, complex, or terribly ill-fitted for small to medium-scale environments, especially in developing regions.

Index Terms: Construction Management System, MERN Stack, React.js Front end, Node.js Back end, Express.js API, Mongo DB Database: Role-Based Access Control, Task Assignment, Inventory Management, Progress Tracking, Site Plan Annotation, Real-time Data Updates, Cloud Storage Integration, JWT Authentication, Digital Construction Workflow.

I. INTRODUCTION

Connect is a complete platform built to simplify how construction projects are managed from start to finish from early planning all the way to execution and hand over. The goal is to cut down on confusion and misalignment by keeping everyone on the same page. With important information always at hand, team scan make better, faster decisions and avoid the delays that often come from poor communication or disconnected systems. They're designed to keep conversations clear, focused, and tied directly to the work being done Tasks can be assigned, monitored, and updated in one place, so nothing slips through the cracks By bringing everything into one platform, Construction Connect help steams work more efficiently with fewer errors, less rework and lesser time taken. To overcome these challenges, this paper presents a role-based Construction Management System developed using Nextjs for the front end and the MERN stack for back end services. The proposed system unifies all stake holders on a single platform, enabling engineers to assign and monitor tasks, contractors to manage labor resources, workers to update on-site activities, and owners to track project progress in real time.

II. RELATED WORK

Most Current construction management systems typically aim to stream line project coordination by digitalizing elements such as task assignment, documentation, and progress tracking. Construction management software today is still fragmented, with each plat- form designed for a specific segment of the workforce. Engineers might have a system tailored to their workflows; contractors use a different app, while field workers and site supervisors are left with tools that only partially fit their needs. This soloed approach means every group needs its own separate login, setup, and sometimes even training before they can get started. The practical impact is profound the very teams that need to collaborate closely are boxed into isolated digital environments. Imagine an architect who needs real time updates from the construction site but can't access them because their system doesn't sync with the contractor's platform. This lack of integration isn't just inconvenient it leads to critical miscommunications, project delays, and costly errors. In the absence of smooth digital collaboration, teams are forced back onto traditional meth- ods endless phone calls, handwritten notes, and disjointed chat messages. This patch- work process is not only inefficient but also makes it nearly impossible to maintain clear, up-to-date information across all parties.

III. SYSTEM ANALYSIS

Construction projects still run on scattered updates and lots of paperwork. People pass around paper records, send What-s App messages, or just talk things out on site. No surprise this causes delays and confusion between engineers, contractors, and workers. There's no single place to see how things are going in real time, and tracking project progress feels like piecing together a puzzle. Most systems don't even bother with proper role based access, so managing responsibilities or keeping data safe turns into a hassle. Inventory? That's another headache. Without clear digital records, sites end up with shortages or wasted materials. The new system changes all this. It's a web platform built on MERN, pulling everything together in one place. Now you can monitor the whole project from a central dashboard, control that gets access to what, and actually manage construction jobs efficiently. Assign tasks, update progress, and handle inventory right from the interface, all securely backed up behind the scenes. Different user's engineers, contractors, workers, owners each get the right permissions, so everyone sticks to their lane and stays accountable. Photo updates, site plan markings, and daily logs make keeping records easy and boost transparency on site. With all communication in one spot, delays drop and things just flow better. Plus, the system's flexible. You can add features for equipment tracking, attendance, safety checks, or even budget management as you need. Since it scales smoothly, it works great for big teams and multiple projects, making it a smart long-term choice for construction management. Frontend and backend developed using React.js, playing a primary interface for viewing dashboards, submitting forms, updating tasks, inventory, and site progress. Everything can be done on the frontend is communicated to the backend via secure Rest API calls The back end part of this system is created using Node.js and Express.js, which represents the central control area of the entire Project Authentication with JWT, Role Based Permissions, and tasks such as creation or modification of work items, inventory record management, and file uploads are handled in the backend. When asked for information or even when making a simple request from the front end to the backend to upon submitting the request update, the update is processed at the backend level and may interact with the database or cloud drive depending upon the action type.

IV. SYSTEM DESIGN

This system is designed as a modular, extendable web system. MERN architecture-based application Mongo DB, Express.js, React.js, and Node.js. The design is a layered approach, which consists of presentation layer, application layer and data layer, thereby ensuring loose coupling and high maintainability. The frontend of project is developed using React.js, Providing a responsive and interactive between user interface to The main participants including engineers, contractors, workers, and owners. Each function interacts with the system through customized dashboards that display tasks, inventory details, progress updates, and site-relevant information related to their scope of work. The backend, implemented with Node.js and Express.js, handles all Logic of the business, handling APIs, and communicating between the frontend and backend. The system relies on MongoDB as it is the main Data store because of the flexibility and the DBMS offers when dealing with structured, semi-structured data and Unstructured data in the form of text logs, progress notes, and Image meta data. Collections are meant for the users, tasks, Inventory, site plans, daily reports, and annotations, therefore enabling Efficient querying and data retrieval. Authentication and "Security are handled by JSON Web Tokens" To provide the protected access and secure session handling The Design also allows incorporates cloud storage for file uploads Photos, documents, and progress photos. The One can achieve communication between modules through Providing Restful API for easy of data transfer between Applications. On the whole, the design for the system is such that the Scalability for centralized construction Project management with current updates, enhancements and Workflow coordination.

V. SYSTEM ARCHITECTURE

Construction Connect platform system architecture Figure demonstrates how all the elements come together to make Construction Management System. At the top are the users: engineers, contractors, workers, and owners, respectively. The platform based on the role they are in They use a web-based

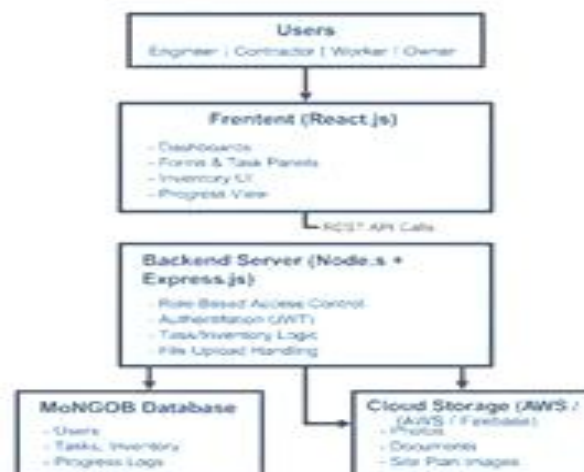


Fig.1.SystemArchitecture

Application data, such as user information, tasks, inventories, and logs of work progress, would be stored on a MongoDB database hosted in the cloud. This cloud setup helps in the scalability, fast access to the data, and real-time updates to all the users. The larger files, like photos, documents, and site plans, would be kept in cloud storage services like AWS. Keeping structured and unstructured data apart keeps the system fast and stable, even at high levels of the uploads. The architecture will ensure that the flow of information is smooth and the users interact with the frontend and backend the frontends ends requests to the backend, which in turn processes those requests and updates the database or cloud storage accordingly, and returns the results to the user. This coordinated process allows clear communication, efficient task handling, and reliable updates for everyone in the project. Security, this is a crucial ingredient of this system. Construction works include sensitive information such as blueprints, worker records, material logs, and site images. The backend verifies every user authentication through JWT authentication and then provides access to them. In addition, Role-Based Access Control will ensure that each user sees only those features meant for his or her role. For example, engineers can upload plans and create tasks, contractor can manage inventory details and stocks, worker can upload site progress related images in the website owner can see the overall progress of his construction.

VI. IMPLEMENTATION

We designed Construction Connect from the ground up with adaptability and future growth in mind, leveraging the MERN stack and integrating cloud storage from day one. Construction Connect changes the way people handle construction projects and Instead of juggling calls, paperwork, and endless meetings, everyone engineers, contractors, workers, suppliers, and property owners connects through one simple platform. Everything happens here people chat, assign and follow up on tasks, share updates, and keep an eye on the progress, all in real time. Managing a construction site can be a mess when information gets lost or people aren't on the same page. Construction Connect cuts out the noise. You get the right info, at the right time, so decisions come easier and delays don't pile up from missed messages or miscommunication. No more guesswork. Integrated messaging tools, so everyone talks in one place. The Construction Connect system runs as a modular, scalable and web app built on the MERN stack so, MongoDB, Expressjs, Reactjs, and Nodejs. The whole project thing takes a layered approach there's the presentation layer, the application layer, and the data layer. Breaking it up like this keeps everything loosely connected and easy to maintain. Upfront, Reactjs drives the interface. It's fast, responsive, and makes it easy for everyone engineers, contractors, workers, owners to get what they need. The majority of construction projects usually involve a number of individuals, each with distinct responsibilities, including engineers, contractors, employees, and owners. Communication among these people fails in the absence of a central common system, resulting in mistakes, delays, miscommunication, and in efficient use of time and resources. In order to overcome these problems, this project offers a single digital platform that allows all of these individuals to work together effectively and communicate with one another using the same source. The MERN technology stack, upon which this project is based, guarantees smooth op- eratin between the MongoDB Atlas database, backend APIs, and frontend interface By designating roles, establishing due dates, establishing priorities, and attaching necessary materials like technical documents, safety manuals, and blue prints, engineers can create and oversee tasks in this way. The data is safely stored and instantly available to all other authorized users as soon as a task is created or updated. Workers on this site can report progress because this is platforms which allow viewing the task, which include status indicators on the progress bar and update options and more things.

VII. TESTING AND RESULTS

The Construction Connect system was tested to ensure that all the major features worked in an realistic environment. User registration, task assignment, updating of progress, inventory access, and reviewing of tasks were tested in the project. Most of the functions performed as expected and new users were being registered with their proper role and name, and engineers and contractors could assign tasks flawlessly to anyone, and workers can upload the progress photos which showed instantly on the engineer and contractor dashboards where they can see the uploaded photo. Currently, we are in the process of debugging the access control logic to reconcile this linkage and provide workers with of rigorous, targeted re-tests of Construction Connect changes the way people handle construction projects and Instead of juggling calls, paperwork, and endless meetings, everyone engineers, contractors, workers, suppliers, and property owners connects through one simple platform.

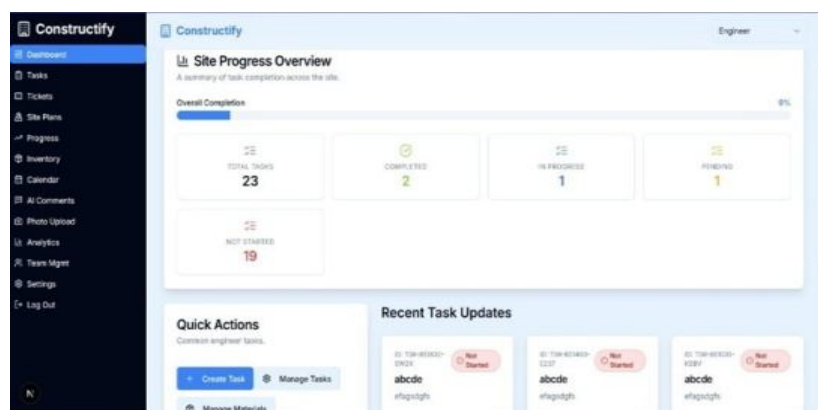


Fig.2. Website

Everything happens here people chat, assign and follow upon tasks, share updates, and keep an eye on the progress, all in real time. The testing phase of the Construction Connect system was done to ensure that all the major features of the project worked correctly under normal working conditions. Each module was checked with practical inputs to ensure that day-to-day construction activities were smoothly handled by the platform. The tests include user registration, which encompassed task assignment, progress updates, material access, and reviewing tasks. During this process, the system responded well all the new users could be added along with their respective roles, engineers and contractors were able to assign tasks without any functional issues, and the workers successfully uploaded progress images daily, which became instantly visible to their supervisors or contractors.

VIII. CONCLUSION AND FUTURE ENHANCEMENTS

Well, a construction management system integrates civil engineers, contractors, workers, and owners onto a single platform where they can easily share information so that communication and information flow can be monitored at all times during coordination and communication stage. This is made possible due to the modular structure and clear data work flows whereby tasks, updates, and approvals flow one person to another. Tests show that the system runs reliably and updates in real-time, secures data, and is easy to use. Certainly, some of the areas may still require improvement but as a whole, the platform is flexible and in accordance with the needs of a contemporary construction project. The material access and inventory module could be strengthened in the future, and better task workflows might be developed, smarter progress tracking could be introduced, with intelligent support capabilities added at last. Then it would become an even more robust digital assistant for construction project management.

IX. APPRECIATION

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