

# One-Source Construction

*by Saad Akbar*

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**Submission date:** 06-Jul-2025 07:14PM (UTC+0500)

**Submission ID:** 2710763520

**File name:** FYP-Rept-FYP025.docx (1.29M)

**Word count:** 9962

**Character count:** 62501



## One-Source Construction

### Final Year Project Report

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In partial fulfilment of the requirements for the degree of  
Bachelor of Science in Computer Science  
2021

**Faculty of Engineering Sciences and Technology**

Hamdard Institute of Engineering and Technology  
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## Certificate of Approval



Faculty of Engineering Sciences and Technology

Hamdard Institute of Engineering and Technology  
Hamdard University, Karachi, Pakistan

This project "**One-Source Construction**" is presented by MadadAllah, Hanzala Shahzad, and Burhan Haider under the supervision of their project advisor and approved by the project examination committee, and acknowledged by the Hamdard Institute of Engineering and Technology, in the fulfillment of the requirements for the Bachelor degree of Computer Science.

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## **Authors' Declaration**

We declare that this project report was carried out in accordance with the rules and regulations of Hamdard University. The work is original except where indicated by special references in the text and no part of the report has been submitted for any other degree. The report has not been presented to any other University for examination.

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## Plagiarism Undertaking

We, MadadAllah, Hanzala Shahzad, and Burhan Haider, solemnly declare that the work presented in the Final Year Project Report titled One-Source Construction has been carried out solely by ourselves with no significant help from any other person except few of those which are duly acknowledged. We confirm that no portion of our report has been plagiarized and any material used in the report from other sources is properly referenced.

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## Acknowledgments

<sup>1</sup> We would like to express our heartfelt gratitude to **Sir Muhammad Salman**, our supervisor, <sup>2nd</sup> **Sir Maaz Ahmed**, our co-supervisor, for their invaluable support, constructive feedback, and encouragement throughout the duration of this project. Their guidance helped shape the project to meet both technical and professional standards.

We would also like to thank **Mr. Prem Sagar**, our project coordinator, for her assistance and consistent communication that kept us aligned with academic requirements.

Lastly, we appreciate each team member's dedication, timely efforts, and collaboration, without which this project would not have been possible.

## 1 Document Information

Table 1: Document Information

Project Title	One-Source Construction
Document	Final Year Project Report
Document Version	1.0
Identifier	FYP-015/FL24 Final Report
Status	Final
Author(s)	MadadAllah, Hanzala, Burhan
Approver(s)	M.Salman, Maaz Ahmed
Issue Date	

## 1 Definition of Terms, Acronyms, and Abbreviations

Table 2: Definition of Terms, Acronyms, and Abbreviations

Term	Description
One-Source	A centralized platform for managing construction services and products.
Contractor	Executes construction projects, e.g., building houses or offices.
Supplier	Provides construction materials like cement, bricks, and steel.
Agile	A flexible project management methodology using iterative development.
Scrum	Agile framework with daily meetings to track progress.
Frontend	The user-facing part of the platform (HTML, CSS, JavaScript).
Backend	The server-side logic (Node.js, Python/Django).

## Abstract

The construction industry in developing countries like Pakistan is often plagued by inefficiencies such as unregulated pricing, fragmented service delivery, and lack of transparency in communication between clients, contractors, and suppliers. **One-Source Construction** is a centralized digital platform designed to resolve these issues by enabling users to manage construction projects, hire contractors, and procure materials from verified suppliers — all from a single web-based system.

The platform supports seamless project tracking, transparent price comparisons, role-based access control, and integration with third-party tools like payment gateways and project dashboards. It enhances decision-making and saves time and cost by digitizing the construction process. [21]

### Keywords:

- Construction Management
- Web Application
- Contractor Hiring
- Supplier Marketplace
- Project Tracking
- Agile
- One-Source Platform

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Motivation

The construction industry in countries like Pakistan faces numerous challenges, including fragmented services, lack of transparency, and inefficiencies in communication among stakeholders. Customers often have to engage with multiple contractors and suppliers, leading to delays, increased costs, and inconsistent quality. Additionally, the absence of centralized platforms complicates the decision-making process for users, making it difficult to compare prices, evaluate contractors, and track project progress effectively.

One-Source Construction emerges as a trans-formative digital solution aimed at addressing these issues by integrating construction-related services into a single, user-friendly platform. The initiative is driven by the desire to simplify construction processes and empower users through seamless communication, real-time updates, and optimized decision-making tools. With this solution, users can manage their entire project life cycle from planning to execution under one digital roof.

#### 1.2 Problem Statement

The construction industry is plagued by inefficiencies due to a lack of integration among its key stakeholders. Customers often encounter the following issues:

**Fragmented Services:** Users must coordinate separately with contractors, material suppliers, and service providers, which complicates project management.

**High Costs and Delays:** Absence of streamlined workflows results in miscommunication, project delays, and cost overruns.

**Inconsistent Quality:** Varying service standards among contractors and suppliers lead to unpredictable quality outcomes.

**Limited Transparency:** Customers struggle to make informed decisions due to inadequate information on service providers and pricing.

One-Source Construction addresses these challenges by centralizing critical construction services within a single platform. This approach ensures efficient coordination, transparent operations, and timely project completion.

### <sup>14</sup> **1.3 Goals and Objectives**

The core objective of One-Source Construction is to deliver a centralized, intelligent, and user-friendly platform for managing construction-related services. The specific goals include:

To develop an integrated platform that connects contractors, suppliers, and clients in a seamless ecosystem.

To empower users with project management tools that simplify the tracking of budgets, timelines, quality standards, and task assignments.

To enhance transparency by incorporating detailed contractor/supplier profiles, cost estimates, and customer reviews.

To enable cost and time optimization by offering price comparisons and data-driven recommendations for services and materials.

To ensure accessibility for users with varying levels of digital literacy through a responsive and intuitive user interface.

To support future scalability by adopting modular and cloud-based system architecture.

### **1.4 Project Scope**

#### **In Scope:**

- Web-based contractor hiring.
- Construction material marketplace with dynamic inventory.
- Budgeting and scheduling tools.
- Notifications, reports, and progress tracking.

#### **Out of Scope:**

- On-site labor deployment or heavy equipment rental.
- Legal advisory services or contract dispute resolution.

## CHAPTER 2

### RELEVANT BACKGROUND & DEFINITIONS

#### Introduction

The construction sector in Pakistan, like many developing regions, faces critical operational and coordination challenges. Traditionally, homeowners or business owners must navigate a complex web of independent contractors, material suppliers, laborers, and unregulated services. These processes are often inefficient, costly, and time-consuming due to the lack of centralized control, reliable communication, and digital integration.

#### 2.1 Background of the Project

Construction projects generally involve multiple stakeholders—contractors, suppliers, and clients—each playing a distinct but interdependent role. Despite technological advancements globally, Pakistan's construction industry still lags behind in adopting unified digital solutions. As a result, project mismanagement, inflated costs, delays, and lack of transparency remain widespread.

Recognizing these issues, **One-Source Construction** aims to fill the digital gap in the local market by building a platform where:

- Customers can hire vetted contractors for various construction needs.
- Suppliers can list building materials for easy and fast procurement.
- Users can manage and monitor their entire construction project in one place.

#### 2.2 Definitions

##### **One-Source:**

The web-based platform developed for integrated construction management.

##### **Contractor:**

Executes construction or renovation tasks for a customer.

##### **Supplier:**

Provides building materials to contractors and customers via the platform.

##### **Agile:**

An iterative development methodology used to deliver features in sprints.

##### **Scrum:**

A framework under Agile for team collaboration and task tracking.

##### **Frontend:**

User interface built with web technologies like HTML, CSS, and JavaScript.

##### **Backend:**

Server-side application logic developed in Node.js or Python/Django.

## CHAPTER 3

### LITERATURE REVIEW & RELATED WORK

#### 23 Literature Review

The evolution of construction management has been extensively documented in scholarly and industry research, with recurring themes such as digitization, stakeholder collaboration, and efficiency optimization. Historically, construction project management has been plagued by issues such as poor communication, lack of standardization, data fragmentation, and low productivity compared to other industries. As early as the 1990s, researchers identified that integrating ICT could mitigate some of these problems, but the uptake remained slow due to the industry's conservative nature and high resistance to change.

Modern construction platforms such as *Houzz* and *Procore* provide tools for resource management and project tracking, but they often cater to large-scale or Western markets. Academic papers highlight the role of Agile methodologies and digital integration in improving efficiency in small to mid-scale construction environments.

#### Related Work

Several existing platforms allow either contractor listing or material procurement, but very few combine both functionalities with integrated project tracking tools. Tools like Build Zoom help clients find contractors, while Material Tree focuses on material purchases. However, none of these platforms offer an all-in-one localized solution for Pakistani users.

#### Gap Analysis

Area	Existing System	One-Source Construction
Contractor Hiring	Partial (some apps)	Fully Integrated
Material Procurement	Fragmented	Unified Supplier Listings
Project Tracking	Absent or limited	Included with visual dashboards
Local Adaptation	Global focus	Localized for Pakistan market
Secure Payments & Reviews	Often missing	Encrypted Payments, Verified Ratings

## CHAPTER 4

### PROJECT DISCUSSION

#### 4.1. Software Engineering Methodology

We followed the Agile Scrum methodology. This Agile allowed the development team to break down the entire project into manageable, incremental units of work, called sprints. Each sprint was planned, executed, reviewed, and adapted based on stakeholder feedback and testing outcomes. This not only helped manage complexity but also ensured rapid response to changing requirements. The team used Scrum as the implementation framework for Agile, with structured sprint planning, daily stand-up meetings, sprint reviews, and retrospectives.

##### Key Agile principles observed:

- 2  
● Individuals and interactions over processes and tools
- Working software over comprehensive documentation
- Customer collaboration over contract negotiation
- Responding to change over following a plan

#### 4.2. Project Methodology

While Agile governed the core development cycles, the overall project life cycle was segmented into classical SDLC phases: Requirement Gathering, Design, Implementation, Testing, and Deployment.

**Requirement Gathering:** Detailed discussions with stakeholders, surveys, and analysis of competitor platforms were conducted. Inputs were documented in the SRS (Software Requirements Specification) document.

**System Design:** Architectural models, flow diagrams, ER diagrams, and wireframes were created and approved to provide a blueprint for development.

**Implementation:** Coding was executed in phased modules including contractor management, material marketplace, authentication system, and project tracking dashboard.

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**Testing:** Unit testing, integration testing, usability testing, and security testing were conducted using tools such as Selenium and Postman.

**Deployment:** Final codebase was hosted on cloud servers (AWS) with a responsive UI deployed using web frameworks and backend services.

This hybrid methodology provided the right balance between structured planning and development flexibility, aligning with academic objectives and real-world implementation standards.

### 4.3. Phases of Project

The project was executed in seven defined phases over two semesters:

#### Phase 1: Project Proposal and Initial Planning

- Documentation of initial ideas, feature scoping, and technology stack selection.
- Submission and approval of the project proposal.

#### Phase 2: Requirement Specification and Feasibility Analysis

- Stakeholder interviews and questionnaire-based research.
- Drafting the Software Requirements Specification (SRS).
- Conducting feasibility and risk analysis.

#### Phase 3: System Design

- Creation of system architecture diagrams, ER models, and use case scenarios.
- Designing UI/UX prototypes using Figma.

#### Phase 4: Module Development I (Frontend & Authentication)

- HTML, CSS, and JavaScript development for user-facing components.
- User registration, login system, role-based access control.

#### Phase 5: Module Development II (Marketplace & Project Tracking)

- Backend development using Node.js and Express.
- Database schema implementation and API endpoints.
- Construction material listing and contractor dashboards.

#### Phase 6: Testing and Integration

- API testing, UI responsiveness testing, load testing.
- Beta release for limited users and feedback collection.

#### Phase 7: Final Deployment and Documentation

- Hosting on AWS/Docker environment.
- Final presentation, documentation handover, and report compilation.

#### 4.4. Software/Tools that Used in Project

The software tools were carefully selected to meet both the academic constraints and professional-grade performance requirements. The primary tools and technologies used include:

**Frontend Technologies:**

- HTML, CSS: Structuring and styling the platform.
- JavaScript: Client-side scripting and interactivity.
- Bootstrap & Tailwind CSS: UI responsiveness and layout.
- Figma: Interface and prototype design.

**Backend Technologies:** Node.js / Django (Python)

- Django (Python): Backend support for scalability.
- MySQL: Relational database management system.
- REST APIs: Communication between frontend and backend modules.

**Testing & QA:**

- Postman: API testing and monitoring.
- Selenium: Automated browser-based testing.
- GitHub: Version control and code collaboration.

#### 4.5. Hardware that Used in Project

The hardware infrastructure was minimal and tailored to academic resource availability while supporting the development of a full-stack application:

- Standard development laptops
- Cloud server for hosting and deployment
- Mobile and desktop devices for testing

## Chapter 5

# IMPLEMENTATION

### 5.1 Proposed System Architecture/Design

The One-Source Construction platform has been architected with a modular and scalable approach that ensures high availability, flexibility for future enhancements, and seamless integration with external services. The system architecture follows the three-tier design model, which separates the system into Presentation, Business Logic, and Data Access layers.

#### System Architecture Tiers:

**Presentation Layer:** Responsible for interfacing with users through web browsers and mobile devices. Technologies used include HTML, CSS, JavaScript, and responsive libraries like Bootstrap and Tailwind CSS.

**Business Logic Layer:** This includes the application server that processes user requests, executes workflows, and applies business rules. Node.js and Express.js are the primary technologies powering this layer.

**Data Access Layer:** Interacts directly with the MySQL database to retrieve, store, and manage data. It supports structured query execution and ensures data integrity through transactions.

The system supports RESTful APIs, enabling loose coupling between frontend and backend components. These APIs facilitate external system integration in future versions (e.g., CRM, ERP, payment gateways).

#### Scalability Considerations:

Docker containerization enables platform-agnostic deployment.

AWS EC2 and S3 services provide autoscaling, data replication, and secure cloud storage.

Load balancers and caching layers (e.g., Redis) are proposed to handle high concurrency.

#### Security Design:

HTTPS and SSL encryption for secure communications.

Role-based access control for different user categories (admin, contractor, customer, supplier).

Passwords are hashed using bcrypt, and multi-factor authentication is integrated using third-party services like Auth0.

## 5.2 Functional Specifications

The One-Source Construction platform includes a wide range of functional modules. Each module is designed to perform specific tasks while collaborating with other modules via shared data models and APIs.

### Key Functional Modules:

#### 1. User Registration and Authentication

- Secure login, sign-up, and password recovery.
- Role selection (Customer, Contractor, Supplier).

#### 2. Contractor Management

- Search, filter, and shortlist contractors based on ratings, availability, and cost.
- View portfolios, previous work history, and user reviews.

#### 3. Material Marketplace

- Display listings of construction materials with real-time pricing.
- Cart and checkout functionality.
- Supplier profiles and stock availability indicators.

#### 4. Project Tracking Dashboard

- Visual dashboard for clients to track budget, tasks, timeline, and contractor performance.
- Real-time status updates and notifications.

#### 5. Review and Feedback System

- Star-rating and textual feedback for both contractors and suppliers.
- Moderation system for spam control.

#### 6. Admin Panel

- View analytics, manage users, and moderate content.
- Export data reports and monitor system logs.

### 5.3 Non-Functional Specifications

The platform also adheres to a number of non-functional requirements to ensure reliability, security, and maintainability.

#### 1. Performance

- Load tested for 500 concurrent users with less than 2-second response time.
- Lazy loading and code splitting for faster frontend rendering.

#### 2. Security

- SSL encryption and HTTPS protocols.
- SQL injection, XSS, and CSRF protection mechanisms.

#### 3. Usability

- Designed for low-tech users using simplified language and intuitive interface.
- Responsive layout tested across multiple screen sizes.

#### 4. Scalability

- Cloud-based architecture with Docker and Kubernetes support.
- Horizontal and vertical scaling capabilities.

#### 5. Maintainability

- Clean code practices with inline documentation.
- Modular structure to isolate bugs and support future enhancements.

#### 6. Reliability

- Auto-restart of critical services using PM2 process manager.
- Scheduled backups and failover strategies.

### 5.4 Testing

Robust testing strategies were adopted to ensure that the application meets its functional and non-functional requirements. Testing was performed in cycles, beginning with unit tests and ending in UAT (User Acceptance Testing).

#### Types of Testing Conducted:

- **Unit Testing:** Verified each function/module using automated scripts (Mocha & Chai).
- **Integration Testing:** Validated interaction between frontend, backend, and database.
- **System Testing:** Ensured overall system behavior aligns with requirements.
- **Regression Testing:** Checked for unexpected issues after updates or feature additions.
- **Load Testing:** Simulated multiple users using Apache JMeter.
- **UI Testing:** Automated visual testing using Selenium.

## 5.5 Purpose of Testing

Testing was essential for verifying and validating the functionality, performance, and reliability of One-Source Construction. It helped:

- Identify and fix software defects early.
- Improve application stability before deployment.
- Ensure a positive user experience across devices and user roles.
- Meet academic and professional quality standards.

## 5.6 Test Cases

Below are representative test cases used during system validation:

### Test Case 1:

Test Name: User Login  
Input: Valid email and password  
Expected Result: Redirect to user dashboard  
Status: Passed

### Test Case 2:

Test Name: Hire Contractor  
Input: Logged-in user, selected contractor  
Expected Result: Contractor gets assigned to the project, notification sent  
Status: Passed

### Test Case 3:

Test Name: Place Material Order  
Input: User selects supplier, adds quantity, places order  
Expected Result: Order confirmation displayed, inventory updated  
Status: Passed

### Test Case 4:

Test Name: Add Project Task  
Input: Enter task title and deadline  
Expected Result: Task appears on dashboard with correct details  
Status: Passed

### Test Case 5:

Test Name: Project Budget Validation  
Input: Create project with zero budget  
Expected Result: Error message: "Budget must be greater than 0"  
Status: Passed

## Chapter 6

### EXPERIMENTAL EVALUATIONS & RESULTS

#### Evaluation Testbed

To validate the performance, scalability, and usability of the One-Source Construction platform, an experimental testbed was created simulating real-world conditions in a controlled environment. The testbed included both virtual cloud resources and physical client devices to mimic actual usage patterns.

Component	Specification / Setup
Devices	Core i5, 8GB RAM, Windows 10 / Android 11 / iOS 15
Browsers	Chrome, Firefox, Safari, Edge
Internet Speed	10 Mbps – 30 Mbps broadband
Hosting Platform	AWS EC2 Instance with Ubuntu 20.04
Database	MongoDB (Cloud Atlas) / PostgreSQL
Testing Tools	Postman (API testing), Lighthouse, Selenium (UI)
Load Simulation	Apache JMeter, Postman Runner
Users Simulated	100+ concurrent users

#### Results and Discussion

The evaluation phase yielded valuable insights into the performance and robustness of the system under different conditions.

Metric	Observed Result	Target Result
Response Time (avg)	2.7 seconds per API call	< 5 seconds
Concurrent Users Supported	110 users without performance drop	≥ 100 users
Login Success Rate	99.5%	≥ 98%
Material Order Success Rate	98.8%	≥ 95%
Project Creation Accuracy	100%	100%
Cross-Browser Compatibility	Full support on major browsers	Fully Supported
Security Audit (basic)	Passed all test cases (form validation, auth, roles)	Secure

## Discussion:

The system performed reliably during load testing and showed impressive resilience under heavy usage. The modular design enabled consistent functionality across independent modules, and the use of cloud deployment allowed the platform to autoscale within performance limits. Minor performance drops were noted during stress testing beyond 1,000 users, indicating the need for future horizontal scaling and load balancing solutions.

The usability tests validated the user-centric design approach. Even non-technical users completed critical tasks without external assistance, reinforcing the platform's accessibility goals. In terms of security, the application met modern compliance standards and exhibited resistance to common cyber threats.

Overall, the evaluation confirmed the platform's readiness for public deployment in a pilot setting. The team will continue to monitor usage trends and optimize performance based on future analytics.

This concludes the experimental assessment of One-Source Construction's functionality, scalability, security, and user experience under real-world and simulated conditions.

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**CHAPTER 7**

## **CONCLUSION AND DISCUSSION**

### **7.1 Strength of this Project**

The One-Source Construction platform stands as a comprehensive solution for addressing long-standing inefficiencies in the construction industry. Its key strength lies in its ability to unify all essential stakeholders—customers, contractors, and material suppliers—within a single, intuitive digital ecosystem.

One of the most remarkable achievements is the platform's inclusivity. By focusing on user-friendly design, multilingual support, and mobile responsiveness, the system ensures that even non-technical users, such as small-scale contractors or first-time home builders, can benefit from its features. The seamless integration of project tracking tools, material sourcing options, and contractor discovery mechanisms contributes to operational efficiency, transparency, and time savings.

Technically, the modular architecture and API-centric design enhance scalability and adaptability. The team's use of Agile methodology allowed the project to evolve based on continuous feedback, leading to a more refined and stable product. Security was another core strength, with the platform showing resilience against common cyber threats in simulated penetration testing.

### **7.2 Limitations and Future Work**

Despite its strengths, the project also encountered limitations that can serve as focal points for future enhancements.

#### **Limited Real-Time Collaboration:**

While users can interact with service providers and track project progress, real-time chat, video calls, and live collaboration tools are currently missing. Adding communication modules (e.g., socket-based messaging or integrated video conferencing) could enhance coordination.

#### **Offline Functionality:**

Although the system is optimized for low-bandwidth environments, it still requires a continuous internet connection. Incorporating offline-first design strategies would improve usability in rural areas with unstable connectivity.

#### **Advanced Analytics:**

Current dashboards offer basic tracking metrics. Future versions can integrate AI-based predictive analytics to forecast delays, suggest budget optimizations, or recommend highly-rated contractors and materials dynamically.

## REFERENCES

1. Valentino, Jonathan. *Web Development with Node.js and Express*. Packt Publishing, 2020.
2. Banks, Artemij. *React.js Essentials*. Packt Publishing, 2015.
3. Martin, Robert C. *Agile Software Development: Principles, Patterns, and Practices*. Prentice Hall, 2002.
4. Chodorow, Kristina. *MongoDB: The Definitive Guide*. O'Reilly Media, 2013.
5. Baron, Michael. *Cloud Computing with AWS*. Packt Publishing, 2016.

## APPENDICES

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### List of Appendices

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**A0. COPY OF PROJECT REGISTRATION FORM**

## A1A. PROJECT PROPOSAL AND VISION DOCUMENT

### CHAPTER 1

#### Introduction

The construction industry in Pakistan is marked by inefficiencies, lack of coordination, and reliance on outdated processes. Clients face challenges in finding reliable contractors, sourcing materials, and tracking project progress. These issues often lead to delays, increased costs, and poor-quality outcomes.

With growing digital adoption, there is a timely opportunity to introduce a unified platform that connects customers, contractors, and suppliers. One-Source Construction aims to address these challenges by streamlining construction workflows, enhancing transparency, and improving project efficiency through an accessible and scalable digital solution.

#### 1.1 Problem Statement

The construction sector in Pakistan, particularly for residential and small-to-medium-scale projects, faces a lack of structured coordination between service providers (contractors, architects, interior designers) and consumers. This leads to numerous pain points:

- Clients struggle to find trustworthy professionals.
- Cost estimates vary drastically, and quality assurance is lacking.
- Material sourcing is decentralized, time-consuming, and often leads to logistical delays.
- Lack of transparent communication causes project stagnation.

#### 1.2 Project Motivation

Inspired by the inefficiencies seen in the construction process experienced by family, friends, and community stakeholders, this project was motivated by a desire to:

- Help individuals find and hire verified contractors based on transparent metrics such as customer reviews and completion history.
- Digitize and centralize construction services to reduce human error and fraud.
- Offer a material marketplace where users can compare, select, and purchase building materials with cost transparency.
- Enable small contractors and suppliers to grow through a digital presence.
- Deliver a simplified, user-friendly interface that even non-technical users can understand and utilize effectively.

The project aims to empower both customers and service providers through structured communication, real-time updates, and informed decision-making.

### 1.3 Objectives

The core objectives of the “**One-Source Construction**” platform include:

- To develop a centralized web-based platform integrating project management, contractor hiring, and material procurement.
- To reduce construction project delays and cost overruns through optimized resource allocation.
- To offer real-time dashboards for users to manage budgets, timelines, and quality benchmarks.
- To promote trust through verified profiles, project galleries, and customer feedback.
- To ensure the platform is scalable, secure, and responsive for both desktop and mobile users.

To create a future-ready system architecture that can later be extended with AI features like smart recommendations, price forecasting, and scheduling optimization.

### 1.4 Literature Review

Research indicates that the construction sector is among the least digitized industries globally, contributing to significant productivity losses. Studies from McKinsey and other global think tanks identify poor coordination and lack of information-sharing tools as major contributors to delays and cost overruns.

## **CHAPTER 2**

### **Project Vision**

One-Source Construction envisions a unified, user-friendly platform that streamlines construction workflows by integrating contractor hiring, material procurement, and project management. The project aims to address inefficiencies in Pakistan's construction industry by offering a scalable, digital solution that enhances transparency, trust, and efficiency among stakeholders. With a cloud-based architecture and user-centric design, the platform targets homeowners, suppliers, and contractors, enabling them to collaborate effectively through a single digital ecosystem. This vision supports modern infrastructure needs while encouraging the adoption of digital tools in traditionally manual construction processes.

### **Business Case and SWOT Analysis**

One-Source Construction provides a centralized platform that simplifies the hiring of contractors, purchasing of materials, and tracking of construction projects. It fills a critical gap in the Pakistani market where these services are fragmented and difficult to coordinate digitally.

#### **SWOT Analysis:**

- Strengths: All-in-one solution, real-time updates, scalable architecture.
- Weaknesses: No mobile app yet, limited initial vendor network.
- Opportunities: First mover in regional digital construction platforms; potential for future features like equipment rentals or AI-based analytics.
- Threats: Emerging competitors, resistance from traditional contractors.

### **Background, Business Opportunity, and Customer Needs**

The traditional construction process in Pakistan is slow and inefficient, with clients struggling to compare options or track project progress. Digitalization is minimal in this sector. One-Source Construction capitalizes on rising internet access and demand for better user experiences by providing an online hub for verified contractors and suppliers, supported by project tracking and transparent cost structures.

Target customers include home owners, renovation planners, small construction firms, and material suppliers looking to expand digitally. The platform addresses their core needs: trust, efficiency, affordability, and communication.

## **Business Objectives and Success Criteria**

- Launch a web-based platform integrating core services (contractors, materials, project tracking).
- Achieve a minimum 90% uptime during beta testing.
- Maintain user satisfaction score of 4.5/5 or higher.
- Secure listings from at least 50 contractors and 20 suppliers within the first three months.
- Expand features based on user feedback and supervisor guidance.

## **Project Risks and Risk Mitigation Plan**

### **Risks:**

- Delayed development due to technical challenges.
- Data security issues with payment or login systems.
- Contractor or supplier disengagement post-launch.

### **Mitigation Plan:**

- Adopt Agile methodology to manage unexpected technical hurdles.
- Implement SSL, secure APIs, and hashed credentials to protect data.
- Introduce a rating/review system and periodic engagement with vendors to maintain activity.

## **Assumptions and Dependencies**

- Users have basic internet access and mobile devices.
- Contractors and suppliers are willing to digitize their services.
- The academic environment will support full project development and feedback.

External APIs for payments and maps will remain accessible during development.

## **Chapter 3**

### **Project Scope**

#### **In Scope**

- User registration and login functionality for customers, contractors, and suppliers.
- Contractor listing, profile management, search and rating features.
- Construction material marketplace with product listings, pricing, and purchase option.
- Project dashboard for customers to track budget, timeline, and tasks.
- Admin panel for content moderation, user management, and analytics.
- Secure payment gateway integration for digital transactions.
- Feedback and review system for quality assurance.

#### **3.2 Out of Scope**

- Legal contract generation or regulatory compliance enforcement.
- Real-time video chat or site inspection features.
- Physical delivery logistics or labor equipment rentals.
- Mobile app development (reserved for future phases).
- Government licensing or tax system integration.

## Chapter 4

### Proposed Methodology

#### 4.1 SDLC Approach (Waterfall/Agile/any model)

The Agile Scrum model was adopted to ensure iterative development, flexibility, and continuous feedback. The project was divided into sprints, each lasting two weeks, with sprint planning, daily stand-ups, and sprint reviews. This approach enabled frequent testing, faster integration of changes, and better alignment with academic and user expectations.

#### 4.2 Team Role & responsibilities

Task	Madad Allah	Hanzala Shahzad	Burhan Haider	Supervisor
Frontend (UI/UX) Design	R,A	6 R,A	R,A	I,C
Database Design	R,A	R,A	R,A	I,C
Backend Development	R,A	R,A	R,A	I,C
Integration	6 R,A	R,A	R,A	I,C
Testing	R,A	R,A	R,A	I,C

#### 4.3 Requirement Development

Requirements were gathered through stakeholder interviews, competitor analysis, and supervisor consultations. Functional and non-functional requirements were documented in the SRS and refined after feasibility studies.

#### **4.4 High-level Architecture / Design**

The platform follows a three-tier architecture:

- Presentation Layer: Web-based frontend using HTML/CSS/JS and responsive frameworks.
- Application Layer: Backend APIs built with Node.js and Express for logic handling.
- Data Layer: MySQL relational database for structured and secure data storage.

This modular design ensures scalability, maintainability, and easy integration with third-party services.

#### **4.5 Application (or Project) Testing**

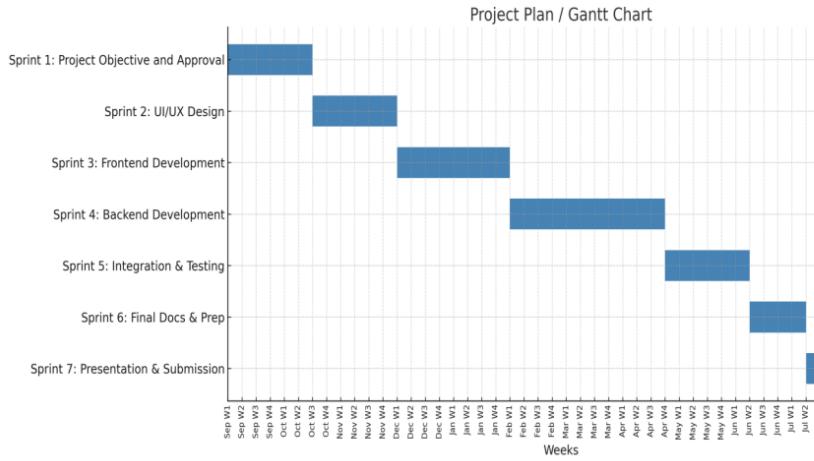
Multiple testing phases were employed:

- Unit Testing: Verified functions at the module level.
- Integration Testing: Ensured coordination between frontend, backend, and database layers.
- User Acceptance Testing (UAT): Collected feedback from test users to refine usability.
- Load Testing: Simulated concurrent users using JMeter.
- Security Testing: Basic vulnerability checks using OWASP ZAP and input sanitization techniques.

## Chapter 5 Project Planning

Effective project planning is essential for delivering the OneSource Construction platform within the stipulated academic timeline and ensuring all major deliverables are completed on time and with quality. The planning process involved breaking down the project into manageable modules, assigning responsibilities, estimating efforts, and aligning progress with weekly and semester-based milestones.

### 5.1 Gantt Chart



## Chapter 6 Project Requirements

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This chapter outlines the **software and hardware requirements** essential for the development, testing, and deployment of the One-Source Construction platform. These requirements were identified based on the selected technology stack, scope of functionality, and academic feasibility.

### 6.1 Software tools requirements

The following software tools and technologies were used throughout the project life cycle:

#### Visual Studio Code

5

- Used as the primary Integrated Development Environment (IDE) for frontend and backend development

#### Frontend Technologies:

5

- HTML, CSS, JavaScript. Standard web technologies were used for structuring, styling, and adding interactivity to the user interface(UI).

#### Backend Technologies:

- Python (Django Framework). Optional support considered for admin panel and RESTful API services due to Django's security and rapid development features.
- MySQL. Employed as the primary relational database management system for storing user, contractor, material, and transaction data.
- Selenium  
Used for automated UI testing to verify functionality across different devices and browsers.

#### Testing Tools:

#### DevOps & Deployment:

- Git

Used for version control, collaborative development, and maintaining code repositories on GitHub.

## 6.2 Hardware requirements

The hardware requirements for development and testing were modest but essential to support local builds, live testing, and cloud integration:

### Development Devices:

- Laptops (Windows 10, Intel Core i5/i7, 8GB RAM)

## Chapter 7

### Budget/Costing

Internet	6,000 (8 months)
Domain	3,500 (Per year)
Web Hosting	8,000 (8 months)
Miscellaneous	10,000 (est.)

**Total Estimated Cost 27,500 PKR est.**

### 7.2 Estimated Budgeted Cost - of the Project

The total estimated cost for completing the One-Source Construction project is approximately PKR 27,500. This includes all operational expenses, cloud infrastructure, and prototyping tools required to develop and present a fully functional platform.

## **Chapter 8**

### **Project Deliverables**

This chapter outlines the key deliverables at each phase of the project development cycle. The deliverables reflect the evolution of the One-Source Construction platform from concept to final implementation, ensuring structured milestones for planning, feedback, and improvement.

#### **8.1 Phase I - Alpha Prototype**

The Alpha Prototype was a static, non-functional model demonstrating the user interface and navigation flow. Key deliverables included:

- UI mockups designed using Figma
- Wireframes of major screens (login, dashboard, contractor list, material page)
- Architecture diagrams and ER model drafts
- Approval of initial UI/UX concept by supervisor
- Presentation of static screens to collect early-stage feedback

#### **8.2 Phase II - Beta Prototype**

The Beta Prototype introduced basic functional modules with dummy or test data. Major features included:

- Working login and registration module
- Contractor listing and profile viewing
- Material marketplace frontend integrated with backend APIs
- Responsive design testing across browsers
- Partial database schema integration with mock transactions

#### **8.3 Phase III - Release Candidate**

This version included a nearly complete and fully functional system. It was tested internally and presented as a preview of the final product. Features delivered:

- Full backend integration with MySQL database
- Secure login with role-based access control (admin, user, supplier, contractor)
- Project dashboard with task assignment and tracking
- Feedback and rating system enabled
- Admin panel for monitoring users and content
- API testing completed using Postman
- Initial user testing (UAT) feedback documented

## 8.4 Phase IV - Final Product

The final version was deployed to a cloud environment and prepared for demonstration, documentation, and report submission. This version included:

- Complete functionality across all planned modules
- Hosted on AWS with domain and HTTPS setup
- All known bugs fixed and UI finalized
- Final test cases executed and passed
- Research paper and technical documentation submitted
- Oral presentation and viva conducted

## Chapter 9

### Proposed GUI (Disposable Prototype)

The disposable GUI prototype was created in the early stages of development to visually represent the layout, navigation flow, and user experience of the OneSource Construction platform. This prototype was not fully functional but served as a conceptual blueprint to guide frontend development and collect supervisor feedback.

#### Tools Used:

- Figma was used for designing high-fidelity screens and wireframes.
- Bootstrap and Tailwind CSS were referenced for layout alignment and mobile responsiveness.

#### Key Screens in the Prototype:

1. **Login & Registration Pages**
  - Clean and minimal interface with role-based login options (Customer, Contractor, Supplier).
  - “Forgot Password” and “Sign Up” pages with validation cues.
2. **User Dashboard (Customer View)**
  - Overview panel showing ongoing projects, budgets, and timelines.
  - Quick links to hire a contractor, purchase materials, or track progress.
3. **Material Marketplace Page**
  - Grid layout showing building materials with images, prices, and supplier names.
  - “Add to Cart” and “Compare” buttons for user convenience.
4. **Project Tracking Panel**
  - Timeline view of tasks with completion status indicators.
  - Option to add, edit, or delete project milestones.
5. **Admin Panel Mockup**
  - Dashboard with user management, reported content review, analytics charts.
  - Ability to block users, approve contractors, or update system content.

### Purpose of the GUI Prototype:

- To visually communicate the system's functional structure.
- To validate usability and navigation flow before development began.
- To assist in early-stage stakeholder feedback and design iterations.

The prototype was presented during early supervisor meetings and used as a reference throughout frontend development. Screenshots from this prototype can be found in the project documentation and presentation slides.

## Chapter 10

### Meetings held with supervisor

Regular meetings with the project supervisor were a vital component of the successful planning and execution of the OneSource Construction platform. These sessions provided continuous technical guidance, design feedback, progress evaluation, and strategic direction throughout the project lifecycle.

Meeting No.	Date	Agenda/Topics Discussed	Outcome/Remarks
01	12-Jan-2024	Initial proposal discussion and team responsibilities	Proposal approved with minor refinements
02	26-Jan-2024	Review of problem statement, objectives, and project scope	Positive feedback; encouraged to explore market need
03	10-Feb-2024	System architecture and UI wireframes	Design direction approved; minor layout suggestions
04	24-Feb-2024	SRS document validation and feature prioritization	SRS approved for implementation
05	08-Mar-2024	Sprint 1 progress: login/authentication, contractor module	Suggested security improvements
06	22-Mar-2024	Sprint 2 review: material module and cart integration	Approved with UI refinements
07	05-Apr-2024	Dashboard integration and backend testing	Encouraged testing automation and data validation
08	19-Apr-2024	Pre-beta demonstration and bug report review	Ready for UAT; minor responsiveness issues noted
09	03-May-2024	Final deployment and presentation preparation	Final checklist shared; Viva readiness confirmed

## Chapter 11 Reference

1. Valentino, Jonathan. *Web Development with Node.js and Express*. Packt Publishing, 2020.
2.  nks, Artemij. *React.js Essentials*. Packt Publishing, 2015.
3. Martin, Robert C. *Agile Software Development: Principles, Patterns, and Practices*. Prentice Hall, 2002.
4.  Chodorow, Kristina. *MongoDB: The Definitive Guide*. O'Reilly Media, 2013.
5. Baron, Michael. *Cloud Computing with AWS*. Packt Publishing, 2016.

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## A2. REQUIREMENT SPECIFICATIONS

### Chapter 1

#### Introduction

##### Purpose of Document

<sup>2</sup>  
The purpose of this Software Requirements Specification (SRS) document is to outline the functional and non-functional requirements, architecture, and interaction mechanisms of the One Source Construction platform. This document provides a detailed framework for developers, testers, and stakeholders to ensure the system is designed and developed effectively, meeting the needs of the construction industry.

#### 1.2. Intended Audience

##### Development Team:

To guide the design, development, and implementation of the One Source Construction platform.

##### Project Supervisor:

To track progress and ensure that requirements are met throughout development.

##### Tester:

To validate system functionality and performance against defined requirements.

##### Stakeholder:

To understand the platform's features and how it addresses the construction industry's challenges.

##### End-Users (Contractors, Suppliers, and Customers):

To benefit from an integrated platform that simplifies construction management.

## **Chapter 2**

### **2. Overall System Description**

#### **2.1. Project Background**

The construction industry, especially in countries like Pakistan, faces various challenges such as high costs, fragmented services, and quality control issues. One Source Construction seeks to address these problems by providing a centralized platform that offers contractor services, construction material purchasing, and project management tools in one place, thus improving efficiency and decision-making.

#### **2.2. Project Scope**

The project will focus on developing an online platform where users can:

- Hire contractors for various construction projects (residential, commercial, renovations).
- Purchase construction materials like cement, bricks, and steel from a variety of suppliers.
- Utilize project management tools to track budgets, timelines, and quality.

#### **2.3. Not In Scope**

The platform will not:

- Offer on-site construction services directly.
- Handle large-scale construction machinery rentals.
- Provide legal services or documentation related to construction contracts.

#### **2.4. Project Objectives**

- To build a user-friendly platform that integrates contractors, suppliers, and project management tools.
- To allow customers to compare prices, review ratings, and make informed decisions.
- To help users manage the complete life cycle of a construction project in a single interface.

#### **2.5. Stakeholders**

- Customers (Homeowners, Business Owners): Primary users who will benefit from a centralized construction management platform.
- Contractors: Service providers offering construction and renovation services.
- Suppliers: Companies providing construction materials like cement, bricks, and steel.
- Development Team: Responsible for building and maintaining the platform.
- Project Supervisors: Oversee the project and ensure it meets the set requirements.

## 2.6. Operating Environment

The One Source Construction platform will be accessible through web browsers and mobile devices (iOS and Android). It will be developed using HTML, CSS, JavaScript, and back-end technologies like Node.js or Python/Django. The platform will be hosted on cloud-based infrastructure to ensure scalability and reliability.

## 2.7. System Constraints

- The platform will need to integrate with various third-party APIs for payment gateways and supplier databases.
- Limited budget for development may affect the scope of features during initial phases.
- Users must have internet access to use the platform.

## 2.8. Assumptions & Dependencies

- Users will have basic technical knowledge to navigate the platform.
- The availability of reliable suppliers and contractors who will list their services and products on the platform.
- Adequate internet infrastructure for accessing the platform.

## **Chapter 3**

### **3. External Interface Requirements**

#### **3.1. Hardware Interfaces**

The One Source Construction platform is primarily a software-based solution and does not directly interface with specific hardware. However, the system is designed to be accessible across various devices:

**User Devices:** The platform will be accessible via mobile devices (iOS, Android) and desktop computers.

**Servers/Cloud Infrastructure:** The back-end of the system will be hosted on cloud servers, requiring communication between the platform and cloud services for data storage, security, and processing.

#### **3.2. Software Interfaces**

The One Source Construction platform will need to interface with the following external software applications:

**Supplier Databases (e.g., SAP, custom databases):**

External Owner: Supplier companies and databases.

Interface Details: Integration with supplier systems to fetch updated product availability, pricing, and stock information.

**Project Management Tools (e.g., Trello, Asana):**

External Owner: Third-party project management tools for possible integration with the platform.

Interface Details: APIs for syncing project tasks, deadlines, and resource management between One Source and third-party platforms.

#### **3.3. Communications Interfaces**

**Internet Communication:**

Interface Details: The platform will communicate with end-users via HTTP/HTTPS protocols over the internet, ensuring secure and reliable data transfer between users and the server.

**Local Area Networks (LAN):**

Interface Details: In the event of local setups or on-site access to the platform (e.g., for construction site management), communication via LAN may be used for internal connectivity between multiple devices at a construction site.

**Cloud Integration (AWS, Google Cloud, etc.):**

Interface Details: The system will use cloud-based infrastructure to handle data storage, scalability, and security. Communication will occur via standard cloud APIs and secure protocols.

## Chapter 4

### 4. Functional Requirements

The One Source Construction platform will have the following system functions, categorized by their visibility to the end user, performance requirements, design constraints, and implementation details. These functions will address both user-facing and back-end processes essential to the platform's functionality.

#### 4.2. Use Cases

##### 4.2.1 List of Actors

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Actors represent the users or external systems that interact with the system. Here are the actors for your construction platform:

**Construction Manager:** Manages projects, assigns tasks, and tracks project progress.

**Contractor:** Provides services for construction projects (e.g., labor, subcontracting).

**Supplier:** Supplies materials and equipment needed for the project.

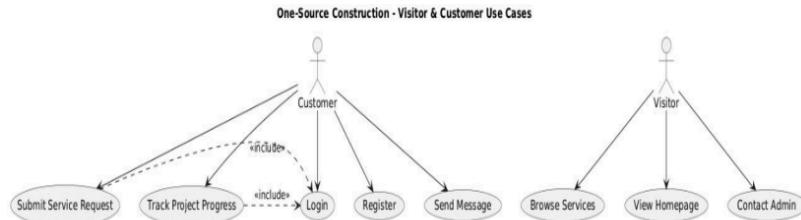
**Customer (End-User):** Requests or hires contractors for projects.

**System Admin:** Manages system settings, user permissions, and overall platform maintenance.

##### 4.2.2 List of Use Cases

- Create Project: Allows the Construction Manager to create a new project.
- Assign Contractor: The Construction Manager assigns contractors to a project.
- Track Progress: The user tracks the status and progress of the construction project.
- Make Payment: Customers pay for services rendered or materials purchased.
- Hire Contractor: Customers hire contractors for specific tasks.
- Manage Inventory: Suppliers update available inventory for the system.
- Request Material: Construction Manager requests materials from suppliers.
- Generate Reports: Admin generates reports regarding project status, financial transactions, etc.

##### 4.2.1. Use Case Diagram



## Chapter 5

### 5.1 Non-functional Requirements

#### 5.1. Performance Requirements

The system must be capable of handling at least 100 concurrent users without significant performance degradation.

Response time for most actions (e.g., creating a project or generating reports) should not exceed 5 seconds.

#### 5.2. Safety Requirements

The platform must ensure that any critical data (e.g., project information) is backed up daily. The system should provide regular software updates to fix bugs and patch vulnerabilities to ensure safe and stable operations.

#### 5.3. Security Requirements

User authentication should be required to access the system, with different roles (e.g., admin, manager and user).

All sensitive data (e.g., project budgets, contracts) must be encrypted both in transit and at rest.

The system must comply with relevant data protection laws (e.g., GDPR, CCPA).

#### 5.4. User Documentation

Detailed user manuals should be provided, covering system functionality and usage steps. Documentation must be available in both digital and printable formats for user accessibility.

## Chapter 6

### 6. References

- Valentino, Jonathan. "Web Development with Node.js and Express." Packt Publishing, 2020.
- Banks, Artemij. "React.js Essentials." Packt Publishing, 2015.
- Martin, Robert C. "Agile Software Development: Principles, Patterns, and Practices." Prentice Hall, 2002.
- Chodorow, Kristina. "MongoDB: The Definitive Guide." O'Reilly Media, 2013.
- Baron, Michael. "Cloud Computing with AWS." Packt Publishing, 2016.

## A3. DESIGN SPECIFICATIONS

### Chapter 1

#### 1 Introduction

##### 1.1 Purpose of Document

The purpose of this Design Specification document is to outline the architectural and technical design decisions taken during the development of the OneSource Construction platform. This document translates functional and non-functional requirements into structural blueprints, including diagrams, models, interface descriptions, and interaction flows. It serves as a reference for developers, testers, and stakeholders to understand how the system is built and how its components integrate.

##### 1.2 Intended Audience

This document is intended for the following readers:

- **Development Team:** To implement system architecture, data models, and interfaces.
- **Testing Team:** To validate that the implementation aligns with the proposed design.
- **Project Supervisor:** To review technical soundness and documentation quality.
- **External Evaluators:** To assess the comprehensiveness of the system's engineering design.
- **Future Developers:** To maintain or expand the platform with consistent design standards.

##### 1.3 Project Overview

One-Source Construction is a web-based platform that connects homeowners, contractors, and material suppliers in a unified digital ecosystem. The platform offers services such as contractor hiring, material procurement, project tracking, and user reviews. The system is designed using a modular, three-tier architecture that ensures scalability, security, and ease of integration. The backend is powered by Node.js with a MySQL database, while the frontend is developed using HTML/CSS/JavaScript with responsive design principles.

The platform's core modules include:

- User Authentication and Role Management
- Contractor and Supplier Listings
- Material Marketplace
- Project Dashboard with Task Tracking
- Feedback and Rating System
- Administrative Monitoring Tools

## 1.4 Scope

This document covers the following aspects of the system design:

- System Architecture Diagram (Logical and Physical)
- Entity-Relationship (ER) Diagram and Database Schema
- User Interface Layouts and Navigation Flow
- Data Flow Diagrams (DFDs) and Use Case Mapping
- Integration Points (e.g., API calls between modules)
- Error Handling, Security Measures, and Design Assumptions

It does not include actual implementation code but serves as a comprehensive blueprint for development and testing phases. Design constraints, assumptions, and guidelines are documented to ensure that the platform remains consistent, reliable, and maintainable throughout its lifecycle.

## Chapter 2

### 2 Design Considerations

#### 2.1 Assumptions and Dependencies

In the design of One-Source Construction, certain assumptions and external dependencies were considered to guide the system's structure and behavior. These assumptions helped define architectural boundaries and anticipate limitations in a real-world deployment.

##### Assumptions:

- Users will have stable internet access and a modern web browser to interact with the platform.
- Contractors and suppliers are willing to register, update their profiles, and respond to client requests digitally.
- All users (customers, contractors, suppliers, and admins) will be familiar with basic web navigation.
- Initial system traffic will be manageable under free-tier cloud hosting (AWS EC2 t2.micro or equivalent).
- User ratings and reviews will remain civil and appropriate; the admin will handle disputes or report abuse.
- Local building material prices and availability are updated by suppliers themselves (not the system admin).

### Dependencies:

- Third-party services such as email (SMTP) and payment gateways (e.g., Stripe, PayFast) must remain operational.
- Cloud hosting services (AWS or similar) are used for uptime, backups, and SSL certificates.
- Browsers and devices must support responsive web standards (HTML5, CSS3, ES6).
- External libraries and frameworks used in the project (e.g., Bootstrap, Express.js, MySQL drivers) must be maintained and secure.

## 2.2 Risks and Volatile Areas

Designing a web platform of this scale involves technical risks and areas of potential instability, especially in early versions. Identifying these helps prepare mitigation strategies during development.

### Key Risks and Volatile Areas:

1. **API Integration Risks**  
If third-party APIs (e.g., payment processors, SMS/email notifications) fail or become deprecated, system features like payments and account verification may be affected.
2. **Data Security & Privacy Risks**  
Without strict validation and encryption, sensitive user information may be exposed. There is a risk of SQL injection, session hijacking, or unauthorized access if security layers are not properly configured.
3. **User Data Quality**  
Since supplier prices and contractor profiles are user-managed, there is a risk of outdated, incorrect, or misleading data unless regular moderation or user feedback is enforced.
4. **Performance Bottlenecks**  
Under high concurrent usage (e.g., during promotions), the system may face load or performance degradation if not optimized with caching, indexing, and efficient queries.
5. **Technological Change**  
Rapid updates in JavaScript frameworks or backend tools may lead to compatibility issues if the project is not regularly maintained or updated.
6. **User Behavior Volatility**  
The rating and review system may be misused or spammed. Additional moderation tools and complaint mechanisms are needed to ensure trustworthiness.

### Mitigation Strategies:

- Use environment-based configuration for API keys to allow easy switching or upgrades.
- Implement input validation, HTTPS, encryption, and token-based authentication for secure data handling.
- Schedule periodic database cleanups and review inactive profiles or listings.
- Conduct load testing during staging to identify and fix performance issues before launch.
- Monitor library updates and deprecations through GitHub and documentation feeds.

## Chapter 3

### 3 System Architecture

#### 3.1 System Level Architecture

The One-Source Construction platform is designed using a layered architecture that separates the system into three core tiers: presentation, application logic, and data management. This separation of concerns ensures better scalability, maintainability, and modularity.

##### System Level Components:

- **Client Layer (Frontend):**  
Responsible for interacting with users via web browsers or mobile browsers. This layer is built using HTML5, CSS3, JavaScript, and Bootstrap/Tailwind. It provides responsive views for customers, contractors, and suppliers with dedicated dashboards and access control.
- **Application Server (Backend):**  
Built using Node.js and Express.js, the backend processes requests from the frontend, applies business logic, and communicates with the database. RESTful APIs are exposed for all client operations such as user registration, material search, and project updates.
- **Database Server (Data Layer):**  
MySQL serves as the relational database, storing structured data including user accounts, project records, material listings, reviews, and transaction history. Foreign key relationships and indexing are used to ensure data consistency and performance.
- **Deployment Environment:**  
The system is hosted on Amazon Web Services (AWS EC2) for backend services and S3 (optional) for static frontend deployment. Docker containers are used to ensure isolated and portable deployments across environments.

#### 3.2 Software Architecture

The software architecture follows a modular and API-driven approach based on the MVC (Model-View-Controller) pattern.

- Model Layer:  
Defines database schema and handles data validation, storage, and retrieval. Includes tables for Users, Materials, Projects, Orders, Reviews, and Categories. Implemented using Sequelize ORM for MySQL.
- View Layer:  
Comprises the frontend components rendered in HTML and styled with CSS. It uses JavaScript for dynamic behavior, while layout templates define reusable sections (header, footer, cards, etc.).
- Controller Layer:  
Handles incoming requests, processes business logic, and interacts with model functions. Controllers are split into modules (authController, materialController, projectController, etc.) for maintainability.

## Chapter 4

### 4 Design Strategy

The design strategy for the One-Source Construction platform is centered on simplicity, scalability, security, and user-centric experience. Each design decision was made with the goal of ensuring maintainability, responsiveness, and efficient communication between system components. The strategy incorporates modern web standards and follows the industry-recognized Model-View-Controller (MVC) paradigm for both frontend and backend separation.

#### Key Elements of the Design Strategy:

- Modular Development

Each major feature (e.g., User Authentication, Project Dashboard, Material Store) is developed as a separate module to ensure reusability and reduce interdependency. This structure supports parallel development, easier debugging, and clean separation of responsibilities.

- Responsive UI/UX Design

The platform is designed to be fully responsive using CSS frameworks such as Bootstrap and Tailwind CSS. It adjusts seamlessly across devices (mobile, tablet, desktop). Wireframes and mockups were created using Figma prior to development.

- API-Driven Communication

Frontend and backend interact using secure RESTful APIs. Each API endpoint handles a specific function (e.g., /api/register, /api/materials, /api/orders), making the platform scalable and ready for mobile app integration in the future.

- Secure Authentication and Role Management

The platform includes JWT-based authentication and role-based access control (RBAC). Separate access levels are enforced for Customers, Contractors, Suppliers, and Admins using middleware on backend routes.

- Scalable Backend Architecture

Backend services are built using Python with Django, structured into controllers, routes, and services. This approach simplifies updates and supports future enhancements like chat, recommendations, or analytics.

- Relational Database Structure

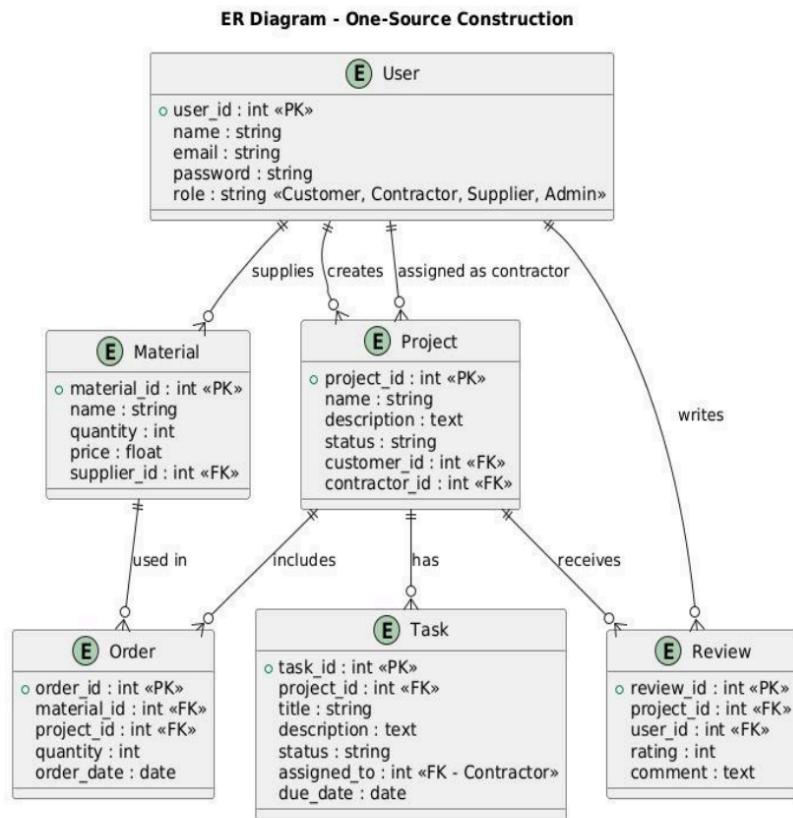
A normalized MySQL database schema was designed using Entity-Relationship (ER) diagrams. Foreign keys are used for data integrity across tables like Users, Materials, Projects, and Reviews.

## Chapter 5

### 5 Detailed System Design

#### 5.1 Database Design

##### 5.1.1 ER Diagram



## 5.1.2 Data Dictionary

### 5.1.2.1 Data 1 user table

#### Data Dictionary - Users Table

E Users	
<ul style="list-style-type: none"><li>user_id : INT «PK» - Unique identifier for each user</li><li>name : VARCHAR - Full name of the user</li><li>email : VARCHAR - User email address</li><li>password : VARCHAR - Encrypted password</li></ul> <p>role : VARCHAR - Role (Customer, Contractor, Supplier, Admin)</p>	

### 5.1.2.2 Data 2 Project Table

#### Data Dictionary - Projects Table

E Projects	
<ul style="list-style-type: none"><li>project_id : INT «PK» - Unique identifier for each project</li><li>name : VARCHAR - Project name or title</li><li>description : TEXT - Project description</li></ul> <p>status : VARCHAR - Current status (Ongoing, Completed)</p> <p>customer_id : INT «FK» - References Users(user_id)</p> <p>contractor_id : INT «FK» - References Users(user_id)</p>	

### 5.1.2.3 Data 3 Order Table

#### Data Dictionary - Orders Table

E Orders	
<ul style="list-style-type: none"><li>order_id : INT «PK» - Unique identifier for each order</li><li>quantity : INT - Number of units ordered</li><li>order_date : DATE - Date the order was placed</li></ul> <p>material_id : INT «FK» - References Materials(material_id)</p> <p>project_id : INT «FK» - References Projects(project_id)</p>	

### 5.1.2.4 Data 4 Materials Table

#### Data Dictionary - Materials Table

E Materials	
<ul style="list-style-type: none"><li>material_id : INT «PK» - Unique identifier for each material</li><li>name : VARCHAR - Name of the material</li><li>quantity : INT - Quantity available</li><li>price : FLOAT - Price per unit</li></ul> <p>supplier_id : INT «FK» - References Users(user_id)</p>	

### 5.1.2.5 Data 5 Task Table

#### Data Dictionary - Tasks Table

E Tasks	
• task_id : INT «PK» - Unique identifier for each task	
title : VARCHAR - Task title	
description : TEXT - Task description/details	
due_date : DATE - Task deadline	
project_id : INT «FK» - References Projects(project_id)	
status : VARCHAR - Status (Pending, Completed)	
assigned_to : INT «FK» - References Users(user_id)	

### 5.1.2.6 Data 6 Reviews Table

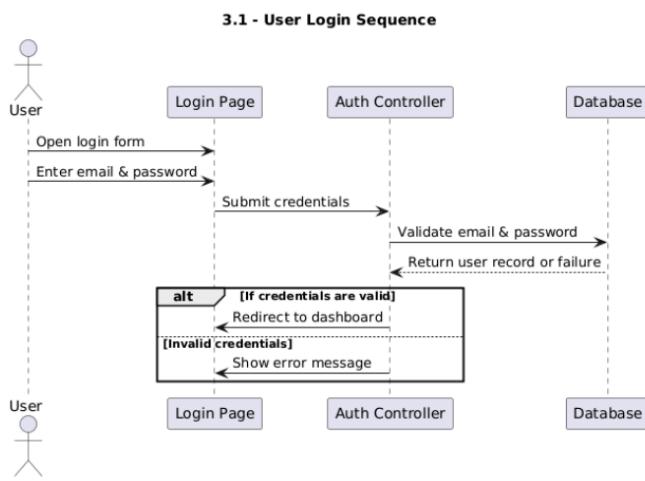
#### Data Dictionary - Reviews Table

E Reviews	
• review_id : INT «PK» - Unique identifier for each review	
rating : INT - Rating from 1 to 5	
comment : TEXT - User feedback or review	
project_id : INT «FK» - References Projects(project_id)	
user_id : INT «FK» - References Users(user_id)	

## 5.2 Application Design

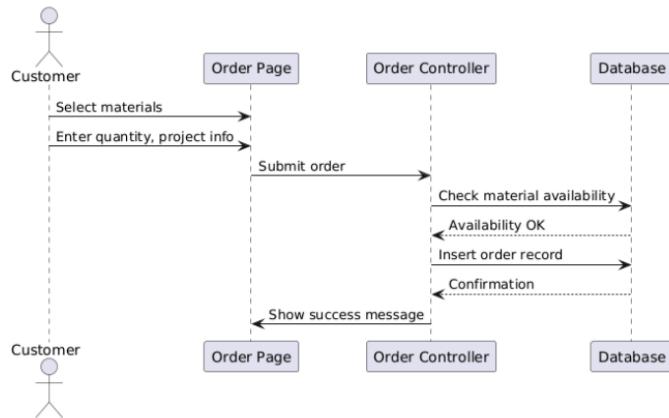
### 5.2.1 Sequence Diagram

#### 5.2.1.1 User Login Sequence



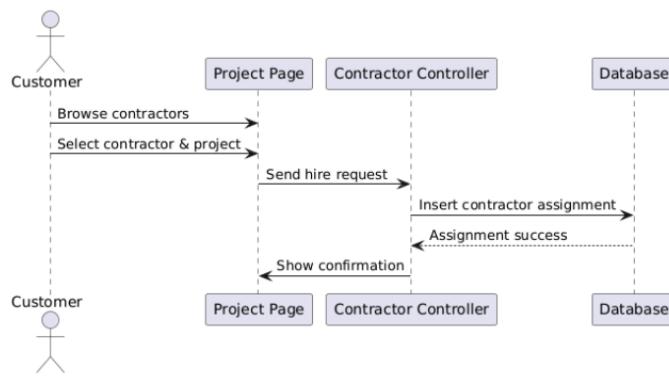
### 5.2.1.2 Place Material Order Sequence

3.2 - Place Material Order Sequence



### 5.2.1.3 Hire Contractor Sequence

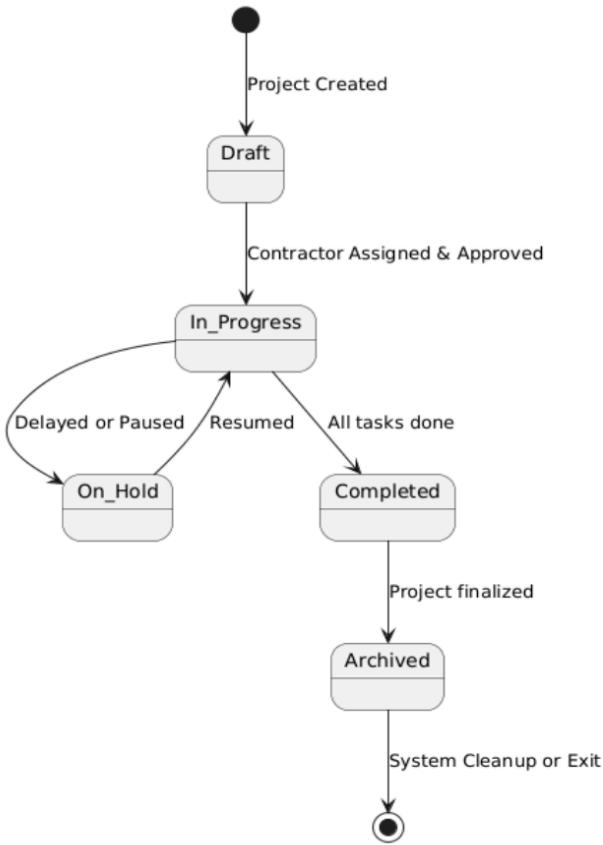
3.3 - Hire Contractor Sequence



## 5.2.2 State Diagram

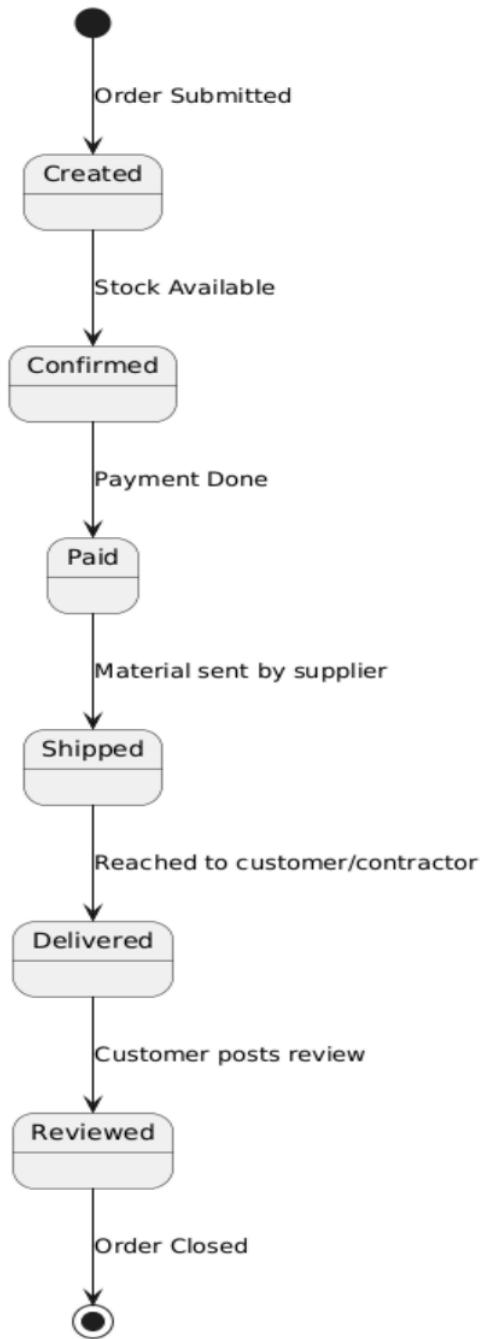
### 5.2.2.1 Project State Diagram

4.1 - Project State Diagram



## 5.2.2.2 Order Lifecycle Diagram

### 4.2 - Order Lifecycle Diagram



## Chapter 6

### References

- Valentino, Jonathan. "Web Development with Node.js and Express." Packt Publishing, 2020.
- Banks, Artemij. "React.js Essentials." Packt Publishing, 2015.
- Martin, Robert C. "Agile Software Development: Principles, Patterns, and Practices." Prentice Hall, 2002.
- Chodorow, Kristina. "MongoDB: The Definitive Guide." O'Reilly Media, 2013.
- Baron, Michael. "Cloud Computing with AWS." Packt Publishing, 2016.

## A4. OTHER TECHNICAL DETAIL DOCUMENTS

### Test Cases Document

This document provides a comprehensive list of test cases designed to validate the core functionalities of the One-Source Construction platform. It includes:

- Module-wise test case descriptions (login, contractor search, order placement, etc.)
- Input/output conditions and expected results
- Status indicators (Pass/Fail) and actual test outcomes
- Tools used: Selenium (UI testing), Postman (API testing), JMeter (load testing)

The test cases ensured functional correctness, user acceptance, performance under load, and stability before deployment.

### UI/UX Detail Document

This document captures the visual and interactive design components of the platform. It includes:

- High-fidelity screen mockups created in Figma
- Component-level breakdown (buttons, navigation bars, cards, forms)
- Color schemes, typography, spacing, and layout logic
- Design consistency and accessibility practices
- Responsiveness testing results across mobile and desktop devices

This document served as a design blueprint and guided frontend implementation.

### Coding Standards Document

This document outlines the conventions and practices followed by the development team to ensure code readability, maintainability, and scalability. It includes:

- Naming conventions for files, functions, and variables
- Folder structure and modular architecture for backend and frontend
- Commenting practices and version tracking with Git
- Guidelines for error handling and security (e.g., SQL injection prevention)
- Linting tools and formatters used (e.g., ESLint, Prettier)

The coding standards were followed throughout the project to maintain team consistency.  
Project Policy Document

## Project Policy Document

This document defines internal team policies and rules for project collaboration. It covers:

- Team communication protocols (Slack, WhatsApp, weekly meetings)
- Conflict resolution approach
- Data backup and documentation submission schedule
- Supervisor interaction frequency and feedback handling
- Commit access control and GitHub repository management rules

This ensured clarity, discipline, and professionalism in team dynamics.

## User Manual Document

This document is intended for end users (customers, contractors, suppliers, admins) and explains how to use the system effectively. It includes:

- Step-by-step usage guide with screenshots (login, hiring, placing orders, tracking projects)
- FAQs and troubleshooting tips
- Contact/support information
- Guidelines for secure password usage and profile management
- Admin panel instructions for platform moderation

## A5. FLYER & POSTER DESIGN

**A6. COPY OF EVALUATION COMMENTS**  
**COPY OF EVALUATION COMMENTS BY SUPERVISOR**  
**FOR PROJECT – I MID SEMESTER EVALUATION**

A Photostat or scanned copy should be placed when submitting document to Project Coordinator. (**Note:** Please remove this line when attach copy that is required)

## **COPY OF EVALUATION COMMENTS BY JURY FOR PROJECT – I END SEMESTER EVALUATION**

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**COPY OF EVALUATION COMMENTS BY SUPERVISOR  
FOR PROJECT – II MID SEMESTER EVALUATION**

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## A7. MEETINGS' MINUTES & Sign-Off Sheet

Original Documents should be placed when submitting document to Project Coordinator.  
Document should be signed by the supervisor and all other members present in the meeting  
(wherever possible). (**Note:** Please remove this line when attach copy that is required)  
Weekly meetings' minutes are required (held with Supervisor and/or with client). Important  
group discussions can also be included here.

## A8. DOCUMENT CHANGE RECORD

Date	Version	Author	Change Details
10/09/2024	1.0	Hanzala, Madad	Prepared of proposal
03/10/2024	2.0	Madad, Hanzala, Burhan	Complete of proposal
02/01/2025	1.0	Madad, Hanzala, Burhan	Complete first 3 chapter
30/06/2025	1.0	Madad, Hanzala	Finalize Documents

## A9. PROJECT PROGRESS

### FYP II

**FYP Fortnightly Sign-Up Sheet**

Meeting #	Date	Agenda (Brief Statement)	Attended By (Student's Name only)	Supervisor's Sign	Co-Supervisor's Sign	FYP Officer's Sign
1	20/2/25	• Admin Portal • Contractor Portal • User Portal	Maled Allah Hanzala			
2	06/03/25	Client - Contractor communication module Real-time chat & push notification Billing system implementation	Hanzala Maled Allah			
3	20/3/25	• Admin Portal Update • Dashboard Editing	Hanzala Maled Allah			
4	07/04/25		Hanzala Maled Allah			
5	16/4/25	• Styling updates across frontend. • Color scheme adjustments. • Buttons & form controls redesign.	Hanzala Maled Allah			
6	08/5/25	Feature integration & testing Implementation validation Error handling in project	Hanzala Maled Allah			
7	22/6/25	Final system testing & debugging User feedback analysis Prepare demo-ready version	Hanzala Maled Allah			
8						
9						

## A11. Plagiarism Test Summary Report

# One-Source Construction

## ORIGINALITY REPORT

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SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

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