



## CLOUDCONSTRUCT: CLOUD-BASED PROJECT MANAGEMENT SYSTEM FOR D.R. LOPEZ CONSTRUCTION SERVICES

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### ABSTRACT

This capstone project aims to develop and implement a cloud-based Project Management System for D.R. Lopez Construction Services, addressing the company's complete reliance on manual processes for billing, progress tracking, reporting, and cost estimation. Such reliance often leads to delays, errors, and inefficiencies. The system is designed to deliver projects in an organized manner, on time and within budget, enhancing overall efficiency by centralizing project documentation, automating billing and progress tracking, digitizing cost estimation, and streamlining the generation of site and safety reports. The system utilizes JavaScript, React, Express, MySQL, and is deployed via Vercel and Railway. It follows the Rapid Application Development (RAD) methodology to enable fast development and iterative improvements based on user feedback. The system was evaluated using the ISO 25010 standard. Three quality characteristics—functionality, portability, and security—were assessed through test cases, while all eight ISO 25010 characteristics were measured using a Likert-scale survey completed by 60 respondents, composed of Civil Engineering and IT students, professors, and industry professionals. The system achieved an average mean score of 4.50, which was interpreted as "Very Good," indicating that it meets user expectations. It demonstrates enhanced workflow efficiency, overcomes the limitations of manual processes, and provides a fully functional solution for project management. Future improvements may focus on mobile accessibility and predefined cost estimation templates to further streamline the workflow.

**Keywords:** *Cloud-based, Project Management, React.js, Express.js, MySQL, Vercel, Railway, Rapid Application Development (RAD) methodology, ISO 25010*

### INTRODUCTION

Digitalization has had a significant impact on the construction industry. It has been the driving improvements in operational performance and productivity. The Department of Public Works and Highways (DPWH, 2023) emphasized that investing in state-of-the-art technologies not only supports better infrastructure development but also enhances the overall management of construction process. As a result, many construction firms are adopting digital solutions such as cloud computing and automation to streamline project management.

Nevertheless, despite these advancements, several construction companies still rely on outdated practices for critical tasks. For instance, D.R. Lopez Construction Services, established in late 2020 in Tanza, Cavite by Engr. Douglas R. Lopez, specializes in general construction and civil engineering projects. While the company manages several projects, essential activities—such as billing, progress tracking, and inventory monitoring—manually, resulting from issues in coordination of various tasks, tracking of updates, and maintenance of project documentation. Smaller construction firms often suffer these challenges due to high cost and limited technological support (Philippine News Agency, 2022). This is the same situation faced by the company, which relies on manual methods due to the lack of affordable digital tools.

A major issue in the company is the drafting of proposals, a process that is extremely time-consuming and requires extensive checking at each step. Engr. Lopez expressed his frustration, saying, "As a project manager, it is very exhausting to write an entire proposal by hand. This practice usually leads to mistakes in computation and takes up my time to the

extent that I feel worn out." This constant checking slows down the entire process and increases the likelihood of mistakes. Engineers also continue to use physical documents for site progress reports, making collaboration slower and updates harder to track. Inventory is recorded in a logbook, so shortages are only discovered during manual checks, which delays material replenishment.

Because of these challenges, there is a clear need for a digital system that can help the company manage documentation more effectively, improve collaboration, and reduce delays in project activities. In addressing the inefficiencies at D.R. Lopez Construction Services, the implementation of a cloud-based Project Management System emerges as an effective solution.

### Objectives of the Study

This study aimed to develop and implement a cloud-based Project Management System to ensure organized project execution, timely completion, and adherence to budget for D.R. Lopez Construction Services. The system includes project scheduling to assign tasks to engineers, automated cost estimation using the Bill of Quantities (BOQ) and Bill of Materials (BOM) for accurate project costing, and resource management that updates quantities as they are issued. It also generates detailed reports to monitor project progress and performance, and its quality is evaluated based on ISO/IEC 25010 standards.

### Scope and Delimitation of the Study

This study focuses on the development of a cloud-based application entitled "CloudConstruct: Cloud-based Project Management System for D.R. Lopez Construction Services" to digitalize and streamline key

construction management processes. The system focuses on proposal planning, site progress tracking, and resource management, aiming to reduce computation errors, improve collaboration, and enhance efficiency in monitoring project updates and material stocks. It includes user roles for the admin/project manager, site engineer, and safety engineer. The Admin/Project Manager can assign tasks using the calendar, create projects, prepare proposals by encoding Bill of Quantities (BOQ) dimensions and generating total estimates, manage the Bill of Materials (BOM) with automatic cost computations based on the BOQ, handle document management, create progress billing, and manage project resources.

Site Engineers can request materials and submit daily site reports. They also monitor ongoing activities at the project site to ensure tasks are completed efficiently. Safety Engineers can create incident reports and file safety reports. They also oversee compliance with safety procedures to maintain a safe working environment.

The system has limitations that may impact its functionality and user experience. For instance, it requires an internet connection since it is cloud-based, making it unavailable offline. It does not have a mobile application for on-site engineers, who typically carry phones rather than laptops, though it can be accessed through mobile browsers. Additionally, there is no live communication or chat feature that allows users to send direct messages within the system. Furthermore, the system does not include a procurement module, meaning material purchasing and supplier management must still be handled separately.

### Significance of the Study

This study benefits D.R. Lopez Construction Services by introducing a cloud-based project management system designed to automate project operations and modernize administrative tasks. The company is provided with modules for resource management, cost estimation, and progress monitoring, enabling it to organize resources, keep track of projects, and streamline the flow of ongoing tasks through modernization and automation. The system allows managers and engineers to supervise projects in real time, leading to timely, budgeted, and organized project delivery. The project management process has been a major driver of operational efficiency, yet staff cannot be programmed to perform higher-level activities such as strategizing, planning, and dedicating themselves to the project.

In addition, this system eliminates the need for manual tracking, which is the main source of errors, and establishes a more accurate and reliable standard for project management. The construction team benefits in their daily activities, as the system not only makes coordination among the three groups—administrators, site engineers, and safety engineers—easier but also provides better access to reports and documents. The researchers also gain practical experience in programming, system design, and problem-solving, while future researchers may use this study as a reference for developing or improving construction management solutions.

### Review Related Literature

#### Digitalization in the Construction Industry

As the construction industry evolves, companies worldwide are turning to new technologies to boost efficiency, productivity, and overall project performance. Digitalization has become a key factor in driving innovation and competitiveness, completely transforming traditional construction methods. Various research studies have highlighted the effects of digital transformation in the construction sector, including its impact on decision-making, risk reduction, cost management, and project effectiveness (Musarat et al., 2022; Botton & Forgues, 2020; Siman, 2023).

The shift toward digital tools has considerably enhanced project management by improving communication, streamlining workflows, and reducing delays. According to Musarat et al. (2022), digitization increases construction efficiency by reducing manual labor, accelerating construction, and lowering expenses. This aligns with Botton and Forgues' (2020) concept of Building 4.0, which focuses on automating and decentralizing construction operations through the use of IoT and data-driven decision-making. Construction 4.0 seeks to increase overall operational efficiency, ensure project accuracy, and improve real-time decision-making by minimizing the need for human intervention.

Cloud computing has become a key enabler of online collaboration in the Philippine construction industry. According to Siman (2023), cloud platforms enable real-time communication, remote construction operations, and efficient data sharing. This also improves accessibility, allowing stakeholders to stay connected and make decisions from anywhere, thereby enhancing overall project efficiency. Similarly, Alviar et al. (2024) found that mobile technology significantly improves communication, reduces project delays, enhances collaboration among stakeholders, and streamlines operations. It supports real-time data access for informed decision-making and performance tracking.

The impacts of digitalization have also been driven by external pressures, such as the COVID-19 pandemic, which forced construction firms to adopt digital technologies to maintain business operations. Anastacio et al. (2021) conducted research on construction management in San Jose City, Philippines, and found that interruptions caused by the pandemic—such as labor shortages, rising material costs, and strict health protocols—significantly delayed project schedules. However, companies that adopted cloud computing and digital collaboration tools were better able to adapt to the crisis.

Intranet systems within construction firms also play an important role in effective collaboration and enhancing operational efficiency, as emphasized by Norma (2020). They allow employees and contractors to access real-time information, share construction guidelines, provide training materials, track acknowledgments, and ensure document compliance. This seamless communication significantly reduces operational delays and streamlines construction management processes.

#### Cloud Computing in Project Management System

Cloud computing has transformed how technology is accessed and utilized, offering on-demand services such as data storage, networking, and application development over the internet. Instead of managing physical hardware, users rely on powerful remote servers housed in large data centers. According to Susnjara and Smalley (2025), this flexibility and scalability make cloud computing essential for various activities, including email access, streaming services, business operations, and advancements in artificial intelligence. Companies benefit by reducing costs, improving collaboration, and efficiently scaling resources.

Drapkin (2024) noted that cloud-based project management has transformed the way teams plan and execute projects. Unlike traditional on-premise systems, where everything is managed locally, cloud project management brings all project-related activities into one accessible digital platform. This shift makes collaboration easier while also reducing maintenance costs and improving security. As Nidamanuri (2023) highlights, leveraging cloud-based solutions such as SaaS, IaaS, and PaaS allows organizations to streamline workflows, reduce costs, and adapt to the dynamic demands of modern ICT projects.

Thobejane and Marnewick (2020) found that cloud computing projects introduce higher complexity due to novel operational dependencies and

governance challenges, identifying 18 unique complexity factors alongside 78 shared with traditional IT projects. Their study highlights five key project management knowledge areas—risk management, stakeholder management, resource management, integration management, and business case development—as essential for successful cloud project execution.

Cloud computing has significantly changed the e-commerce sector by providing scalable, flexible, and affordable resources that enable online retailers to meet changing consumer needs. By removing the need for physical servers and offering on-demand access to servers, storage, and advanced analytics via the internet, it enables operations with increased security and reliability. This allows companies to use real-time information for personalized experiences, scale smoothly during peak periods, and recover swiftly from disruptions. By using cloud technologies, e-commerce systems can efficiently handle, store, and analyze data while quickly adapting to shifting market demands. Cloud technology also provides vital business features for customer relations, inventory management, and sales analytics, in addition to strong security measures to maintain client satisfaction (Wagner, 2023; Haldiya, 2024; Mpingana et al., 2024).

In the construction sector, cloud computing has transformed project data management by providing scalable, on-demand resources that allow documents, plans, and schedules to be securely stored and accessed. It enhances collaboration among project teams by centralizing information and enabling real-time updates, thereby improving coordination and decision-making. Cloud solutions also streamline project execution, reduce operational costs, and increase flexibility, allowing construction projects to be managed more efficiently (Haldiya, 2024).

The Philippine government is taking new steps toward digital transformation, and one of its key initiatives is cloud integration. Bower (2022) stated that this transition is expected to bring numerous benefits, from minimizing costs to improving efficiency. By switching to cloud-based systems, the government can access top-tier computing resources without the need for expensive hardware, turning large capital expenses into more manageable subscription fees. This change also leads to lower labor and energy costs, better security, and faster innovation. More importantly, it has the potential to boost productivity and streamline public services.

Features & Benefits of Cloud Computing in Construction Management

Cloud computing improves construction project management by enabling real-time collaboration, enhancing resource management, and minimizing operational costs (Golightly et al., 2023). Risks such as data breaches are minimized through strong cybersecurity solutions, including intrusion detection and prevention systems.

Cloud computing also enhances project management by improving collaboration, efficiency, and scalability through real-time data access and integration across distributed teams. It enables seamless communication, resource sharing, and automation, reducing delays and increasing productivity. Somanathan (2023) highlights that multi-cloud deployments introduce security challenges such as misconfigurations, inconsistent security standards, and interoperability issues, requiring meticulous oversight and cohesive security policies. By leveraging cloud-based solutions with standardized frameworks, organizations can optimize workflows, streamline operations, and adapt to evolving project demands with greater flexibility (Somanathan, 2023).

As noted by Altes et al. (2024), if Filipinos believe cloud storage (CS) would benefit them and be relevant to their career or studies, they are

more likely to use it. However, the tendency to utilize CS services is influenced by social factors and security concerns. Providers should strengthen security protocols and highlight the usefulness of cloud storage in everyday tasks to boost adoption.

According to Lauri (2024), the Bill of Materials (BOM) and Bill of Quantities (BOQ) are enhanced when cost estimation, procurement, and inventory control are incorporated into cloud-based project management. By ensuring that all components and materials are available, a BOM reduces shortages and boosts manufacturing efficiency (Landau, 2024). Meanwhile, a BOQ provides a thorough cost breakdown, facilitating precise resource allocation and budget planning (Falak, 2021). Construction companies can reduce errors in cost estimation and project execution, automate computations, and track materials in real time by utilizing cloud technologies.

As Industry 4.0 drives the adoption of smart technologies, automation, and real-time analytics, cloud-based BOM and BOQ systems can introduce automated processes that align with these advancements. According to Bongo, Abellana, and Caballes (2020) from Cebu Technological University, successful implementation of Industry 4.0 requires financial investment, infrastructure readiness, and a highly skilled workforce. Integrating BOM and BOQ into a cloud-based, automated system can reduce human error, improve productivity, and enable data-driven decision-making, representing a key step toward a fully digitalized, Industry 4.0-ready construction environment.

Bello et al. (2021) noted that cloud computing brings many advantages, such as eliminating data silos and providing affordable IT solutions for small and medium-sized companies. This technology integrates advancements like BIM, IoT, and big data analysis, making construction more connected and efficient. Cloud computing will be essential for future businesses in enhancing long-term sustainability, competitiveness, and productivity.

Conceptual Framework

The study’s conceptual framework is described using the Input-Process-Output (IPO) system approach.

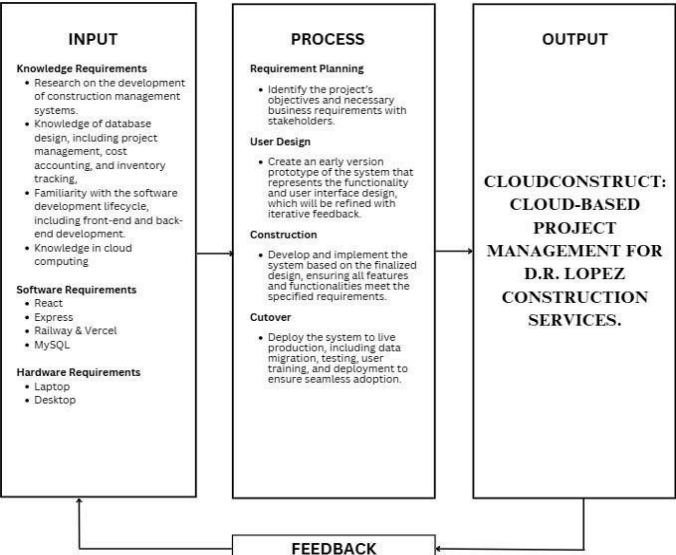


Figure 1. IPO Model

The input phase showcases the knowledge requirements that must be acquired for this study, which involve identifying and gathering necessary research about construction processes, databases, and project management. The proponents must have a strong understanding of

software development tools such as React.js, Express.js, MySQL, and cloud services like Railway and Vercel. The hardware requirements for the project include a laptop or desktop computer capable of running the necessary development tools and software.

The process phase employs the Rapid Application Development (RAD) method, which is a quick, adaptable, and iterative system development approach. User requirements and client workflow information are collected, analyzed, and classified to determine the system features. These requirements are validated during demonstrations of initial prototypes and user feedback sessions so that the system is suitable for the need. During the design phase, the initial blueprints, architecture, and user-interface layouts are created so that the system adheres to the recognized requirements. Subsequently, coding and debugging are carried out alongside system construction to fix any issues, while continuous testing and user feedback are relied upon to enhance features and usability. Finally, the system goes live, users are trained, and it begins replacing the manual processes.

The output phase delivers the final product of the system, which includes automated project proposal cost estimation and billing, resource records, digitalized reporting, print functions, and a cloud-based project management platform for D.R. Lopez Construction Services. This showcases the completion of the project objectives and the fulfillment of user needs.

User feedback is a continuous process that takes place throughout the entire development period and is aimed at improving the system. Feedback is meticulously scrutinized and applied to bug fixes, feature enhancements, and usability improvements. This procedure ensures that the system effectively satisfies user needs, aligns with the project's aims, and is fully ready for launch.

## METHODOLOGY

### Project Design and Development

In this study, the researchers utilized the Rapid Application Development (RAD) model in constructing the cloud-based Project Management System for D.R. Lopez Construction Services. This model was chosen because it enables fast development, iterative prototyping, and continuous user feedback, ensuring that the system meets client requirements efficiently.

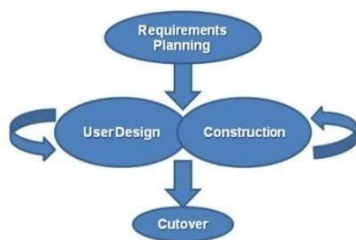


Figure 2. Rapid Application Development Model

During the initial phase of project development, the proponents conducted surveys and interviews with the client to gather user requirements and carefully determine the limitations of the current business operations. The collected requirements were validated through client discussions, which included prototype demonstration and feedback sessions to confirm that the proposed system features met their actual operational needs. Additionally, the client demonstrated how business costs are computed, allowing the proponents to understand the fundamentals of project estimation in civil engineering.

Furthermore, the scope of the system was outlined, which includes features such as user account profiles, automated Bill of Quantities (BOQ) and Bill of Materials (BOM) for cost estimation; progress billing; document records; resource management; and digitalized safety and site reports — to ensure accuracy, efficiency, and proper project management.

In the User Design phase, the proponents systematically designed the future system's processes and created corresponding models. Priority was given to designing user-friendly interfaces to ensure that users could navigate the system with ease. At the same time, the database architecture was structured to effectively manage and retrieve data related to computed calculations and various administrative tasks.

After the design phase, the Construction phase began. Once all requirements and plans were finalized, project management-initiated construction activities according to the project schedule while keeping the design specifications in line. Engineering calculations were continuously analyzed and converted into corresponding system modules to ensure accurate calculated completion. Extensive testing and debugging were conducted during this phase to confirm that all features were functioning properly and operating as intended.

The Cutover phase is the final stage, in which the system is transitioned from development and testing to full operational use. This means it is functioning properly and ready to replace current processes. The project team launched the system and completed the following: connecting all modules, configuring servers and databases, and performing final checks to confirm that each feature worked correctly. Before full deployment, the system underwent pilot testing in the company's actual work environment, where selected users performed real operational tasks to evaluate system functionality and identify potential issues.

Stakeholders received training to familiarize themselves with the system's workflows, functionalities, and reporting tools. In addition, user manuals, guides, and video tutorials were provided. The phase concluded when the system was formally handed over, including reports on deployment status, user acceptance, and overall readiness.

The use of diagramming tools—including sitemaps, data flow diagrams, relational database models, data dictionaries, and use case diagrams—aided in visualizing, designing, and analyzing the system's workflow throughout its development cycle.

Project development began in the third week of January of the second semester of academic year 2025–2026 and is expected to be completed by December of the first semester of the same academic year, spanning a total of 45 weeks.

### Testing Procedure

The ISO/IEC 25010 software quality model was used as the main testing methodology to ensure that the application met international industry standards, serving as the primary basis for the overall evaluation of the system. This model guided the evaluators in assessing three main quality aspects of the project: functionality, portability, and security.

Functional testing focused on validating the operation of all features based on the documented requirements and their interaction with real users. The login procedure for all user roles—Admin, Site Engineer, and Safety Engineer—was verified, and it was found that access to the dashboard and visibility of profiles aligned with the designated permissions.

Additionally, the cost estimation module was subjected to extensive testing to ensure that create, read, update, and delete (CRUD) operations functioned as expected and that automatic computations were accurate and consistent. The material request feature was also examined, and it was confirmed that items could be distributed, their movement tracked and accurately recorded in the material usage logs without errors.

Moreover, the progress billing feature was scrutinized to ensure that billing for each cycle accurately reflected project progress, while the submission of Site and Safety reports was evaluated for completeness, correctness, and proper handling of attachments.

Portability testing assessed the system’s capability to run on different device types, screen sizes, and environments. It also included checking compatibility with leading browsers, ensuring uniformity on the latest stable versions, and testing layout adaptability on computers, tablets, and mobile devices. The software was tested under various network scenarios to confirm that it remained accessible and responsive even when internet connections were slow or unstable.

Security testing ensured that the system was protected against unauthorized access and common cyber threats. Testers verified that JWT token authentication was correctly applied for secure login sessions, role-based access control properly restricted features according to user roles, and passwords were securely encrypted in the database.

Additional tests checked login attempt limitations and account-locking delays, ensuring that brute-force attacks were prevented and suspicious login patterns were detected.

To complete these tests, unit testing, integration testing, and system testing were applied in combination throughout the evaluation process. Testers validated each characteristic’s compliance with specifications using test cases organized to list inputs, steps, and expected outcomes. The thorough and structured testing procedure demonstrated that the system met ISO/IEC 25010 standards and confirmed its readiness for operation in real-world scenarios.

Evaluation Procedure

The system was evaluated by 60 respondents from different stakeholder groups, including Civil Engineering and IT students, professionals, and employees of D.R. Lopez Construction Services. All respondents were provided with a recorded video system demonstration and Google links for evaluation purposes.

The Likert Scale was used to gather responses on specific topics. It allows for a qualitative interpretation of data by assigning numerical values to levels of agreement or disagreement with given statements.

Table 1. Likert Table for System Evaluation

| Numerical Scale | Interpretation |
|-----------------|----------------|
| 5.0             | Excellent      |
| 4.0             | Very Good      |
| 3.0             | Good           |
| 2.0             | Fair           |
| 1.0             | Poor           |

The ISO/IEC 25010 software quality model was used for the evaluation of the application, providing a structured listing of features for determining software quality. The criteria include Functional Suitability, which checks the system’s completeness and correctness; Performance Efficiency, which evaluates time behavior and resource usage;

Compatibility, which determines how well the system coexists and interoperates with other components; Usability, which measures how simple and intuitive the system is; Reliability, which checks stability and consistency; Security, which assesses the protection of data and integrity; Maintainability, which evaluates how easily the system can be improved or modified; and Portability, which measures how well the system works across different environments. The input gathered will be used to confirm the system’s quality and readiness for deployment.

Statistical Tools

The survey data were interpreted using percentage and mean calculations. Percentage was used to determine the fraction of respondents who selected each answer, whereas the mean (average) was utilized to provide a summary of the overall assessment for each question, thus offering a measure of central tendency. The use of these tools made the interpretation of respondents’ evaluations of the system more effective.

Table 2. Descriptive Evaluation of the Mean

| Numerical Scale | Interpretation |
|-----------------|----------------|
| 4.51 - 5.00     | Excellent      |
| 3.51 - 4.50     | Very Good      |
| 2.51 - 3.50     | Good           |
| 1.51 - 2.50     | Fair           |
| 1.00 - 1.50     | Poor           |

Project Structure

The system was developed to switch the company’s manual project management processes to a digital platform. It focused on cost estimation and billing for the construction company. The proponents utilized JavaScript with frameworks such as React.js for the frontend and Express.js for the backend, while MySQL served as the database. For deployment, Vercel was used for the frontend, and Railway was used for the backend and database.

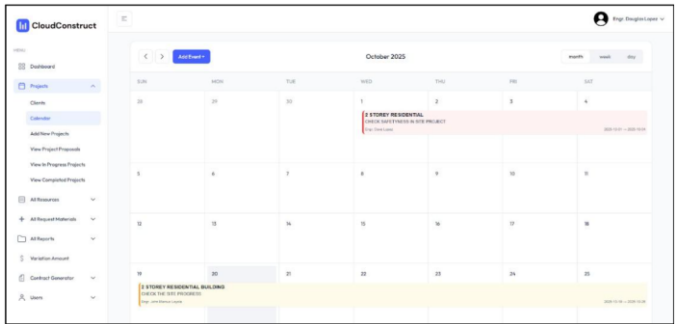


Figure 3. Calendar

The Calendar Module (figure 3) is capable of presenting the tasks assigned to various users along with their due dates. The admin can designate engineers’ duties within a fixed period. Additionally, the module provides the admin with the ability to observe and control project activity timelines, thereby ensuring that deadlines are met. By viewing their tasks by day, users can easily manage their workload, allowing for better planning and time management.

| Item Label             | Unit | Floor | Length | Width | Depth | Initial Qty | \$   | Adjusted Qty | Actions |
|------------------------|------|-------|--------|-------|-------|-------------|------|--------------|---------|
| Excavation             | cu.m |       |        |       |       | 207.20      | 1.20 | 248.64       |         |
| Formwork               | sq.m |       |        |       |       | 104.52      | 0.00 | 0.00         |         |
| Reinforcing Bar        | kg   |       |        |       |       | 1.00        | 0.00 | 0.00         |         |
| Steel Reinforcing Bars | kg   |       |        |       |       | 200.00      | 0.00 | 0.00         |         |
| Steel Reinforcing Bars | kg   |       |        |       |       | 200.00      | 0.00 | 0.00         |         |

Figure 4. Quantity Take-Off (Bill of Quantities)

The Quantity Take-Off page (figure 4) displays a detailed breakdown of measurements for a specific project. It shows item labels, units, floors, dimensions, initial quantities, allowances, and adjusted quantities, allowing project managers to calculate and manage construction volumes without checking every row for accuracy, thanks to the system's predefined formulas. The Project Manager can select General Dimension, which refers to the volumes and areas of work, and Rebar Dimension, which specifies the quantity of rebar for each activity. The Project Manager can also input and update the measurements for each activity if the initial entry was incorrect, ensuring proper planning.

| Item Label                 | Unit | Floor | Length | Width | Depth | Initial Qty | \$   | Adjusted Qty | Actions |
|----------------------------|------|-------|--------|-------|-------|-------------|------|--------------|---------|
| Temporary Formwork         | sq.m |       |        |       |       | 104.52      | 0.00 | 0.00         |         |
| Temporary Reinforcing      | kg   |       |        |       |       | 1.00        | 0.00 | 0.00         |         |
| Temporary Reinforcing Bars | kg   |       |        |       |       | 200.00      | 0.00 | 0.00         |         |

Figure 5. Material Take-Off (Bill of Materials)

The Material Take-Off page is the primary and sole source of reference for all construction materials needed for a specific project at a given time. The information is systematized and presented in such a clear manner that project managers, estimators, and engineers can access material data that is not only accurate but also updated at all times. For every material entry, descriptions are provided along with the material name, type, specifications, unit of measure, and unit cost.

The page automatically integrates the Quantities Take-Off, meaning that all total quantities shown are based on measurements taken from the QTO calculations. This reduces manual errors and ensures uniformity between dimensional calculations and the material listing.

| Material Name          | Brand Name | Unit | Cost     | Stock | Actions |
|------------------------|------------|------|----------|-------|---------|
| Formwork               | Generic    | sq.m | \$100.00 | 36    |         |
| Cutting Bar            | Generic    | kg   | \$100.00 | 48    |         |
| Steel Reinforcing Bars | Generic    | kg   | \$100.00 | 48    |         |

Figure 6. Resource Management

The Resource Management module provides an overview of all materials and equipment available in the system. It displays key statistics, including the total number of resources and distinct brands. Users can easily add new resources, ensuring efficient tracking and management of materials. Damaged items are tracked to ensure proper maintenance or replacement, while returned items are recorded to monitor resource usage and availability.

| Item Label             | Unit | Floor | Length | Width | Depth | Initial Qty | \$   | Adjusted Qty | Actions |
|------------------------|------|-------|--------|-------|-------|-------------|------|--------------|---------|
| Excavation             | cu.m |       |        |       |       | 207.20      | 1.20 | 248.64       |         |
| Formwork               | sq.m |       |        |       |       | 104.52      | 0.00 | 0.00         |         |
| Reinforcing Bar        | kg   |       |        |       |       | 1.00        | 0.00 | 0.00         |         |
| Steel Reinforcing Bars | kg   |       |        |       |       | 200.00      | 0.00 | 0.00         |         |

Figure 7. Generated Report

The Generate Report feature allows users to create comprehensive reports based on project data. It enables the admin and other users to select specific timeframes or criteria for the reports. The system automatically sorts the data into formats that are easy to understand for analysis. Generated reports can include progress summaries, resource usage, and estimation details. This functionality reduces the risk of stakeholders making incorrect decisions and, at the same time, allows for efficient monitoring of project performance.

The system is cloud-based and requires an internet connection. However, it lacks a dedicated mobile app for on-site engineers, does not support live messaging, and excludes a procurement module, requiring material purchasing and supplier management to be handled separately.

## RESULTS AND DISCUSSION

The evaluation of the system was carried out based on the ISO/IEC 25010 software quality model, which is a widely accepted international standard for assessing software quality. This model examines the main quality attributes such as functional suitability, reliability, usability, performance efficiency, security, portability, compatibility, and maintainability, through which the system's effectiveness in meeting user needs and adapting to various construction workflows is rated. These measures serve as the primary factors for determining system capability, stability, and overall user satisfaction.

In the table below, the system's overall rating is displayed as a summary of the evaluation across different criteria. It provides a comprehensive assessment that indicates the system's total performance, offering crucial information about its efficiency and strengths.

Table 3. Respondent's Overall Rating

| CRITERIA                  | MEAN | INTERPRETATION |
|---------------------------|------|----------------|
| Functional sustainability | 4.63 | Excellent      |
| Reliability               | 4.41 | Very Good      |
| Portability               | 4.49 | Very Good      |
| Usability                 | 4.50 | Very Good      |
| Performance efficiency    | 4.52 | Excellent      |
| Security                  | 4.49 | Very Good      |
| Compatibility             | 4.49 | Very Good      |
| Maintainability           | 4.47 | Very Good      |
| TOTAL                     | 4.50 | Very Good      |

The evaluation of the system reveals that the solution is highly rated across all ISO/IEC 25010 criteria, as indicated by mean scores ranging from 4.41 to 4.63. The highest score, 4.63 (“Excellent”), was assigned to Functional Suitability, reflecting the system's strong accuracy and completeness in handling construction-related tasks such as project scheduling, resource tracking, and cost estimation. Reliability received the lowest average score of 4.41 (“Very Good”), showing that while there were minor slowdowns during heavy data retrieval, the system remained stable with no major failures. Other criteria—Performance Efficiency (4.52), Usability (4.50), Portability (4.49), Security (4.49), Compatibility (4.49), and Maintainability (4.47)—were also classified as “Very Good,” demonstrating lasting efficiency, adaptability, and user-friendliness.

The findings emphasize that a well-designed, technology-based project management system can deliver large-scale operational efficiency even for a small firm. The system was evaluated by 60 participants, including industry professionals, and received an overall rating of 4.50, signifying both high effectiveness and a positive user experience. The data obtained from testing support the assertion that the system has achieved its goal of making construction processes more efficient.

The research highlights that the system is capable of effectively managing project workflows and reducing inefficiencies in construction management. Improved communication and coordination between site workers and the project manager were among the main outcomes, leading to the timely and accurate execution of tasks. These outcomes match the characteristics of cloud-based project management systems described by Drapkin (2024) and Nidamanuri (2023), which highlight centralized data management and real-time information access to enhance project team collaboration.

CONCLUSION

This capstone project successfully developed and implemented a Cloud-Based Project Management System for D.R. Lopez Construction Services, achieving its objective of delivering projects in an organized manner, on time, and within budget. The system offers the benefits of centralizing project data, automating scheduling and budgeting through Bill of Quantities (BOQ) and Bill of Materials (BOM) integration, and making reporting more efficient, which has resulted in better communication between office staff and on-site engineers. The tests for functionality, portability, and security, performed based on ISO/IEC 25010 standards, attributed trustworthiness, effectiveness, safety, and usability to the system. Users reported that the system is easy to navigate and supports coordination between different project activities. The

outcomes of the testing confirm that the system has a significant impact on project management processes and user satisfaction.

In addition, the use of cloud-based tools has been validated, as they can significantly enhance construction project efficiency, reliability, and accuracy from a management perspective. The system, for instance, highlights the benefits of integrating automated scheduling, budgeting, and reporting, as it enables smoother workflows, fewer mistakes, and better communication between office staff and the on-site crew. The results imply that the real estate and construction industry can benefit from the application of such systems by operating with higher accuracy, greater timeliness, and improved accountability. Moreover, the system is aligned with current technological standards in construction management. These implications indicate that the system can serve as a driver for the continuous development of project organization, implementation, and overall operational efficiency.

RECOMMENDATIONS

Several recommendations are proposed to enhance the system in future development. It is highly recommended to develop a mobile version of the system customized for engineers. Since fieldwork often limits the use of desktop devices, a mobile app would enable users to submit reports, track progress, and access project data in real time during on-site operations in a convenient manner. Future versions of the system may also allow the use of predefined project templates, which would eliminate repetitive manual input. For instance, selecting a particular project type could automatically generate the associated work items, materials, and budget conditions.

Adding an image-uploading feature to the site material request process would be a step toward accurate verification and documentation of materials. Last but not least, a Gantt chart for the admin dashboard would not only assist in visualizing project timelines but also make monitoring overall progress easier. The cloud-based project management system can serve as a secure, reliable, and efficient platform that supports the daily operations of construction professionals and encourages continuous improvement in project management by adopting these advancements.

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