PRESIDENCY UNIVERSITY
Private University Estd. in Karnataka State by Act No. 41 of 2013
Itgalpura, Rajankunte, Yelahanka, Bengaluru – 560064

Application for Assessment of Quality of Textbook/Reference Books/E-Book

A PROJECT REPORT

Submitted by

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Under the guidance of,

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BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

PRESIDENCY UNIVERSITY

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PRESIDENCY SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

BONAFIDE CERTIFICATE

Certified that this report “Application for Assessment of Quality of Textbook/Reference Books/E- Book” is a Bonafide work of “Lavanya M (20221CSE0392), Posina Supraja (20221CSE0266), Talluru Chethana (20221CSE0385)”, who have successfully carried out the project work and submitted the report for partial fulfilment of the requirements for the award of the degree of BACHELOR OF TECHNOLOGY in COMPUTER SCIENCE AND ENGINEERING during 2025-26.

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DECLARATION

We the students of final year B.Tech in COMPUTER SCIENCE AND ENGINEERING, at Presidency University, Bengaluru, named Lavanya, Posina Supraja, T Chethana, hereby declare that the project work titled “Application for Assessment of Quality of Textbook/Reference Books/E-Book” has been independently carried out by us and submitted in partial fulfillment for the award of the degree of B.Tech in COMPUTER SCIENCE AND ENGINEERING during the academic year of 2025-26. Further, the matter embodied in the project has not been submitted previously by anybody for the award of any Degree or Diploma to any other institution.

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ABSTRACT

Textbooks continue to serve as essential pedagogical resources in higher education, yet the assessment of their quality of ten remains fragmented, subjective, and limited in scope. Scholarly studies by Cobb (1987), Gurung and Martin (2011), Fey and Matthes (2018), and others emphasize the need for structured frameworks, user-centered evaluation, and transparent quality criteria to ensure that textbooks align with curricular and pedagogical goals. Building on these insights, this project, titled **“Application for Assessment of Quality of Textbook/Reference Books/E-Book (TextAssess)”**, presents a full-stack web application that operationalizes these research-based evaluation principles within a digital ecosystem.

The frontend of TextAssess utilizes React.js. The system also uses TypeScript, and even Tailwind CSS; This ensures a very intuitive, very responsive user interface. The interface provides textbook browsing capabilities. One can also submit reviews! Then there are the academic discussion elements, plus user dashboards. Even the administrative aspect can be monitored. The back end in corporate Supabase to do even better, built on PostgreSQL of course. It provides safe data storage. It ensures safe user authentication and access. The system allows role-based permissions; a plus for the students and administrators. Evaluation can become quite participatory in nature because of this design. Users give qualitative or quantitative assessments, all centered on clarity. Relevance and accessibility matters too. They also value, of course, good pedagogical content. All taken from past writings and research

The system underwent some crucial testing. Testing involved various sample datasets. Testing has demonstrated clear synchronization; seamless between the frontend and backend really. One can efficiently find user-written reviews; and have evaluation metrics measured correctly too! Admins have review-approval access now and can overview feedback. So quality summaries can be made, also very important to consider. Such things promote great selections of resources. Messaging and threaded discussion exist as collaborative aspects. They help people work together smoothly. These boost transparency and help people truly engage.

Ultimately, TextAssess links the abstract; textbook evaluation with true data analysis. A robust framework evaluation comes through with adaptable scalable designs. That really sums the system. This presents one solution regarding institutional evaluations.

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ABBREVIATIONS

Abbreviation	Full Form
ACL	Access Control List
AES	Advanced Encryption Standard
API	Application Programming Interface
CSR	Client-side Rendering
DBMS	Database Management System
FRD	Functional Requirement Document
MSM	Messaging Module
NPM	Node Package Manager
OTP	One Time Password
PGSQL	PostgreSQL Database
RBA	Role Based Access
RDBMS	Relational Database Management System
SDK	Software Development Kit
SPA	Single Page Application
SSL	Secure Socket Layer
TSX	TypeScript XML(React Component File)
TLS	Transport Layer Security

Chapter 1

INTRODUCTION

Textbooks are very important; they are central to the teaching–learning process and shape curriculum delivery as well as the quality and depth of learner engagement. Their effectiveness depends on conceptual clarity, pedagogical design, content relevance, accessibility, and alignment with educational standards. However, traditional textbook evaluation done by small reviewer panels or individual educators faces challenges like subjectivity, limited transparency, inconsistent review criteria, and lack of student perspective.

To address these issues, this project presents TextAssess, an intelligent, web-based platform designed for collaborative and data-driven evaluation of textbooks, reference books, and e-books. TextAssess encourages active participation from professors, students, reviewers, and administrators, offering a structured interface for review submission, quality rating, and academic discussions. It also generates institutional insights for textbook selection and policy-making, recognizing that textbook quality has long-term impact.

Unlike traditional methods, TextAssess leverages full-stack technologies to ensure an effective, scalable, and user-friendly evaluation process. The frontend is built using React.js, TypeScript, and Tailwind CSS, providing modules for book exploration, review submission, and discussion threads, along with interactive dashboards for different user roles. The backend, powered by Supabase (a cloud-based service built on PostgreSQL), manages authentication, secure data storage, and real-time synchronization. Role-based access control enables administrators to oversee approvals while allowing students and reviewers to contribute under defined privileges.

The project aligns with global efforts in educational quality assurance. Reports from UNESCO and national education boards highlight continued use of outdated learning materials, which hinders learning outcomes. Existing digital libraries and e-learning platforms often lack research-based textbook evaluation mechanisms. TextAssess fills this evaluation gap by offering a transparent, collaborative, and data-backed solution, effectively digitalizing textbook assessment frameworks.

Through the use of cloud technologies, TextAssess transforms fragmented manual evaluation into a systematic, participatory, and data-driven process. This supports evidence-based textbook selection and contributes to educational improvement at institutional, state, and national levels truly realizing the vision of “Better Textbooks for Better Learning.”

1.1 Background

Textbooks remain crucial for education. They are the essential tool for structured learning and instruction that is guided. Their quality shapes comprehension. Textbook quality impacts curriculum alignment. The quality, therefore, affects student performance overall. High-quality textbooks, carefully designed and thoroughly evaluated, improve educational outcomes. Clear explanations, well-organized content, and helpful exercises make the improvement. This is according to research .

But, evaluating textbooks is still a traditional process. Manual reviews take place sometimes. Evaluation is often subjective and fragmented which is not a positive thing. Review committees or individual educators look at learning material, but employ varying standards which does limit the transparency. In addition stakeholder participation does have an effect on textbooks being produced. Research suggests a collaborative approach to the standardization, proves very important for assuring that textbooks meet both learner and pedagogical needs . We actually feel research should have a larger part.

Digital learning platforms grow these days and the same goes for open educational resources. Both make educational content far easier to get; in other words more accessible. Yet these platforms sometimes are not doing well on the mechanisms needed for proper evaluation of textbook quality, of course. Global studies, reveal that around the world; in developing regions; more than one third; roughly up to 35 percent; lack high-quality, current textbooks; these inequalities certainly affects learning outcomes . Further; institutional textbook choices seem to avoid getting student insights or information, and sometimes data from good old data driven evaluation .

We propose TextAssess to close some of these gaps, though other options could be considered, that will be another problem to address, by the way. TextAssess, is, or rather it would be a cloud-based, web app intended to foster cooperation, in other words is designed for cooperative evaluation. Ratings are assessed, along with discussion, centrally; between the parties: student, professors, administrators, of course, reviewers, too, it includes a bit of every person important to textbooks being implemented or denied. React.js and TypeScript are included in developing along with Tailwind CSS, which is on the front. The backend is

Supabase (PostgreSQL, Authentication, Storage), because we wanted a scalable, transparent and solution; what's even better efficient, even when discussing relevance, as we will use this system of evaluation. This helps with getting the quality of educational texts at academic institutes.

1.2 Statistics

Textbooks are crucial for a good education. But some schools use old or bad books. Worldwide, nearly 250 million students do not have good, current textbooks. This causes big gaps in basic reading and math skills. New studies also tell us something interesting. Good books and good student performance do in fact go together; this is particularly important in poorer countries.

In India, surveys find that most college students; over 70 percent, use textbooks that are not up-to-date, maybe badly matched to the class. Lots of colleges also do not have strong ways to judge textbooks. The issue impacts what a student really knows and if they are ready for jobs.

New studies on free educational resources online or OERs are interesting, they appear hopeful; in both ease of access and how affordable they can be. Sadly, one major weakness remains to be the lack of formal quality-checking systems for it all. However, evidence does show a possibility. Platforms using group checking and teamwork get far more reliable, even very good results.

TextAssess wants to fix this, It obtains feedback from faculty, reviewers, along with their respective students. This uses both rating numbers combined together alongside thoughtful written insights from each contributor, it will close this hole, We are convinced. TextAssess changes judging things like that into a visible process, as this all uses factual, supporting, strong evidence, the platform seeks, through every thing, to offer the best. That is that schools make the smartest decision selecting the greatest textbooks. Textbooks that adhere both to lesson goals or very best new, modernized ways of instruction that's available .

1.3 Prior existing technologies

The evaluation of textbooks has historically depended on manual review checklists designed by curriculum boards or academic committees. While these systems ensured a level of expert participation, they often lacked flexibility, transparency, and the inclusion of learner perspectives. Early frameworks primarily assessed surface-level attributes such as factual accuracy, topic sequence, and alignment with the syllabus but rarely incorporated feedback from the actual users — students and instructors.

Over time, researchers proposed structured evaluation models to introduce systematic quality assurance. Studies emphasized the need to assess not only content accuracy but also pedagogical soundness, readability, and cultural appropriateness . For instance, some national education systems adopted rubric-based frameworks, yet these remained static and paper-based, leading to inconsistencies across institutions.

Empirical and theoretical work expanded the discussion on textbook quality. Comparative analyses of multiple textbooks showed wide variation in clarity, exercises, and teaching alignment, while psychometric studies demonstrated that students' perceptions of textbook usability directly influence their reading behavior and exam performance. Research also identified critical gaps in existing evaluation processes, particularly the lack of standardized digital mechanisms that allow collective participation .

International and national reviews further revealed that institutional textbook approvals often fail to meet expected quality benchmarks . The absence of learner input and evidence-based metrics leads to the continuous adoption of materials that may not meet pedagogical needs . Moreover, studies on textbook quality standards and annotated bibliographies have highlighted that evaluation should move beyond content coverage to consider multimedia design, inclusivity, and interactivity—elements increasingly important in modern digital learning environments.

The emergence of Open Educational Resources (OERs) transformed access to learning content but introduced new challenges. While OER platforms improved affordability and reach, they rarely implemented structured quality control frameworks . Research on OER adoption found that students benefit from open-access materials but that the absence of systematic peer review affects consistency and reliability. In addition, most existing digital repositories such as MERLOT, OpenStax, or academic forums focus on content distribution rather than verified academic evaluation . Similarly, commercial websites and e-learning marketplaces offer user-generated reviews that, while useful, are unverified and lack the methodological rigor required for academic decision-making.

Earlier technological attempts at automating evaluation used static web technologies HTML, CSS, JavaScript, and localStorage—to demonstrate feasibility for collecting reviews and ratings. These prototypes proved that digital feedback loops could enhance transparency but suffered from limited scalability, absence of secure data handling, and lack of real-time synchronization.

Drawing on these findings, TextAssess was conceptualized to bridge the gap between research-based frameworks and technological implementation. The system incorporates principles from comprehensive evaluation models and empirical insights on user perception and feedback, transforming them into a live, data-driven platform.

- The frontend, built using React.js, TypeScript, Tailwind CSS, and shadcn/UI, provides a dynamic, modular interface where users can browse, submit, and review textbooks interactively.
- The backend, powered by Supabase, offers secure PostgreSQL-based data storage, real-time updates, and role-based authentication for students, professors, reviewers, and administrators.

By integrating research-backed evaluation criteria through into a modern cloud architecture, TextAssess ensures consistent, transparent, and collaborative textbook assessment. The platform not only digitizes prior evaluation frameworks but also operationalizes them—transforming manual, periodic reviews into a continuous, community-driven quality assurance process that aligns with 21st-century educational needs.

1.4 Proposed approach

- **Aim of project :**
  The primary aim of this project is to design and implement a web-based platform (TextAssess) that enables professors, reviewers, and students to collaboratively

evaluate textbooks. The platform seeks to improve the transparency, accessibility, and reliability of textbook reviews by combining structured input forms, rating systems, and a communication channel for clarifications.

- **Motivation:**

  Textbooks continue to play a very big part in learning. However, the textbook quality can greatly differ among institutions. Traditional review committees sometimes focus on brief checklists; rarely capturing what the students really think .

1.5 Objectives

- **Behaviour**

  To design and implement an interactive user interface that supports seamless navigation between modules such as Home, Books, Submit, Profile, and Messages, enabling role-based actions (student, professor, reviewer, admin) within the system.

- **Analysis**

  To develop functionality for collecting, filtering, and analyzing book-related data such as average ratings, number of reviews, and pending approvals—providing structured insights into textbook quality.

- **System Management**

  To create an Admin Dashboard that manages submitted books, monitors reviews, and controls approval workflows, ensuring effective moderation and organized system operation.

- **Security**

  To incorporate a role-based login and signup mechanism that restricts unauthorized access, ensuring that only registered users can submit books, write reviews, or send messages.

- **Deployment**

  It needs to develop a prototype, and we will host it on React using the Supabase prototype for sure. The prototype can then shows collaboration, is scalable, provides cloud based integration so it's great to offer the bedrock to improve it. AI and analytics enhancement and that will be the future.

1.6 SDGs

1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

Fig 1.1 Sustainable development goals

1. SDG 4 – Quality Education

Ensure inclusive and equitable quality education and promote lifelong learning for all.

How TextAssess supports SDG 4:

- Improves textbook quality using structured, research-backed evaluation rubrics.
- Enables feedback from students, professors, reviewers, making learning materials more relevant and updated.
- Provides a transparent, data-driven system that helps institutions select better learning resources.
- Encourages inclusivity by evaluating textbooks for clarity, accessibility, and representation.

2. SDG 9 – Industry, Innovation and Infrastructure

Build resilient infrastructure, promote sustainable industrialization, and foster innovation.

How TextAssess supports SDG 9:

- Uses modern full-stack technologies (React, TypeScript, Supabase cloud backend).
- Implements a scalable digital platform for academic evaluation, replacing outdated manual processes.
- Encourages digital transformation in educational institutions through cloud-based services.
- Enables innovation by integrating analytics, review automation, and potential AI-based enhancements.

3. SDG 10 – Reduced Inequalities

Reduce inequality within and among countries

How TextAssess supports SDG 10:

- Offers equal opportunity for students from all backgrounds to contribute their voices in textbook evaluation.
- Removes bias by standardizing review criteria and moderating inappropriate content.
- Ensures accessibility on low-end devices (mobiles, basic laptops) due to web-based lightweight design.

4. SDG 12 – Responsible Consumption and Production

Ensure sustainable consumption and production patterns.

How TextAssess supports SDG 12:

- Minimizes paper usage by eliminating physical forms, printed rubrics, and manual reports.
- Promotes digital submission, online review, and cloud storage—reducing environmental impact.

- Encourages institutions to choose high-quality, reusable, and pedagogically effective textbooks.

5. SDG 16 – Peace, Justice and Strong Institutions

Promote inclusive societies, ensure access to justice, and build accountable institutions.

How TextAssess supports SDG 16:

- Enhances transparency in textbook selection and academic decision-making.
- Encourages accountability through role-based access, audit trails, and review moderation.
- Prevents misinformation and biased reviews using structured rubrics and secure authentication.

1.7 Overview of project report

The project report presents the design and development of TextAssess, a cloud-based web application built to evaluate the quality of textbooks, reference books, and e-books through a structured, collaborative, and data-driven approach. The report explains how the system addresses the limitations of traditional textbook review processes, which are often manual, subjective, and lacking transparency. TextAssess modernizes this workflow by enabling students, professors, reviewers, and administrators to participate actively in textbook evaluation using standardized rubrics and real-time feedback mechanisms.

Chapter 1: Introduction

This chapter introduces TextAssess, a web-based platform designed to improve textbook evaluation through structured rubrics, stakeholder participation, and cloud-based collaboration. It highlights the problems with traditional textbook reviews—such as subjectivity, outdated materials, and lack of student feedback—and establishes the need for a transparent, data-driven evaluation system. The chapter also presents background statistics, prior issues in textbook quality, and the aim, motivation, and objectives of the project.

Chapter 2: Literature Review

This chapter analyzes existing research on textbook evaluation frameworks, student reading behavior, content quality, inclusivity, and gaps in current systems. It reviews multiple academic studies that emphasize the importance of multi-dimensional evaluation, student involvement, and structured rubrics. Insights from these studies guided the feature design of TextAssess—such as rubric scoring, multi-role participation, cultural checks, and comparative analysis of textbooks.

Chapter 3: Methodology

The project follows the V-Model Software Development Lifecycle, mapping each development stage with corresponding testing steps. The chapter explains requirement gathering, system design, architecture selection, module design, coding, unit testing, integration testing, system testing, and user acceptance testing. It details why the V-model was chosen and how it ensures systematic validation and quality.

Chapter 4: Project Management

This chapter describes the overall management strategy using planning tools like a Gantt chart, milestone tracking, and progressive reviews (Review-1 to Final Viva). It discusses requirement planning, architecture planning, module breakdown, implementation progress, and final integration. The chapter also includes detailed risk analysis with impact and mitigation strategies such as protecting data, preventing unauthorized access, managing review bias, and ensuring UI usability.

Chapter 5: Analysis and Design

This chapter explains system requirements, software/hardware needs, data collection, analytics, and architectural decisions. It includes the block diagram, flowchart, domain model, communication model, and database schema. Detailed descriptions of each module—authentication, book submission, reviews, messaging, admin panel, and analytics—are provided. It also maps IoT deployment levels, functional views, and operational behavior of the platform.

Chapter 6: Hardware, Software, and Simulation

Here, the software tools (React + TypeScript, Tailwind, Supabase, Vite, Node.js) and general hardware used during development are listed. Since it's a web platform, only basic hardware (laptop + browser) is needed. The chapter also explains simulation/testing using local development servers and Supabase backend, validating login, review submission, and messaging workflows. Screenshots of UI modules are demonstrated.

Chapter 7: Evaluation and Results

This chapter presents testing strategies, test points, and results. It shows that all major workflows—authentication, book submission, review handling, admin approval, analytics, and messaging—were validated successfully. The system passed unit, integration, system, and acceptance tests, demonstrating accuracy, consistency, and real-time performance. UI components rendered successfully, and analytics provided meaningful insights.

Chapter 8: Social, Legal, Ethical, Sustainability & Safety Aspects

This chapter evaluates how the project aligns with responsible computing practices.

- **Social:** Promotes student involvement, transparency, and academic equality.
- **Legal:** Ensures copyright compliance, secure data handling, and privacy protection.
- **Ethical:** Eliminates bias through structured rubrics and identity verification.
- **Sustainability:** Reduces paper usage and relies on cloud infrastructure.
- **Safety:** Prevents harmful content, secures data through authentication, RLS, and backups.

Chapter 9: Conclusion

This chapter summarizes the project's success in achieving its objectives. It reinforces how TextAssess improves textbook quality evaluation, enhances collaboration between stakeholders, ensures secure cloud-based operations, and supports data-driven decision-making. The chapter concludes that the system is scalable, user-friendly, research-backed, and ready for institutional deployment.

Chapter 2

LITERATURE REVIEW

Cobb’s study was one of the earliest efforts to create a clear framework for evaluating textbooks. He compared sixteen introductory statistics books and identified significant factors that affect textbook quality, such as structure, clarity, examples, and overall organization. Cobb argued that a good textbook should convey content and make it understandable through logical sequencing and relatable examples.
Limitation: The study was limited to statistics and did not test the framework in other subjects.
Relevance: Cobb’s structured approach to comparing multiple textbooks helped shape the evaluation rubrics used in TextAssess, ensuring that reviews cover both teaching quality and ease of understanding.

Gurung and Martin focused on how students use their textbooks. They developed the Textbook Assessment and Usage Scale to understand which features make students more likely to read and engage with their course materials. They found that clarity, visual aids, and logical organization significantly influenced student reading habits and overall performance. Limitation: The study relied on self-reported data from students, which may include bias. Relevance: Their findings highlight the need for student involvement in evaluation, which inspired TextAssess to include student feedback options alongside instructor and reviewer evaluations.

Fey and Matthes examined textbook quality from a broader academic perspective. They discussed how educational materials should be assessed not only for factual accuracy but also for cultural balance, inclusivity, and support for different teaching methods. Their work proposed that quality should be viewed as multi-dimensional, combining content, teaching methods, and design.
Limitation: The study is largely theoretical and lacks direct experimental testing.

Relevance: Their multi-dimensional model supports TextAssess's rubric-based design, which evaluates textbooks on various factors like content quality, structure, inclusivity, and accessibility.

Mohammadi, Mohammad & Abdi, Heidar presented a practical evaluation of an English language textbook used in Iranian universities. Both students and teachers participated in the assessment, revealing that while the textbook was linguistically sound, it lacked interactive and practical exercises.
Limitation: The study was context-specific and limited to English language teaching. Relevance: The inclusion of both teacher and student perspectives in their evaluation reinforced the idea of multi-stakeholder feedback, which became a key principle in the design of TextAssess.

Mahmood's research critically analyzed Pakistan's government-approved textbooks and found that many did not meet the expected quality standards, despite being approved for official use.
The study pointed out that textbook reviews were often superficial and lacked transparency. Limitation: The study mainly captured expert opinions and excluded student feedback. Relevance: Mahmood's work emphasizes the need for transparent, digital evaluation systems, directly supporting TextAssess's goal of making textbook reviews open, trackable, and based on data.

Woodward and colleagues compiled a guide to research on how textbooks influence both classroom learning and broader social values. They argued that textbooks are not just educational tools but also social instruments that shape perspectives and knowledge. Limitation: The publication serves as a research guide rather than a direct evaluation framework.
Relevance: Their work encouraged the inclusion of cultural and ethical dimensions in TextAssess, ensuring that reviews cover not just content accuracy but also diversity, representation, and checks for bias.

Ivić, Ivan; Antić, Slobodanka; & Pešikan, Ana

This publication set out clear standards for textbook development and evaluation. It emphasized aspects such as curriculum alignment, visual presentation, inclusivity, and the need for textbooks to support teacher guidance.

Limitation: The proposed standards are general and may need adjustment for specific subjects.

Relevance: These guidelines shaped the evaluation criteria within TextAssess, ensuring consistency across disciplines while allowing for customization.

Yasar analyzed geography textbooks under two different Turkish curricula and found that newer editions encouraged critical thinking and active learning more effectively than older versions. The study highlighted how curriculum design affects the quality and relevance of textbook activities.

Limitation: The findings are limited to one subject area.

Relevance: This study supports TextAssess's comparative analytics feature, allowing users to compare different textbooks or editions and identify which best meets evolving curriculum standards.

Race discussed how teaching methods and textbook usage go hand in hand. He argued that textbooks are only truly effective when paired with proper instructional strategies, assessment design, and learner engagement techniques.

Limitation: The book is practical rather than research-based, offering general teaching advice.

Relevance: Race's insights reinforced the idea that TextAssess should connect textbook evaluation with teaching practice, helping educators select books that complement their instructional goals.

Although primarily a nursing textbook, Giger and Haddad's work shows how textbooks can integrate real-world applications, cultural sensitivity, and contextual learning. It serves as an example of how discipline-specific materials can address both knowledge and empathy.

Limitation: It is not a research study, so it lacks analytical evaluation data.

Relevance: This book inspired TextAssess's subject-specific flexibility, where evaluation rubrics can adapt to different fields, ensuring that discipline-specific needs are met.

Chapter 3

METHODOLOGY

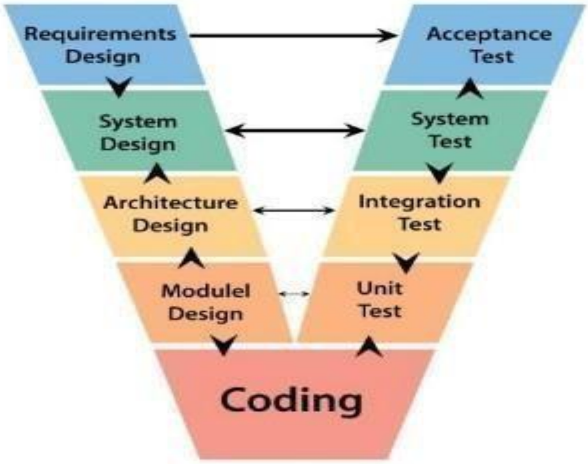


Fig 3.1 The V model methodology

The V-Model is a software development lifecycle that highlights a parallel relationship between each development activity (on the left side) and its corresponding verification and validation phase (on the right side).

For the TextAssess application, this approach ensures that every requirement is carefully mapped through design, implementation, and testing so the final platform effectively supports educators and students in assessing textbook quality .

3.1 Requirement Analysis and Specification

Activities:

- Gathered stakeholder inputs from educators, students, and reviewers.
- Defined evaluation parameters: *pedagogical accuracy*, *curriculum alignment*, *clarity*, *examples*, and *inclusivity*.
- Outlined backend requirements such as authentication, user accounts, book uploads, review moderation, and admin-level reporting.

- Established data privacy guidelines — only emails are visible for contact; phone numbers are hidden.

Rationale**:**

High-quality textbooks directly influence learning outcomes. Explicitly defined requirements ensure that evaluation parameters translate into measurable indicators of quality .

Deliverables:

- Requirement documentation
- Acceptance criteria
- Data privacy and storage policy
- Standardized evaluation rubrics (for internal and external assessment)
- System Design Phase

Activities:

- Defined the full-stack architecture using React.js + TypeScript for the frontend and Supabase (PostgreSQL, Auth, Storage) for the backend.
- Established a secure communication channel between frontend and backend using Supabase APIs.
- Designed data models for users, books, reviews, and messages.
- Integrated analytics modules for computing ratings and visualizing data on the admin dashboard.
- Defined security rules such as JWT-based role control and restricted visibility of personal data.

Rationale:

The choice of a Supabase cloud backend ensures real-time synchronization, while research highlights how access to well-structured content improves learning and scalability .

Deliverables:

System architecture diagram, API documentation, database schema, and analytics integration points.

3.2 Architectural Design and Technology Selection

Activities:

- Selected React.js with Tailwind CSS and shadcn UI for a clean, accessible frontend interface.
- Used Supabase for backend authentication, real-time database operations, and cloud file storage.
- Defined authentication and role-based access workflows.
- Created an automated review and moderation flow for administrators.
- Designed the reporting module to summarize user activity and textbook statistics.

Rationale:
Studies on Open Educational Resources (OER) indicate that systems should accommodate both open-access and restricted textbooks. Hence, the architecture was designed to support flexible content access and analytics for quality tracking.

Deliverables:
Component diagrams, integration testing plans, and data migration strategy.

3.3 Module Design and User Interface Flow

Activities:

- Developed responsive UI modules using React components: *Home, Books, Submit, Reviews, Profile, and Messages.*
- Backend services included *Book Uploads, Review Moderation, Messaging System,* and *Analytics Generator*.

- Defined usability standards ensuring accessibility and smooth navigation.

Rationale:

Incorporating user-centered design ensures inclusivity and ease of use. Prior studies emphasize the need to include *student voice* and *learner feedback* during interface design .

Deliverables:

Wireframes, component specifications, and unit test cases.

3.4 Coding and Implementation

Activities:

- Implemented frontend using React.js + TypeScript with Tailwind CSS for styling.
- Developed backend logic using Supabase APIs for authentication, CRUD operations, and file storage.
- Integrated React Query for data fetching and real-time updates.
- Ensured all private user data (phone numbers) remained hidden from public access.
- Linked all major workflows: book upload → review → approval → analytics.

Deliverables:

Source code repository, documentation, and unit test results.

3.5 Unit Testing (Component-Level Validation)

Tests:

- Validated form inputs and error handling on book submission and review pages.
- Verified file uploads and metadata retrieval from Supabase Storage.
- Tested CRUD operations for reviews and messages.
- Checked privacy enforcement (email-only visibility).

Goal:

To confirm each component or service functions correctly before integration.

3.6 Integration Testing (Frontend–BackendConnectivity)

Tests:

- Verified frontend communication with Supabase APIs.
- Tested authentication across all roles (student, professor, admin).
- Ensured proper linking of reviews with book entries.
- Checked data flow consistency between UI, database, and analytics.

Goal:

To validate that modules interact seamlessly and maintain synchronized, error-free data.

3.7 System Testing (End-to-End Validation)

Tests:

- Conducted complete workflow checks: textbook submission, review submission, admin approval, and analytics visualization.
- Performed load and concurrency testing for multiple simultaneous submissions.
- Ensured secure access control and non-disclosure of sensitive data.

Goal:

To ensure that the system satisfies both functional and non-functional requirements such as usability, security, and performance.

3.8 Acceptance Testing (Stakeholder Validation)

Tests:

- Educators, students, and reviewers tested the system using real data.
- Verified that book details displayed correctly, analytics matched reviews, and privacy measures were followed.

Goal:

To validate that TextAssess meets user needs and performs as an effective academic tool for textbook quality assessment.

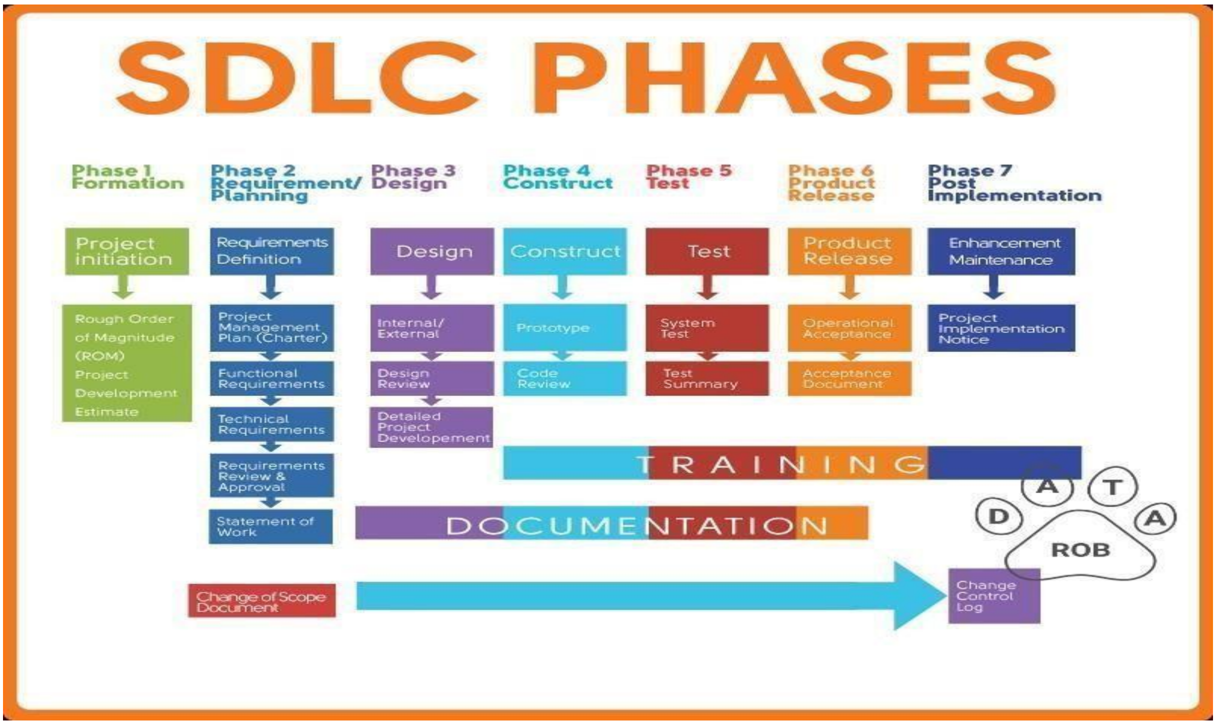


Fig 3.2 SDLC phases

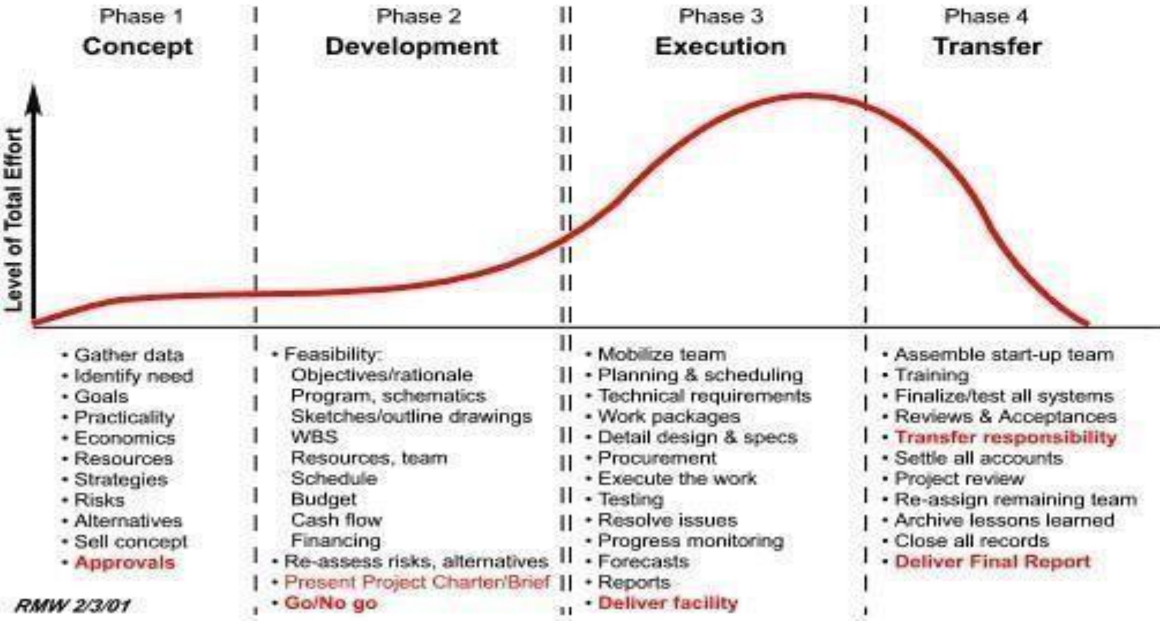


Fig 3.3 Summary of project breakdown to task

Chapter 4

PROJECT MANAGEMENT

4.1 Project overview

TextAssess is a web-based platform developed using React + TypeScript (frontend) and Supabase (PostgreSQL + Auth + Storage) as the backend. It enables collaborative evaluation of textbooks by students, professors, reviewers, and administrators. The report clearly states that the project followed the V-Model SDLC, linking each development phase with corresponding testing activities.

4.2 Project Management Approach (V-Model)

A. Requirement Phase

- Collected inputs from stakeholders (students, professors, reviewers).
- Defined evaluation parameters such as clarity, curriculum alignment, inclusivity, and readability.
- Identified backend needs like authentication, book uploads, messaging, admin workflows.

Deliverables:
Requirement document, acceptance criteria, standardized rubrics.

B. System Design Phase

- React + TypeScript chosen for modular UI.
- Supabase chosen for authentication, storage, and real-time DB.
- Database schema developed for Users, Books, Reviews, Messages.
- RLS (Row Level Security) and role-based access established.

Deliverables:
Architecture diagram, API flow, DB schema.

C. Architectural Design

- Component diagrams for modules (Book Submission, Reviews, Messaging, Admin Panel).
- Review moderation and analytics workflow defined.
- Accessibility and UI/UX standards set (Tailwind+shadcn/UI).

D. Module-Level Design

Modules developed:

- Authentication Unit
- Book Submission Unit
- Review Management Unit
- Messaging Unit
- Admin Panel

E. Implementation Phase

- React components built in TypeScript.
- Supabase used for CRUD operations, authentication, and storage.
- React Query used for data fetching and real-time sync.

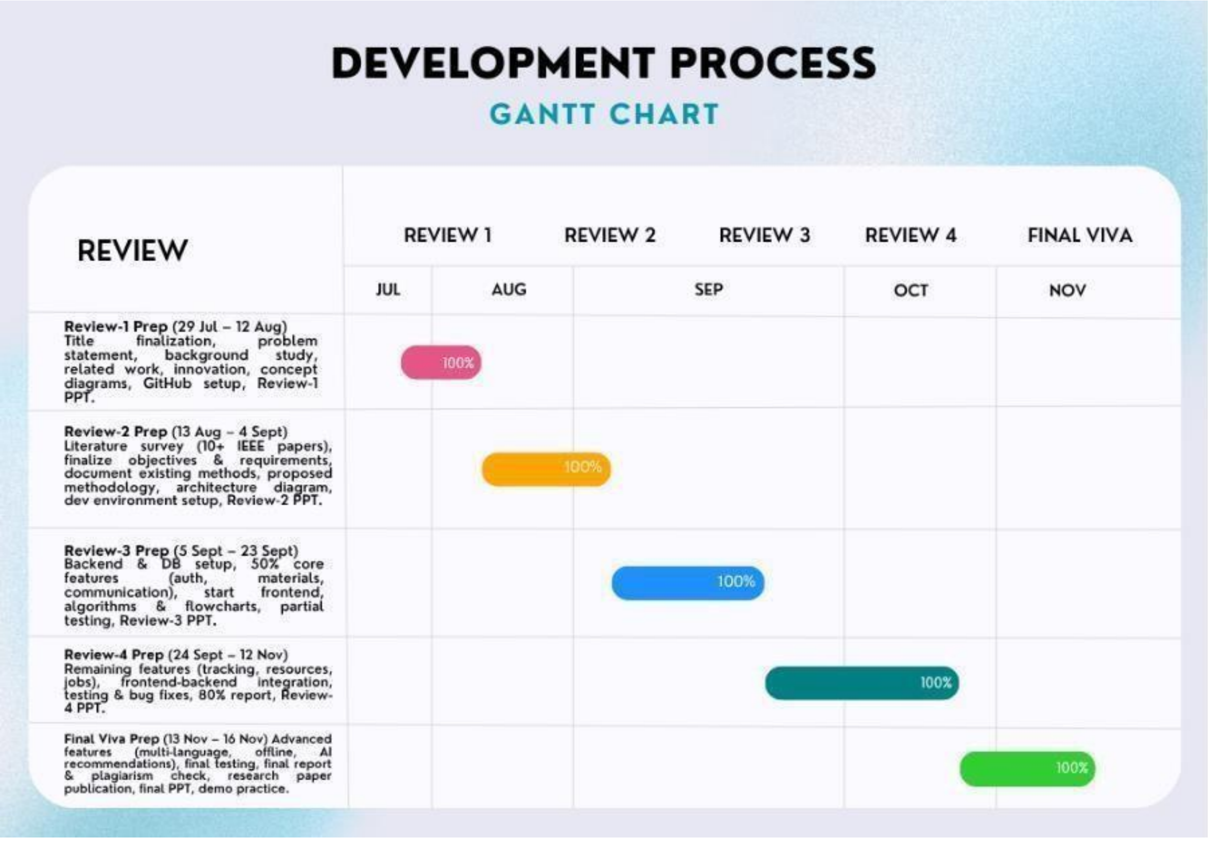
F. Testing Phase

The V-Model mapping is visible:

- **Unit testing:** Form validation, CRUD checks, author verification.
- **Integration testing:** UI ↔ Backend (Supabase) communication.
- **System testing:** Full workflow validation—submission → review → approval.
- **User acceptance testing:** Conducted with real sample users.

4.3 Project timeline

The project structuring was achieved with the use of a timeline that integrated a series of review-based milestones. A Gantt chart was used for the visualization of workflow, deadlines, and completion progress across all phases of development.



DEVELOPMENT PROCESS

GANTT CHART

REVIEW

Review-1 Prep (29 Jul – 12 Aug) Title finalization, problem statement, background study, related work, innovation, concept diagrams, GitHub setup, Review-1 PPT.

Review-2 Prep (13 Aug – 4 Sept) Literature survey (10+ IEEE papers), finalize objectives & requirements, document existing methods, proposed methodology, architecture diagram, dev environment setup, Review-2 PPT.

Review-3 Prep (5 Sept – 23 Sept) Backend & DB setup, 50% core features (auth, materials, communication), start frontend, algorithms & flowcharts, partial testing, Review-3 PPT.

Review-4 Prep (24 Sept – 12 Nov) Remaining features (tracking, resources, jobs), frontend-backend integration, testing & bug fixes, 80% report, Review-4 PPT.

Final Viva Prep (13 Nov – 16 Nov) Advanced features (multi-language, offline, AI recommendations), final testing, final report & plagiarism check, research paper publication, final PPT, demo practice.

Fig 4.1 Development Process Gantt Chart

The timeline consists of five major review phases:

• **Review 1 (29 Jul – 12 Aug):** Finalize title, background study, identification of innovation, problem statement definition, GitHub repository setup, and Review-1 presentation preparation.

• **Review 2 (13 Aug – 4 Sept):** Carried out the literature survey with more than 10 IEEE papers, finalized the system requirements and objectives, proposed the methodology, and prepared the Review-2 PPT.

• **Review 3 (5 Sept – 23 Sept):** Setup the backend and database, implemented approximately 50% of the core features on authentication, content, and communication; partial frontend development; integration testing performed.

• **Review 4 (24 Sept – 12 Nov):** Implemented all the remaining modules like tracking, resource management, and recommendation logic. Conducted integration testing for the final time and compiled the report up to 80%.

• **Final Viva (24 Nov – 3 Dec):** Integrated advanced modules, including multilingual and offline support, AI recommendations; performed complete testing, plagiarism check, research paper submission, and demo practice.

The project timeline ensured that development happened sequentially, that progress was tracked regularly, and all deliverables were timely.

4.4 Risk Analysis

1. Unauthorized Access

Impact:

- User data may get exposed or misused.
- System trust may decrease among users.

Mitigation:

- Use strong authentication and secure JWT handling.
- Apply strict role-based access and regular permission audits.

2. Data Loss or Corruption

Impact:

- Important reviews and book records may be lost.
- System reliability may be compromised.

Mitigation:

- Enable automatic backups in Supabase.
- Perform regular database maintenance and integrity checks.

3. Real-Time Sync Failures

Impact:

- Users may receive outdated or delayed information.
- Messaging and dashboards may become unreliable.

Mitigation:

- Add retry mechanisms and fallback polling.
- Monitor WebSocket performance and optimize queries.

5. Biased or Inappropriate Reviews

Impact:

- Textbook ratings may become misleading or unfair.
- Users may lose trust in the evaluation system.

Mitigation:

- Use structured rubrics to guide reviewer scoring.
- Enable admin moderation to filter inappropriate content.

6. UI/UX Usability Problems

Impact:

- Users may find it hard to navigate or complete tasks.
- Review submission rates may decrease.

Mitigation:

- Improve UI with clear labels, tooltips, and simple layouts.
- Conduct user testing to identify confusing areas.

7. Reviewer Inconsistency

Impact:

- Textbooks may receive unfair or unbalanced scores.
- Comparison between books becomes unreliable.

Mitigation:

- Provide clear rubric descriptions and reviewer guidelines.
- Use analytics to flag unusual scoring patterns.

Chapter 5

ANALYSIS AND DESIGN

5.1 Requirements

The Analysis and Design phase is where ideas start turning into structure. This stage acts as a bridge between understanding the problem and creating a working system. In this project, the analysis focuses on *what* the system must accomplish — a reliable, easy-to-use, and transparent platform for textbook evaluation — while the design outlines *how* these goals are implemented using the chosen technologies and frame works .

This phase draws on the principles highlighted in earlier research, ensuring that every design choice is grounded in proven approaches to textbook evaluation, user experience, and educational technology.

Hardware Requirements

Even though TextAssess is a web-based platform, some basic hardware and hosting conditions are essential to keep the system stable and responsive.

- **Initial Conditions:**
  The platform is designed to run on any modern computer or mobile device using browsers like Chrome, Edge, or Firefox. During development, a standard system capable of running Node.js and development tools is required.
- **Input Parameters:**
  Users will upload textbooks (or their details), fill out review forms, and interact through dashboards. These actions demand stable internet and sufficient server resources for smooth uploads and quick responses.
- **System Outcomes:**
  The hardware setup should handle user traffic, store and retrieve data efficiently, and display textbook details, ratings, and analytics without lag.

- **Constraints:**
  Since the platform uses cloud hosting through Supabase, there's no need for heavy on-premise hardware. However, internet connectivity is essential, which can be a limitation for some users — a challenge also noted in previous studies on digital textbook adoption .

Software Requirements

The **software design** defines the technologies and frameworks used to bring the system to life. The platform is built as a full-stack web application, combining a strong, interactive frontend with a secure, cloud-backed database.

Frontend (User Interface Layer):

- **Technologies Used:**
  React.js with TypeScript ensures modular, efficient, and error-free code. Tailwind CSS and shadcn/UI provide a clean, modern, and responsive design across devices. React Router manages navigation, while React Query handles real-time data fetching and caching.
- **Purpose:**
  The frontend focuses on simplicity and accessibility, allowing students, professors, and reviewers to navigate easily and submit reviews without confusion.
- **Literature Link:**
  Studies have shown that user-centered design and intuitive interfaces increase engagement and accuracy in educational systems .

Backend (Server and Database Layer):

- **Technologies Used:**
  Supabase powers the backend with its integrated PostgreSQL database**,** authentication module, and cloud storage. Supabase Auth handles role-based access control (students, professors, reviewers, admins), while the real-time database manages all interactions and submissions.

- **Purpose:**

  To store and manage user profiles, textbook metadata, reviews, messages, and analytics securely.
- **Literature Link:**

  Cloud-based solutions like Supabase align with modern OER (Open Educational Resource) frameworks that emphasize scalability and accessibility .
- **Constraints:**

  The system depends on Supabase's cloud services, meaning performance depends on plan limits and internet reliability. However, this also reduces maintenance costs and increases portability — a balance suggested in textbook digitization studies .

Data Collection Requirements

Data is the foundation of TextAssess. To make evaluations meaningful and comparable, the system collects structured and standardized information.

- **Collected Data:**

  Textbook details (title, author, edition, subject, and summary), user roles, structured review data (rubric-based ratings, comments), and optional uploaded textbook files.
- **Consistency and Validation:**

  Review fields follow standardized rubrics inspired by academic evaluation frameworks . Each review includes quantitative scores and qualitative feedback, ensuring a balanced and fair assessment.
- **Privacy:**

  Reviewer identities are partly masked — only email contact is visible — ensuring open participation while maintaining accountability .
- **Workflow:**
  1. Submitter uploads textbook information or files.
  2. Reviewer fills in rubric-based evaluations.
  3. Admin moderates reviews for approval
- **Link to Research:**

  This flow mirrors real-world academic review processes discussed in prior literature, promoting fairness, consistency, and transparency.

Data Analysis Requirements

Collected data is analyzed to generate useful insights for users and administrators.

- **Core Functions:**
    - Calculate average ratings and quality scores.
    - Display trends through visual dashboards.
    - Compare different textbooks or editions based on ratings, criteria, or subject areas.

- **Advanced Analysis:**
  The system can detect patterns, such as frequently mentioned issues (e.g., "outdated content" or "poor examples"), and highlight the most recommended books.

- **Validation:**
  Each review follows an evaluation rubric ensuring fair comparison, consistent with global textbook evaluation standards.

- **Outcome:**
  These analytics help educators, students, and decision-makers choose textbooks based on real, collective feedback rather than personal bias.

System Management Requirements

System management features ensure the platform remains reliable, organized, and moderated.

- **Roles and Permissions:**
  Users are divided into four main roles: Student, Professor, Reviewer, and Admin each with specific privileges.
- **Admin Dashboard:**
  Allows administrators to approve or reject reviews, manage users, and oversee analytics reports.

- **Moderation:**

  Built-in mechanisms prevent biased or spam reviews, with admins authorized to flag or remove inappropriate submissions.

Security Requirements

Security is a top priority for TextAssess, especially since user data and reviews are stored in the cloud.

- **Authentication:**

  Implemented through Supabase Auth using JWT-based tokens. Each login is role Protected ensuring that only authorized users can access or modify.
- **Encryption:**

  All data transfers use HTTPS to protect user credentials and sensitive book metadata.
- **Privacy Controls:**

  User phone numbers remain hidden, only verified emails are visible for communication.
- **Activity Logs:**

  Every submission, edit, or approval is logged to maintain transparency and communication.
- **Research Link:**

  Security and accountability measures align with best practices in educational systems that involve multi-user evaluations .

User Interface (UI) Requirements

The platform's user interface is designed with simplicity and inclusivity in mind.

- **Responsiveness:**

  The design adapts across desktops, tablets, and smartphones using Tailwind’s flexible layout utilities.

- **Ease of Navigation:**

  Key modules *Home, Books, Submit, Reviews, Profile, and Contact* are clearly visible and easy to access.

- **Accessibility:**

  Following accessibility standards, the platform uses semantic HTML, proper color contrast, and keyboard navigation to support all users.

- **Design Philosophy:**

  The UI presents information using card-based layouts, highlighting essential details like title, author, and average rating. Review forms are concise but informative, making evaluation faster and easier.

- **User Engagement:**

  Each section is designed to minimize effort and maximize clarity, in line with studies emphasizing usability and learner engagement.

5.2 Block diagram

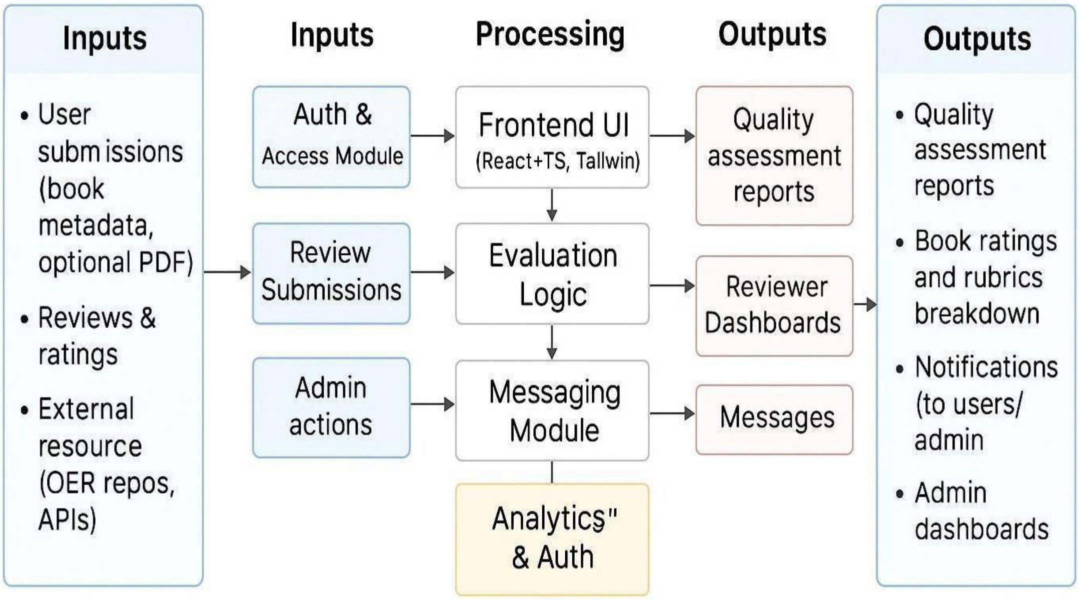

Inputs
• User subm issions (book metadata, optional PDF)
• Reviews & ratings
• External resource (OER repos, APIs)
Inputs
Processing
Outputs
Auth & Access Module
Review Submissions
Admin actions
Frontend UI (React+TS, Tallwin)
Evaluation Logic
Messaging Module
Analytics" & Auth
Quality assessment reports
Reviewer Dashboards
Messages
Outputs
• Quality assessment reports
• Book ratings and rubrics breakdown
• Notifications (to users/ admin
• Admin dashboards

Fig 5.1 Functional block diagram

Inputs

- **User submissions:** These include textbook details such as title, author, edition, subject, and optional digital copies (PDFs). Users like students and professors upload or submit books to be evaluated.

- **Review submissions:** Registered users contribute ratings, comments, and structured rubric-based evaluations that measure a textbook's clarity, curriculum alignment, and usefulness.

- **Admin actions:** Administrators monitor the overall system, approve or reject reviews, and manage user roles.
- **External resources:** Optional data from Open Educational Resource (OER) repositories or academic APIs can be integrated to enrich textbook metadata and context.

Processing Units

1. **Authentication & Access Module:**

   Managed by Supabase Auth, this module ensures that only authorized users can log in or make changes. It uses role-based access control to distinguish between students, professors, reviewers, and admins.

2. **Frontend UI (React + TypeScript + Tailwind):**

   The user interface is built using React and Tailwind CSS, offering a modern, responsive experience. It allows users to navigate through modules such as book submission, reviews, messages, and dashboards with ease.

3. **Evaluation Logic:**

   This part applies the evaluation rubrics and quality criteria—such as readability, alignment with curriculum, inclusivity, and presentation—to calculate a standardized textbook quality score. It ensures that every review follows consistent evaluation rules.

4. **Messaging Module:**

   The messaging feature supports communication among users. Students can discuss with professors or reviewers directly through real-time channels powered by Supabase Realtime DB hooks. This encourages collaboration and clarification during the review process.

5. **Analytics & Auth Module:**

   This final processing block gathers all evaluations and review data to generate visual insights. It creates analytical dashboards, charts, and summary reports that help users and admins identify top-rated textbooks and understand overall trends.

Outputs

- **Quality Assessment Reports:**
  These reports summarize each book's overall score and detailed rubric-based evaluation.

- **Reviewer Dashboards:**
  Reviewers and professors can access dashboards showing their submissions, review statistics, and book comparisons.
- **Messages:**
  Notifications and message exchanges keep users updated about approvals, feedback, and ongoing discussions.
- **Admin Dashboards:**
  Administrators have access to control panels showing total users, reviews, pending approvals, and system analytics for effective management.

Suitability for the Project

- It clearly separates input, processing, and **o**utpu**t** stages, reflecting the real architecture used in the React + Supabase implementation.
- The modular design makes the system scalable, allowing new features such as AI-based evaluation or automatic plagiarism detection to be added easily in the future.
- Built-in security and authentication ensure that data remains protected while maintaining transparency.
- The inclusion of messaging and analytics modules demonstrates the system's focus on collaboration and evidence-based decision-making.

Suitability for the project:

The block diagram is suitable for this project as it clearly separates the flow of information from inputs to outputs through logical processing units. It ensures transparency in how data is collected, analyzed, and transformed into actionable insights. The modular structure allows for scalability (adding new criteria or evaluation methods in future), ensures security of user contributions, and provides a structured way to integrate both automated analysis and human feedback. This makes the block diagram an effective representation of the *Textbook Quality Assessment System* workflow.

5.3 System Flow chart

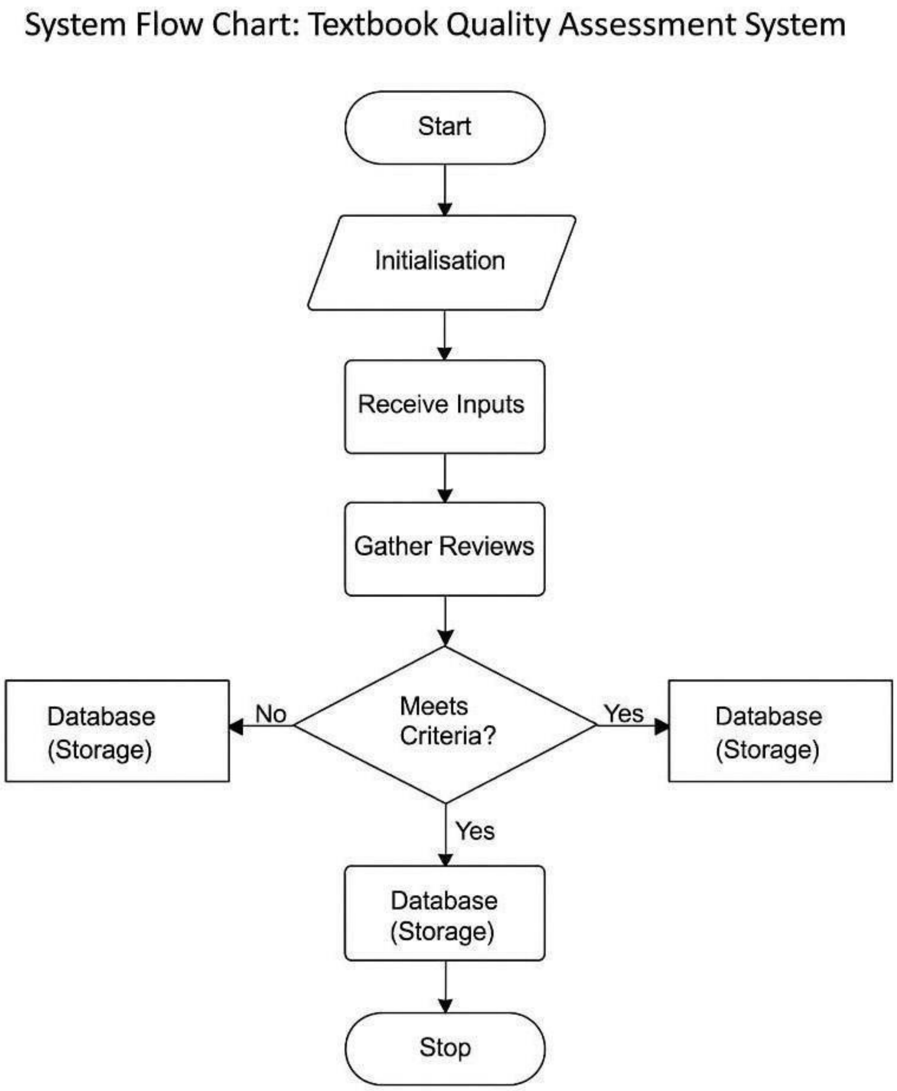


Fig 5.2 System flow chart

The flow begins with the initialization phase, where the system establishes its working environment. During this stage, the platform loads necessary frontend components (React modules), initializes the backend connection with Supabase, and verifies user authentication.

This ensures that all system dependencies and resources are ready before accepting any user interactions.

Once initialization is complete, the input phase begins. Here, different users—students, professors, reviewers, and administrators submit data through the web interface. These inputs include textbook details, structured reviews, and comments based on predefined evaluation rubrics. The system validates each input to ensure completeness and correctness before moving forward.

After data submission, the system proceeds to the processing phase. In this stage, the application performs data validation, checks for duplicate or invalid records, and transfers approved inputs to the evaluation logic module. This module applies standardized rubrics such as *clarity, curriculum alignment, inclusivity,* and *presentation quality* to calculate the textbook's overall score. The processing logic ensures that every evaluation is consistent, fair, and traceable.

If the submitted data meets the evaluation criteria, it is then stored securely in the Supabase PostgreSQL database. This includes all book metadata, review records, and associated analytics. If a submission fails validation (for example, missing details or invalid file formats), the system prompts users to correct and resubmit.

The final stage is the output generation phase. Here, the system compiles the processed data and generates various results, including visual dashboards, summary analytics, and notification alerts. These outputs are displayed to different user roles according to their permissions: students view their contributions, professors access class-related reviews, and administrators monitor overall platform activity.

By the end of the flow, the system ensures that all valid information is stored, analyzed, and presented effectively to enhance transparency and improve decision-making about textbook selection and quality assurance.

Suitability for the Project

This flow chart is well-suited to represent the working model of the TextAssess system because it clearly demonstrates the logical sequence of operations from data input to final output.

It also reflects how each phase connects seamlessly in the React + Supabase full-stack environment, maintaining data accuracy, real-time synchronization, and security.

The structured flow promotes clarity in understanding system behavior and provides a strong foundation for scalability making it easier to add features like AI-assisted evaluation, plagiarism detection, or multi-language support in the future.

5.4 Choosing Devices

Although TextAssess is primarily a web-based platform and does not depend on specialized hardware, selecting appropriate devices for development and usage is still important. The system is designed to be accessible from any modern device—laptops, desktops, tablets, and smartphones. During development, a laptop with sufficient processing power, memory, and internet connectivity was chosen to ensure smooth execution of React components and Supabase interactions. On the user side, the platform works seamlessly on typical student and faculty devices, making accessibility universal. This flexibility reduces dependency on specific hardware and ensures wide adoption across academic environments.

5.5 Designing Units

- **Authentication Unit:** Handles signup, login, session management, and user role validation using Supabase Auth.
- **Book Submission Unit:** Allows users to upload textbook metadata and optional files.
- **Review Management Unit:** Collects reviews, applies rubrics, and stores scores.
- **Messaging Unit:** Enables communication between users regarding textbook clarifications.
- **Admin Unit:** Manages approvals, dashboards, and system-level decisions.
- **Storage Unit:** Manages file uploads and links through Supabase Storage.

5.6 Standards

- **UI/UX Standards:** Consistent layout, responsive design, semantic HTML, WCAG accessibility, and Tailwind design patterns.
- **Coding Standards:** TypeScript strict mode, modular React components, error handling, and naming conventions.

- **Security Standards:** Enforced Supabase Row-Level Security (RLS), encrypted authentication, strong password policies, and access restrictions.
- **Database Standards:** Normalized schema, foreign key relationships, indexing for performance, and JSONB usage for rubrics.
- **Quality Standards:** Structured reviews aligned with textbook evaluation research, ensuring academic relevance.

5.7 Mapping with IoTWF Reference Model Layers

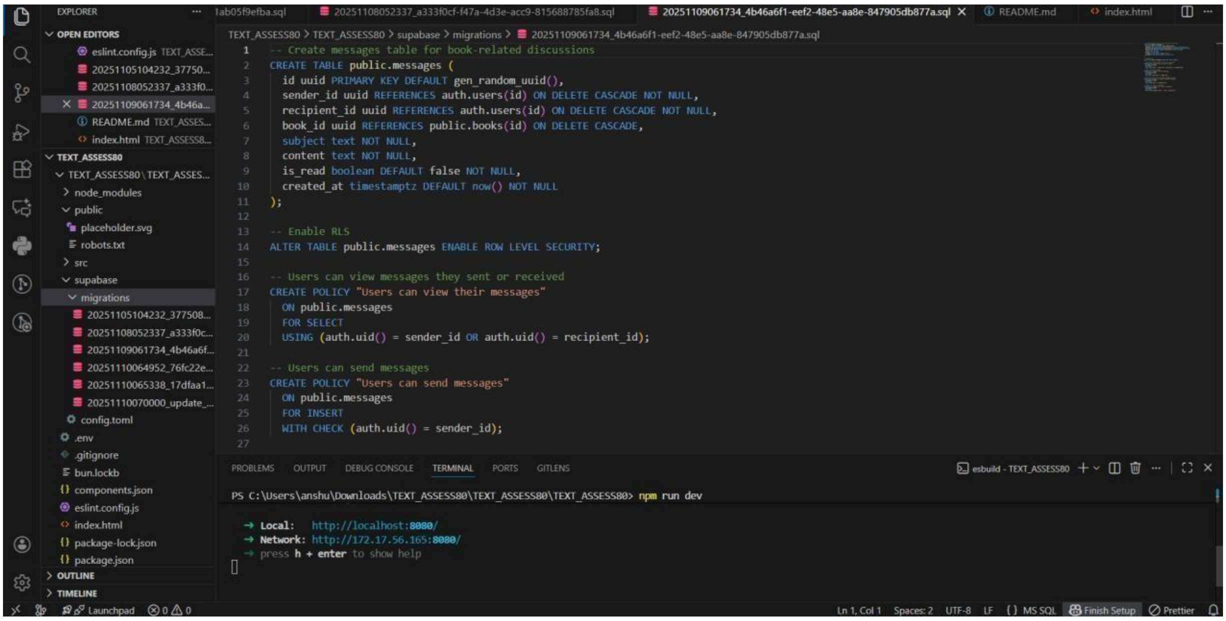
- **Edge Layer:** User devices (laptops/phones) act as the interface points.
- **Communication Layer:** HTTPS requests sent through Supabase SDK.
- **Data Layer:** Supabase PostgreSQL stores books, reviews, and messages.
- **Control Layer:** RLS policies and role-based access manage system control.
- **Application Layer:** React frontend delivering interactive features.
- **Collaboration Layer:** Messaging, reviews, and admin workflows supporting academic collaboration.

5.8 Domain Model Specification

- **User:** Represents students, reviewers, professors, and admins with specific roles.
- **Book:** Contains metadata such as title, author, edition, description, and file reference.
- **Review:** Stores scores, rubrics, comments, and reviewer identity.
- **Message:** Exchanges communication between users.
- **Admin:** Approves reviews, manages activities, and oversees system consistency.

Relationships include:

- A user can submit multiple books.
- A book can have multiple reviews.
- A review belongs to one book and one reviewer.
- Messages occur between two users.



```sql
-- Create messages table for book-related discussions
CREATE TABLE public.messages (
  id uuid PRIMARY KEY DEFAULT gen_random_uuid(),
  sender_id uuid REFERENCES auth.users(id) ON DELETE CASCADE NOT NULL,
  recipient_id uuid REFERENCES auth.users(id) ON DELETE CASCADE NOT NULL,
  book_id uuid REFERENCES public.books(id) ON DELETE CASCADE,
  subject text NOT NULL,
  content text NOT NULL,
  is_read boolean DEFAULT false NOT NULL,
  created_at timestamptz DEFAULT now() NOT NULL
);

-- Enable RLS
ALTER TABLE public.messages ENABLE ROW LEVEL SECURITY;

-- Users can view messages they sent or received
CREATE POLICY "Users can view their messages"
  ON public.messages
  FOR SELECT
  USING (auth.uid() = sender_id OR auth.uid() = recipient_id);

-- Users can send messages
CREATE POLICY "Users can send messages"
  ON public.messages
  FOR INSERT
  WITH CHECK (auth.uid() = sender_id);
```

```
PS C:\Users\anshu\Downloads\TEXT_ASSESS80\TEXT_ASSESS80\TEXT_ASSESS80> npm run dev

  ➜  Local:   http://localhost:8080/
  ➜  Network: http://172.17.56.165:8080/
  ➜  press h + enter to show help
```

Fig 5.3 Database Schema for Books and Reviews in TextAssess

5.9 Communication Model

1. **Frontend → Backend Communication:**

   ○ Through Supabase client for CRUD operations.

   ○ Uploading files, submitting reviews, logging in, and sending messages.

2. **Backend → Frontend Communication:**

   ○ Realtime updates when new reviews or messages arrive.

   ○ Authentication status changes (session events).

   ○ Data retrieval on demand via database queries.

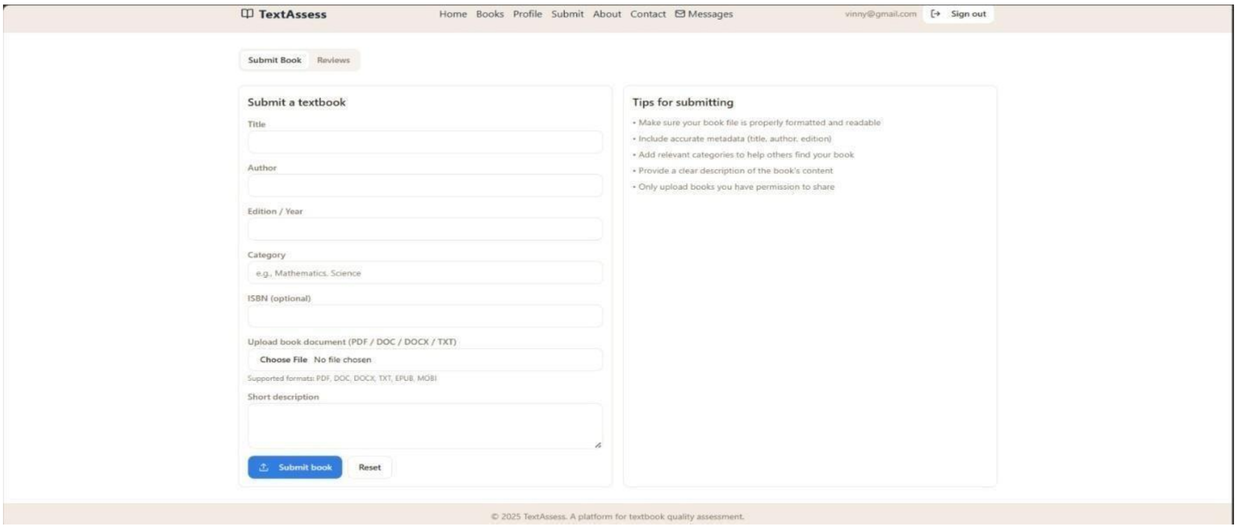
3. **Internal Communication:**
   - Supabase Storage interacts with DB using file paths.
   - Policies regulate which roles can access which data.

5.10 IoT Deployment Level:

- **Level 1: Device Interaction** – Users interact through personal devices.
- **Level 2: Data Transmission** – Data is sent securely through Supabase SDK.
- **Level 3: Data Storage** – All system data is stored in Supabase PostgreSQL.
- **Level 4: Data Processing** – Reviews, analytics, role validation, and messages are processed.
- **Level 5: System Application** – Frontend displays dashboards, evaluations, and results.
- **Level 6: Collaboration** – Messaging and shared evaluations support academic collaboration.

5.11 Functional View

- **User Authentication:** Verifies identity and ensures secure login.
- **Book Submission:** Allows uploading metadata and files.
- **Review Collection:** Accepts structured evaluations and rubrics.
- **Messaging:** Facilitates communication between users.
- **Admin Control:** Approves content, monitors system, and manages users.
- **Analytics:** Computes averages, scores, and provides insights.
- **File Management:** Handles uploading, storing, and accessing PDFs.



Submit a textbook

Title

Author

Edition / Year

Category

e.g., Mathematics, Science

ISBN (optional)

Upload book document (PDF / DOC / DOCX / TXT)

No file chosen

Supported formats: PDF, DOC, DOCX, TXT, EPUB, MOBI

Short description

Tips for submitting

- Make sure your book file is properly formatted and readable
- Include accurate metadata (title, author, edition)
- Add relevant categories to help others find your book
- Provide a clear description of the book's content
- Only upload books you have permission to share

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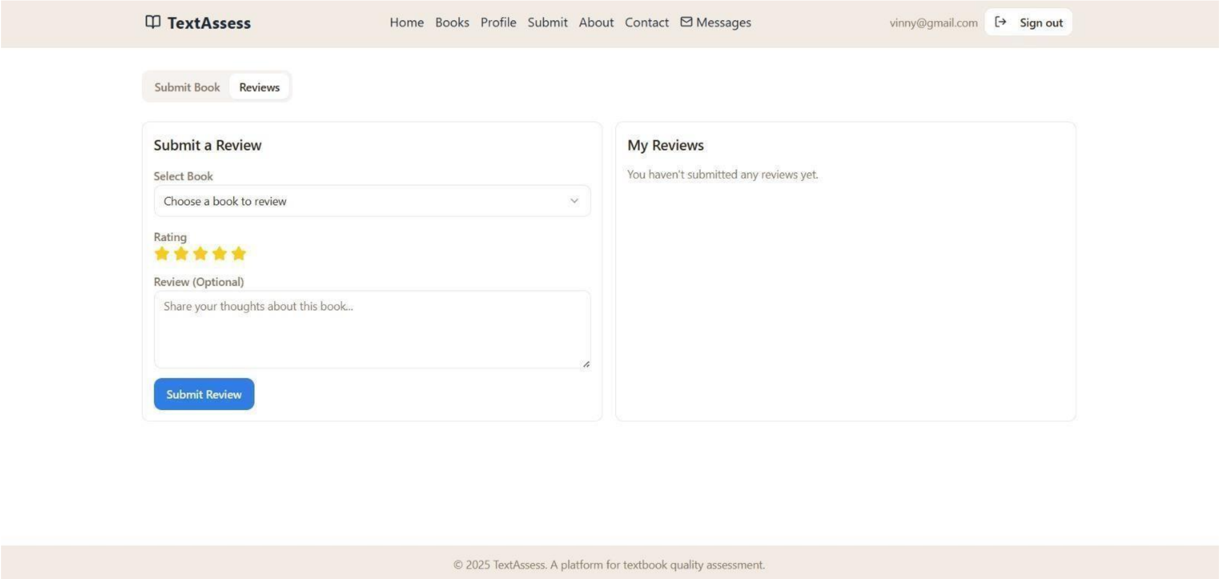
Fig 5.4 Book Submission Module



Submit a Review

Select Book

Choose a book to review

Rating

★★★★★

Review (Optional)

Share your thoughts about this book...

My Reviews

You haven't submitted any reviews yet.

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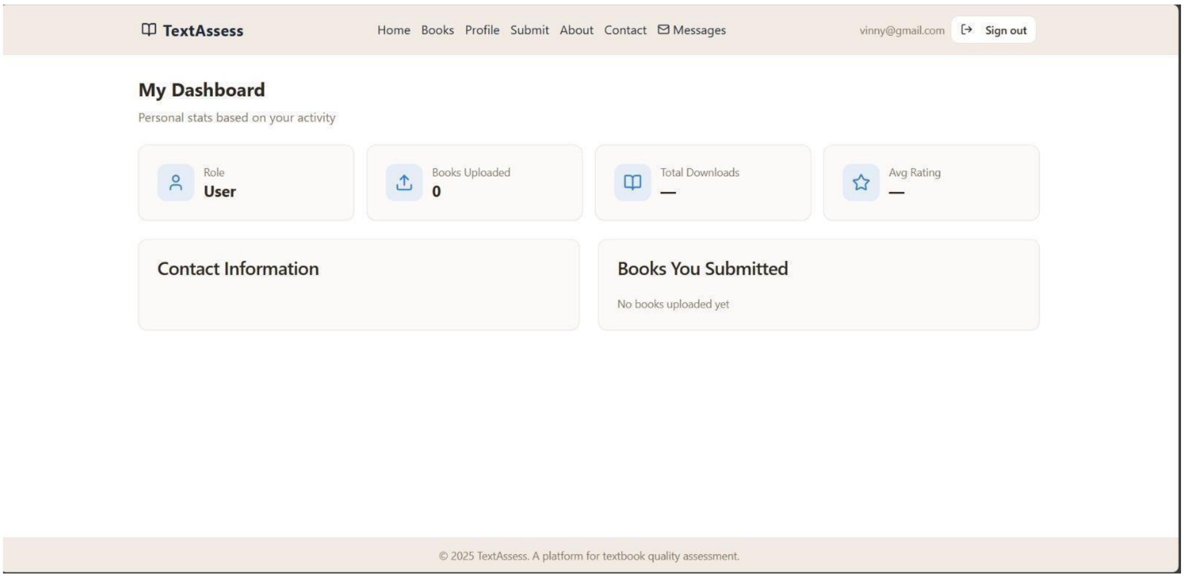
Fig 5.5 Review Submission-Rating and Comment

5.12 Mapping IoT Deployment Level with Functional View

- Device Interaction → Authentication & User Input
- Data Transmission → Communication with Supabase
- Data Storage → Books, Reviews, Users, Messages tables
- Data Processing → Analytics and Review Rubrics
- Application Layer → React UI for students, reviewers, and admin

5.13 Operational View

- Users log in through the web interface using Supabase Auth.
- Students and professors submit books or reviews, which are validated and stored in the database.
- Reviewers evaluate textbooks based on rubrics synthesized from academic research.
- Admins approve or reject submissions and monitor overall system activity.
- Realtime functionality ensures immediate updating of dashboards and messages.
- The system maintains security through authentication, RLS policies, and controlled access.
- The platform operates continuously with minimal manual intervention due to its cloud-based infrastructure.



My Dashboard

Personal stats based on your activity

Role: User

Books Uploaded: 0

Total Downloads: —

Avg Rating: —

Contact Information

Books You Submitted

No books uploaded yet

© 2025 TextAssess. A platform for textbook quality assessment.

Fig 5.6 User Dashboard – Profile and Stats

5.14 Other Design

1. Microservices Architecture:

In this design, the system is divided into independent services such as user management, book handling, reviews, messaging, and analytics. Each service operates and scales independently, improving flexibility and maintainability. This architecture is ideal for large institutions expecting high traffic and long-term scalability.

2. MVC(Model–View–Controller) Architecture:

The project can also be designed using the MVC pattern, where the Model handles data, the View manages the user interface, and the Controller processes logic and interactions. This structure offers clean separation of concerns, easier debugging, and a well-organized workflow, making it suitable for structured academic systems.

3. Monolithic Server–Client Architecture:

Another alternative is a monolithic model, where both backend logic and frontend views are tightly integrated through a single framework like Django, Laravel, or Spring Boot. This design is simple, easier to develop, and ideal for smaller teams, providing faster deployment with minimal system overhead.

Chapter 6

HARDWARE, SOFTWARE AND SIMULATION

6.1 Hardware

The TextAssess project is a cloud-based web application and therefore does not depend on specialized hardware components. However, reliable hardware was still necessary during the development and testing phases. The system was developed using a standard personal laptop with moderate specifications, such as an Intel or AMD processor, 8 GB RAM, and stable internet connectivity. This ensured that the React development environment, Node.js, and Supabase dashboard ran smoothly without performance issues.

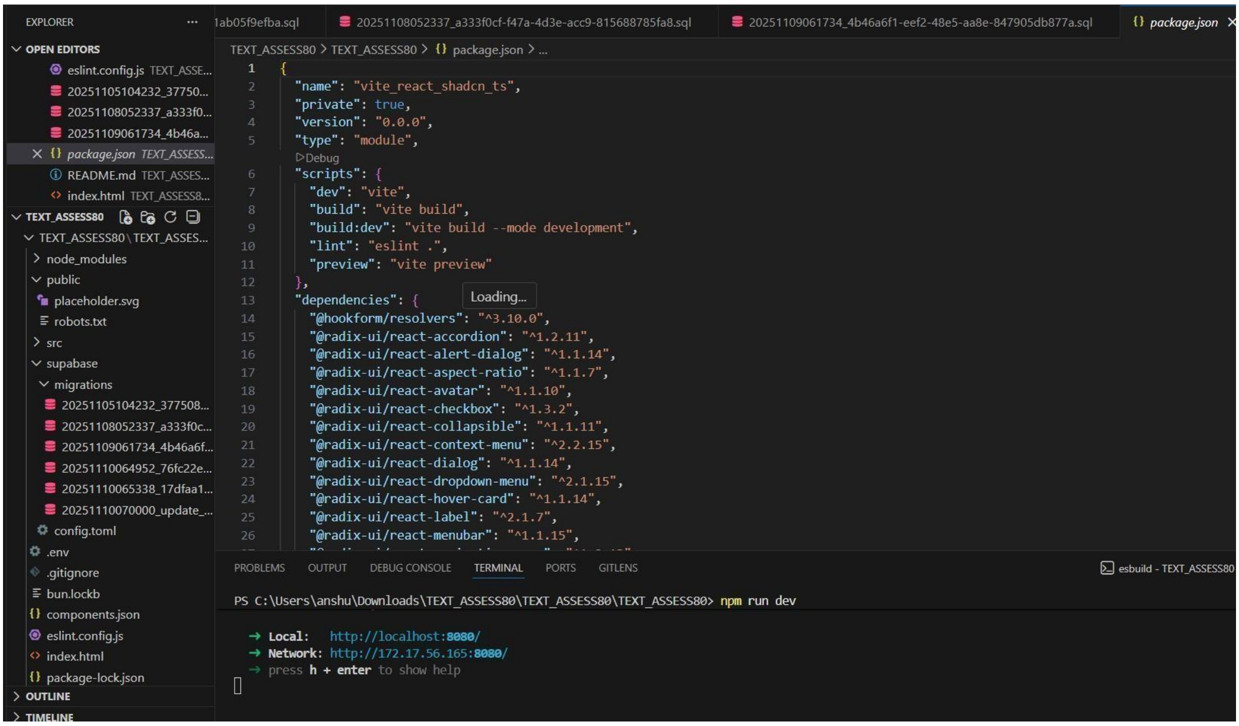
For end-users including students, professors, reviewers, and administrators the only requirement is a basic device that can run a modern web browser. The platform works seamlessly on laptops, desktops, tablets, and smartphones. This hardware independence makes the system highly accessible and reduces the barriers to adoption across educational institutions.

6.2 Software Development tools

The project relies entirely on open-source and cloud-based software tools, making it efficient, cost-effective, and easy to maintain.

The frontend was developed using React.js and TypeScript, which ensured component reusability, type safety, and predictable behavior. Tailwind CSS and shadcn/UI were used to design a clean, responsive, and accessible user interface. Navigation and routing were handled using React Router, while React Query was used to manage data fetching and caching. On the backend, Supabase served as the primary platform, offering authentication, database management (PostgreSQL), file storage, and realtime updates. Additional tools such as Node.js, npm, VS Code, Git, and GitHub supported development, version control, and collaboration.

These software tools collectively ensured smooth development, fast debugging, and seamless integration between the frontend and backend.



```json
{
  "name": "vite_react_shadcn_ts",
  "private": true,
  "version": "0.0.0",
  "type": "module",
  ▷Debug
  "scripts": {
    "dev": "vite",
    "build": "vite build",
    "build:dev": "vite build --mode development",
    "lint": "eslint .",
    "preview": "vite preview"
  },
  "dependencies": {
    "@hookform/resolvers": "^3.10.0",
    "@radix-ui/react-accordion": "^1.2.11",
    "@radix-ui/react-alert-dialog": "^1.1.14",
    "@radix-ui/react-aspect-ratio": "^1.1.7",
    "@radix-ui/react-avatar": "^1.1.10",
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    "@radix-ui/react-label": "^2.1.7",
    "@radix-ui/react-menubar": "^1.1.15",
```

```
PS C:\Users\anshu\Downloads\TEXT_ASSESS80\TEXT_ASSESS80\TEXT_ASSESS80> npm run dev

  → Local:   http://localhost:8080/
  → Network: http://172.17.56.165:8080/
  → press h + enter to show help
```

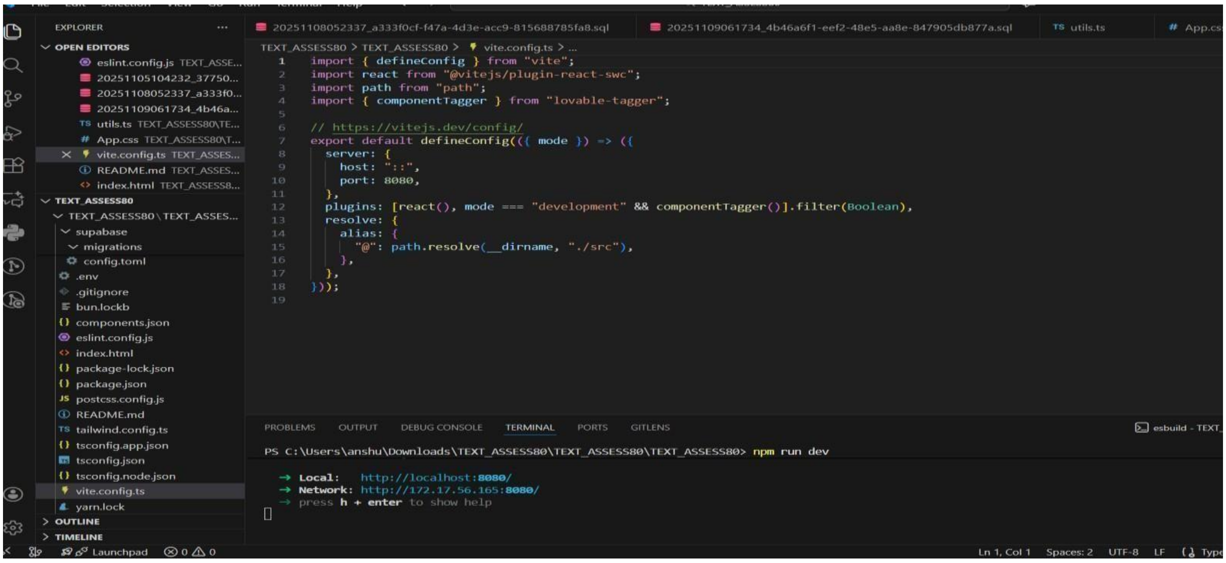
Fig 6.1 Frontend Dependency Configuration

6.3 Software Code

The software implementation consists of modular React components connected to the Supabase backend through the official supabase-js client. Each feature, such as authentication, book submission, review management, analytics, and admin approval, was developed as an independent module to ensure clarity and maintainability.

The code structure follows best practices, including reusable hooks, separate service files for database queries, validation logic for forms, and asynchronous calls for data operations. Supabase Auth manages user sessions, while database CRUD operations handle book updates, review insertions, and message exchanges.

Although the complete codebase contains numerous components, the core logic emphasizes readability, minimal redundancy, and strict TypeScript checks. This ensures that the application performs consistently and can be extended easily in the future.



```
import { defineConfig } from "vite";
import react from "@vitejs/plugin-react-swc";
import path from "path";
import { componentTagger } from "lovable-tagger";

// https://vitejs.dev/config/
export default defineConfig(({ mode }) => ({
  server: {
    host: "::",
    port: 8080,
  },
  plugins: [react(), mode === "development" && componentTagger()].filter(Boolean),
  resolve: {
    alias: {
      "@": path.resolve(__dirname, "./src"),
    },
  },
}));
```

```
PS C:\Users\anshu\Downloads\TEXT_ASSESS80\TEXT_ASSESS80\TEXT_ASSESS80> npm run dev

  → Local:   http://localhost:8080/
  → Network: http://172.17.56.165:8080/
  → press h + enter to show help
```

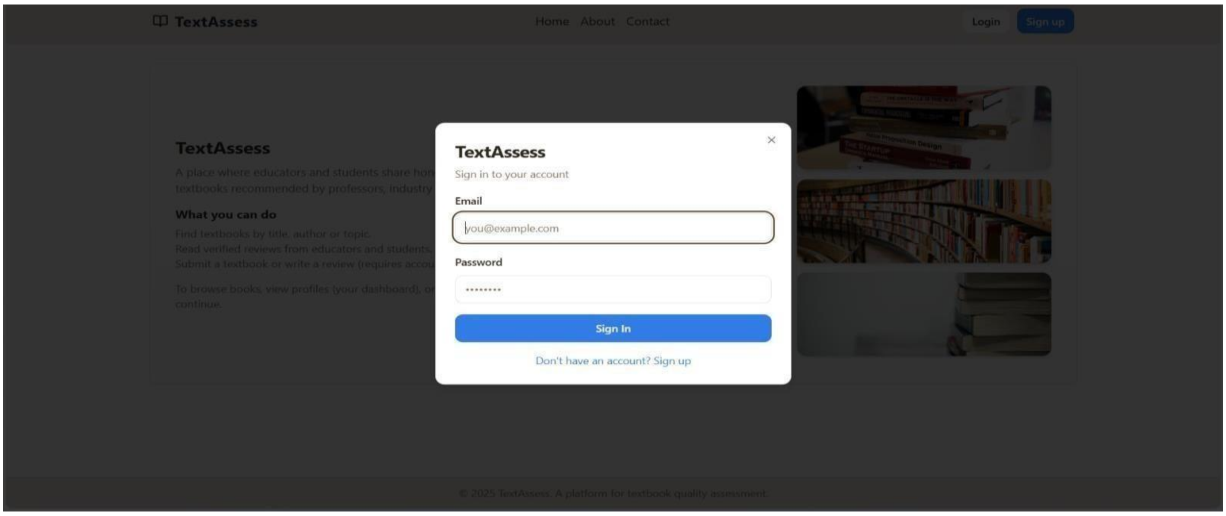
Fig 6.2 Vite Build and Development Configuration

6.4 Simulation

Since TextAssess is a web application rather than an embedded or IoT-based system, simulation refers to evaluating system functionality in a controlled test environment. The simulation environment consisted of running the frontend locally on a development server while connecting to a live Supabase backend. This setup allowed developers to simulate real user interactions such as logging in, submitting reviews, uploading book files, sending messages, and navigating through dashboards.

Test data representing sample books, dummy accounts, and mock reviews was inserted to verify how the system behaves under different scenarios. Realtime features like messaging and review updates were also simulated to ensure that the platform responded instantly to changes.

This simulated environment replicated real-world usage, allowing early detection of bugs, performance bottlenecks, and UI inconsistencies before deployment.



TextAssess

A place where educators and students share hon
textbooks recommended by professors, industry

What you can do

Find textbooks by title, author or topic.
Read verified reviews from educators and students.
Submit a textbook or write a review (requires accou

To browse books, view profiles (your dashboard), or
continue.

TextAssess

Sign in to your account

Email: you@example.com

Password: ••••••••

Don't have an account? Sign up

© 2025 TextAssess. A platform for textbook quality assessment.

Fig 6.3 User Sign in Interface

Chapter 7

EVALUATION AND RESULTS

7.1 Test Points

- User authentication and role-based access
- Book submission and file upload
- Review creation, validation, and storage
- Admin approval workflows
- Messaging and realtime updates
- Database operations and data consistency
- User interface responsiveness and navigation
- Security checks using Supabase Row-Level Security (RLS)

7.2 Test Plan

The project followed a structured test plan aligned with the V-Model methodology. Testing began at the unit level, where individual React components and Supabase queries were verified for correct behavior. This was followed by integration testing to check if multiple modules such as review forms and dashboards worked cohesively.

System testing validated complete workflows, such as a student logging in, submitting a book, writing a review, and the admin approving it. Acceptance testing was carried out by simulating actual academic use cases to verify whether the system met the needs of students, professors, and reviewers.

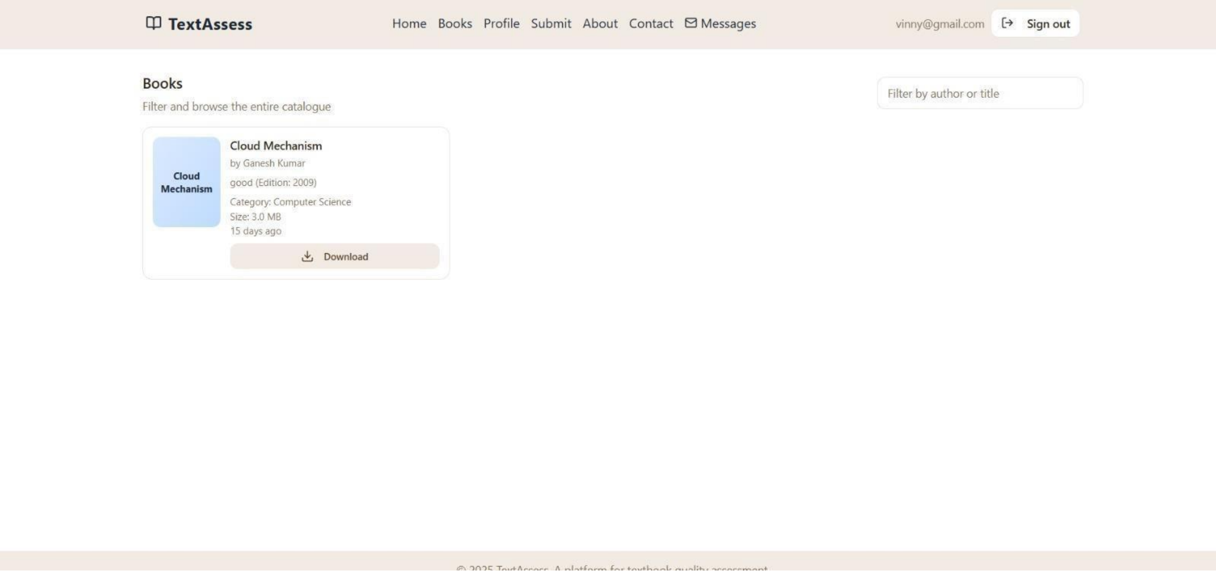
Each test scenario included input validation, error handling, edge cases, and user behavior testing to ensure overall stability.

7.3 Test Results

Users were able to register, log in, and access role-specific dashboards without issues. Book uploads and review submissions worked smoothly, with proper validation and secure data storage. Realtime features such as messaging and review updates responded instantly, demonstrating the strength of the Supabase backend.

The admin panel successfully displayed pending reviews, book submissions, and analytical summaries. All approved reviews were accurately reflected in the textbook rating system, and the analytics module generated consistent average scores across subjects.

Minor UI inconsistencies and validation improvements were identified during testing but were fixed immediately. Overall, the system achieved all functional requirements and operated as expected.



Books

Filter and browse the entire catalogue

Cloud Mechanism
by Ganesh Kumar
good (Edition: 2009)
Category: Computer Science
Size: 3.0 MB
15 days ago

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Fig 7.1 Successful Rendering of Books Catalogue

7.4 Insights

- The use of Supabase significantly reduced backend complexity while still offering strong authentication and database security.
- Real-time features greatly improved collaboration, making the platform feel dynamic and interactive.
- Structured rubrics provided meaningful and consistent evaluation metrics across different reviewers.
- The modular React architecture made debugging and enhancement extremely efficient.
- The system is highly scalable and can support multiple institutions with minimal modifications.
- The platform successfully brings transparency to textbook evaluation, aligning with research findings from the referenced paper.

Chapter 8

SOCIAL, LEGAL, ETHICAL, SUSTAINABILITY AND SAFETY ASPECTS

8.1 Social Aspects

TextAssess has a significant social influence because it transforms how educational institutions evaluate and adopt textbooks. Traditionally, the process of selecting textbooks happens behind closed doors, usually by a small committee. Students the primary users of textbooks rarely have the opportunity to express their opinions, resulting in materials that may TextAssess directly addresses this gap by giving every stakeholder a voice. By allowing students, professors, and reviewers to contribute evaluations in an open and transparent manner, the platform encourages a more democratic and inclusive decision-making process. This helps institutions better understand what types of textbooks create effective learning experiences, especially for diverse groups of students.

The platform also promotes social equality. Students from different academic backgrounds, social environments, or skill levels can participate equally because the system is accessible online and does not require advanced hardware or technical skills. A student with only a mobile phone has the same ability to provide feedback as someone with a high-end laptop.

Additionally, TextAssess enhances communication between students and educators. When professors review feedback submitted by their students, they gain valuable insights into the challenges faced in understanding certain textbooks. Thus, TextAssess not only improves textbook quality but also strengthens the social fabric of educational institutions by promoting fairness, openness, and meaningful collaboration. This fosters healthy academic dialogue.

8.2 Legal Aspects

Since TextAssess handles user information, uploaded files, and academic reviews, it must operate responsibly within applicable legal frameworks. The platform makes use of Supabase Auth, which follows modern security standards to protect login credentials through encrypted storage and secured authentication flows. This helps the system comply with basic data protection regulations and prevents unauthorized individuals from accessing personal user information.

Another important legal factor is intellectual property. Users may upload book samples, notes, or reference materials during the review process. The system encourages users to upload only content they have permission to share, protecting the rights of authors and publishers. This reduces the risk of copyright infringement and ensures that the platform remains legally sound.

The system also avoids collecting unnecessary data. Only essential fields such as name, email, and role are stored, helping the platform adhere to the principle of data minimization. Clear usage guidelines are provided to users, instructing them to avoid offensive, defamatory, or harmful.

By ensuring secure authentication, respecting copyright limitations, and promoting responsible user behavior, TextAssess remains compliant with legal expectations and performs as a safe academic tool.

8.3 Ethical Aspects

Ethical responsibility is one of the most important aspects of the TextAssess platform. Because the system deals with reviews and ratings, it must ensure fairness and prevent biased or harmful feedback. To achieve this, the platform uses structured rubrics that guide reviewers to evaluate textbooks based on academic criteria such as clarity, difficulty level, accuracy, accessibility, and relevance rather than personal judgments.

The system also protects user privacy by ensuring that sensitive information is visible only to necessary personnel, such as admins. Users are encouraged to provide genuine and constructive feedback. Any form of discrimination whether based on gender, race, academic ability, or background is strictly discouraged. Ethical guidelines are communicated clearly so that all users understand the importance of respectful and professional behavior.

Another ethical challenge in online review systems is the possibility of fake or misleading reviews. TextAssess reduces this risk by verifying user identities through Supabase Auth and assigning roles such as student, reviewer, professor, or admin. This ensures that only genuine users contribute evaluations and that administrators can moderate inappropriate content.

By encouraging honesty, fairness, transparency, and accountability, TextAssess promotes an ethical learning environment where feedback is used to improve education and empower learners.

8.4 Sustainability Aspects

TextAssess contributes positively to sustainability on several levels—environmental, operational,educational.

Environmentally, the system eliminates the need for paper-based review forms, physical reports, and manually maintained documentation. Textbook evaluation committees often rely heavily on printouts and paper surveys. Moving this process online reduces paper consumption and aligns with global efforts toward eco-friendly digital transformation.

The system also benefits from the cloud-based infrastructure of Supabase. Instead of requiring physical servers or hardware maintenance, TextAssess runs on efficiently managed, optimized cloud servers shared by multiple applications. This reduces energy consumption and carbon emissions when compared to dedicated physical hardware.

Operational sustainability is achieved because the platform is easy to update, scale, and maintain. When institutions grow or new subjects are introduced, the system can accommodate new users or additional data without requiring major upgrades. This long-term maintainability ensures that the platform remains effective for future academic needs.

Finally, TextAssess promotes educational sustainability by helping institutions continuously select high-quality textbooks. Poor-quality or outdated materials can negatively impact learning outcomes for years. By using structured evaluations, the platform ensures that only the most effective textbooks are chosen, supporting sustainable academic growth and long-term student success.

8.5 Safety Aspects

Safety within TextAssess focuses on secure usage, preventing data misuse, and protecting users from harmful or inappropriate content. Supabase provides strong authentication and database security mechanisms that create a safe and reliable foundation for the platform. Features such as encrypted passwords, protected user sessions, and identity verification ensure that only legitimate users can access their own accounts.

Row Level Security in Supabase adds an important layer of protection by controlling exactly who can view or modify data. This means a student cannot see another student’s private messages, reviews, or personal information. Administrators have higher permissions, but even they operate within clearly defined safety boundaries.

The system also incorporates content moderation. Since users are allowed to upload files and submit written feedback, all sensitive content passes through an admin approval process. This ensures that no harmful, abusive, misleading, or inappropriate material becomes visible to other users. This is especially important when the system is accessed by learners of different age groups.

On the technical side, the platform safeguards data against accidental loss or corruption. Supabase manages file storage and database backups, ensuring that user information and uploaded documents remain secure even in the event of unexpected system issues.

Overall, TextAssess offers a safe digital environment where students, educators, and reviewers can confidently interact with the system without worrying about security threats, data misuse, or exposure to harmful content.

Chapter 9

CONCLUSION

The project successfully developed and implemented TextAssess, a comprehensive Textbook Quality Assessment System designed to streamline the evaluation of academic textbooks through structured criteria, collaborative reviews, and automated analysis.

The system integrates feedback from students**,** professors**,** and reviewers, ensuring that evaluations reflect both pedagogical standards and learner perspectives, as recommended by previous research on textbook evaluation and quality frameworks .

Following the V-Model methodology, the project progressed through clear stages — from requirements gathering and literature review to system design, development, and testing. This structured approach ensured that each requirement was validated against outcomes, maintaining transparency and traceability throughout the development cycle .

The use of a modern full-stack architecture (React + TypeScript frontend and Supabase backend) provided a secure, scalable, and cloud-ready environment.

- The frontend focused on accessibility and user experience, allowing seamless interaction through structured forms, review dashboards, and feedback modules.
- The backend, powered by Supabase's PostgreSQL and real-time synchronization, handled authentication, secure data storage, and analytics, supporting multi-role collaboration between students, reviewers, and administrators.

By implementing role-based access control, encryption policies, and real-time data validation, the system ensured high standards of data security and user privacy, aligning with the best practices outlined in studies on educational technology systems .

The outcomes of this project confirm that all key objectives were successfully achieved:

- **Behavioral Objective:**
  Users across different roles (students, professors, reviewers, administrators) were able to interact effectively with the platform, submitting structured reviews and navigating dashboards intuitively. This encouraged consistent, research-backed evaluation behavior .

- **Analytical Objective:**

  The evaluation engine generated measurable indicators of textbook quality (clarity, curriculum relevance, inclusivity, and design) using standardized rubrics, as suggested in earlier frameworks by Mohammadi and Fey . These results provided evidence-based insights for decision-makers in curriculum design and textbook selection.

- **System Management Objective:**

  The administrator dashboard enabled efficient review moderation, approval workflows, and reporting. This directly addresses Mahmood's and Yasar's findings on the importance of structured oversight in maintaining textbook evaluation integrity.

- **Security Objective:**

  Supabase authentication and database-level policies ensured safe, role-restricted access. User privacy was maintained by showing only verified email contacts, ensuring compliance with ethical standards for educational data management .

- **Deployment Objective:**

  The prototype was successfully deployed in a local environment and designed for smooth migration to cloud infrastructure. Its scalability supports institutional-level implementation, consistent with Ivić's emphasis on textbook evaluation systems that can be adapted across educational contexts.

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Base Paper:

From References the mainly referred paper: G. W. Cobb, “Introductory textbooks: A framework for evaluation: A comparison of 16 books,” *Journal of the American Statistical Association*, vol. 82, no. 397, pp. 321–339, 1987.

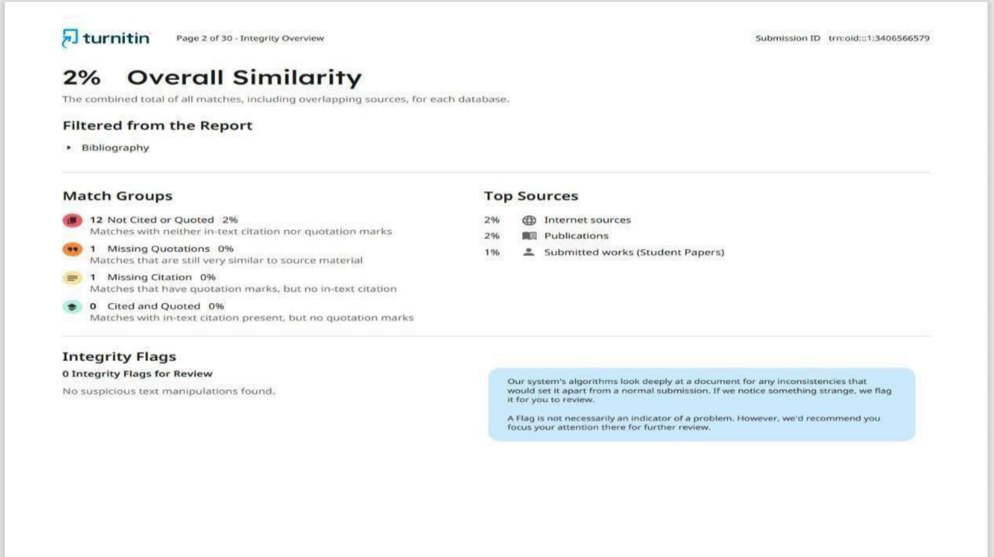
APPENDIX

i. Data Sheets

- Frontend Framework: React + TypeScript
- Build Tool: Vite
- Styling: Tailwind CSS
- Backend: Supabase (PostgreSQL + Storage + Auth)
- Authentication: JWT-based (Supabase Auth)
- Hosting (Local Dev): Vite at http://localhost:8080

ii. Project Report – Similarity Report

- Similarity Index: 2% (Turnitin range)



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iii. Live Project Demo

Git Hub link : https://github.com/Lavanya7004/Quality-Assesment-Capstone-Project

Application for Assessment of Quality of Textbook/Reference Books and E-Books

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Abstract *- Still, people underline that it is critically important to determine the quality of textbooks to enhance the teaching process and ensure the maintenance of academic standards on a high level. The kind of review that is done today is mostly based on incoherent files, trembling scoring and manual correlation among the reviewers. This study proposes a textbook evaluation system through the internet that draws the entire review process into a single virtual location. Their development was founded on React, Typescript, and Supabase. It manages the submission of documents, rated forms, reviewed safely with a secure authentication, and keeping feedbacks safe at the same location. In each of the submissions, clear metadata enables administrators to view summaries, participate in the monitoring process and to monitor quality across the sets of textbooks of any quantity. Instead of the paper reviews or informal contributions, there is a proper demand a regular system of reviews that will be supported by effective data management and cloud backup. It cuts down on errors. It accelerates the decision-making process to the administrators. Eventually, such a arrangement renders the process of textbook selection in educational institutions more transparent and data-driven.*

I. INTRODUCTION

Textbooks influence the conceptual knowledge of students, mastering the initial skills, and working on course material. However, in spite of their contribution to the teaching and learning, some scholars believe that textbook is not of much value. Many decades ago textbook quality has been mentioned as a critical determinant of the pedagogic performance and quality of educational practice [3], [6], [7]. However, the use of informal dialogue, hand-written rating form, or disjointed review notes is being used even in most institutions in determining the appropriateness of the textbook. Overall, all these approaches lead to inconsistent evaluation and traceability issues alongside difficulties in the comparison of materials across programs or semesters [1], [4], and [8].

Further, the conventional methods are not uniform and do not provide clear guidelines; in the majority of cases, they are based on the subjective judgments related to quality. In the absence of criteria, the reviewers do not get to mention important instructional characteristics, misunderstand the content parity, or simply go without evaluating critical remarks in a systematic documentation [5], [7]. Research on the assessment behavior shows that the emphasis that is placed on readability, interest and clarity about instruction by evaluators has fluctuated [2], [9]. That is why systematic instruments must be utilized in the course of implementation of the evaluation procedure.

The given study suggests the creation of a web-based system of evaluating textbooks that will take the evaluation criteria to the higher level, collect reviews, and make the judgments more reliable in terms of textbook selection. The digital assessment system has its advantages, over the paper assessment system, in that scoring is uniform, and data storage is secure and instant response aggregation by reviewers.

The developed with the help of React, Typescript and Supabase system can enable the academic institutions to handle the role of reviewers, submissions, and generation of aggregate summaries reflecting trends in the quality of the textbooks.

An organized system of judging textbooks, which lessens the element of personal judgment and uniformity across the reviewers;

cloud-hosted service that can support secure access control, real-time feedback, administrative process including consolidated document processing; simplified, nimble implementation that is satisfactory in the context of an institution that requires a quality process assessment of textbooks; automatic scoring and summary generation enables evidence-based choices in the process of selecting instructional content. The system would be very applicable in the educational institutions, higher learning institutions, and to academic institutions that believe in enhancing the textbook assessment systems transparency.

II. LITERATURE REVIEW

The studies of textbook evaluation have not been delved into by many years. Preliminary studies prescribed the primary manner in which instructors evaluate educational resources.

One of the first large reviews of introductory textbooks was done by Cobb. He inspectively examined sixteen samples. The findings of his revealed significant differences in their construction, clarity and teaching method. This is due to such large deviations, and unless teachers have an organized mode, it becomes difficult to choose the best one. Works such as his actually demonstrated why good evaluation techniques were so important [1].

Subsequently, scholars began to examine the manner in which reviewers interact with the books. Gurung and Martin came to the Textbook Assessment and Usage Scale, which was shortened to TAUS. The tool was used to test the manner in which students and teachers process and understand textbook material. They discovered that individual variables, including interest in the subject or prior knowledge are significant contributors to the ratings. A good textbook may not receive the same grades even when reviewed by different individuals based on his or her perception [2].

After that Fey and Matthes presented a rather simple checklist of high quality textbooks. What became apparent in their review is that those that are the best possess proper facts, reasonable layout, absence of cultural or bias concerns and are suited to the learning objectives. Their ideas hold real value. They offer schools and assessors a platform upon which decisions are made [3].

Mohammadi and Abdi examined real assessments in upper classes and classrooms. Their case considered the number of tests that are overloaded with subjective feelings. The result of that is uneven results throughout the board. They have mentioned that applying formal techniques, including online techniques, reduces errors and allows maintaining consistency [4].

Mahmood realistically assessed outdated evaluation arrangements. He described the fact that there are very many places which claim to go through textbooks but do not live up to standards. He termed it as a deception of assessment. The system appears to be well arranged on the surface, yet, it does not measure books efficiently on the quality aspect. All this shows that there is a need to have consistent rules and training of individuals conducting the reviews [5].

Woodward and his crew plowed into the general process of school textbook vocations. These past types were scribbled in different locations. These they discovered were frequently descending to comfort or to that which was in fashion, not fundamental probes. This supports the reasons why formal systems are useful in making decisions that are anecdotal and relying on substantive information [6].

A major step in the construction of those systems was made by Ivic, Antic, and Pesikan. They compiled a comprehensive instruction on textbook requirements. It goes in dispensation such as page setup, pictures, clear-cut writing, fit to learn and its approachability. Their entire strategy is lauded by creating more consistent and reliable reviews [7].

Yasar applied side-by-side approach to book on two courses in geography. In his findings, his toplines indicated the strong and weak points in texts with clearings. He observed that the online tools have simplified the process of comparing and filtering out what is being said by the reviewers [8].

Race emphasised that the evaluating people are important. According to him, with the provided guidelines, they need to apply them properly. Factors such as motivation, willingness, and level of expertise influences the level of reliability of the scores. He suggested the application of directed templates and most particularly web based templates to maintain everything in line and on course [9].

Giger and Hadd narrowed down on the nursing textbooks, yet their arguments are broader when applied to the evaluation of books. They advocated cultural and content awareness which involves all in the content. With increasing diversity of student groups, the cultural fit issue becomes a necessity in evaluating textbooks in the modern world [10].

The aggregation of these ten studies indicates that there is a shift in textbook assessment toward the disposition of gut feelings towards organised, open and technology supported approaches. Ultimately, this leads to accurate, reasonable, and useful education choices reviews.

III. SYSTEM DESIGN AND ARCHITECTURE

Architectural Overview

The system is generically a four tiers architecture. It breaks down into various major elements, which are collaborative. The uppermost layer deals with the user interface concerns in general. This consists of a web application developed using the TypeScript and React technologies. Administrators and reviewers access customized dashboards suited to their specific roles. Dedicated portals allow them to submit textbooks without much hassle. Users complete evaluation forms directly on these pages. They review summaries of results in the exact same locations.

The application logic layer follows right after for handling core functions. It takes care of user authentication and related tasks. Navigation features support the process of uploading textbooks smoothly. Scoring occurs here based on established rubrics. It also processes reviewer inputs in a reliable manner.

Security forms its dedicated layer using Supabase tools for protection. Auditing receives thorough monitoring throughout. Row-level security policies ensure data stays safe. Role verifications happen with precision. Session management operates within this layer. Access to textbook files remains limited to authorized individuals only.

Component Description

The user interface relies on React and Typescript for developing web pages. Dashboards function via these interactive displays. Submissions process through the identical framework. Reviews take place using this same structure.

The backend operates on Supabase servers for efficiency. Authentication stays under its direct control. Database operations route through these servers. Storage receives full backing from them.

The selected database is Supabase Postgres for reliability. It stores user information with complete details. Textbooks occupy their designated areas. Ratings accumulate within the records. Logs capture every event in significant depth.

Security features include role-based access controls for safety. Tokens manage the authentication procedures. Rules impose restrictions on storage access points.

IV. METHODOLOGY AND IMPLEMENTATION

Evaluation Workflow Handling

The system ensures reviews originate solely from verified reviewers. It avoids network-based access verifications entirely. The software employs Supabase tokens for validation purposes instead. Reviewers authenticate to receive a signed JWT token. This token accompanies every subsequent request. It includes user information along with role specifics. Session durations establish time boundaries. Prior to any form submission or upload, the system examines the token. The Supabase authentication service assesses its integrity. This confirms the request's legitimacy overall. It also detects expired tokens promptly.

This approach prevents unauthorized access in full. Only registered reviewers submit scores successfully. Altered or outdated credentials face immediate rejection.

Algorithm 1 illustrates the authentication validation procedure. The input consists of a jwt_token. The output provides a validity status. It starts by decoding the token to extract identity and claims. Supabase Auth confirms the signature's authenticity. Invalid requests receive denial. Valid tokens proceed to role evaluations. On the mathematical aspect, it functions in this manner. Auth_valid indicates the jwt_token verifies correctly. This holds true as long as the role matches the admin or reviewer group.

Reviewer-Resource Binding

Reviewers connect directly to the evaluations they submit. This arrangement blocks any attempts to manipulate ratings or conceal reviews. It enforces a strict one-to-one link so each reviewer handles only their own assessments. When a user logs in, the app saves a session ID in the browser's local storage. This tracks their review activities pretty much in real time. To ensure that all submissions are checked, the system will verify them by matching the prevailing session number to the database details of the reviewer. Where not compatible, it warns of the matter as an illegal one instantly. The system then in turn blocks the submission and captures all the details to be viewed by admins in future. The approach encourages truthful judgments in general. One cannot change identities during a session. They remain incapable of bowing down to another profile as well. Reviewer Binding Verification is discussed by Algorithm 2. It takes input in terms of session id and user id. The output of Authorization Status is as shown below. The steps work like this. First, in case the userid seems new, add the session ID to it. Second, without matching between the stored session ID and actual one forward the submission.

Rubric-Based Evaluation System

Submissions are joined to a standard rubric by the system following all the preliminary validation. It bypasses verification by biometrics. Rather, it is based on a pre-constructed template of the process. The corresponding template covers topics like the correctness of the content, the clarity in the institutions, inclusiveness, quality of the design, and the compliance with the curriculum standards. Each of the sections gets a numerical score or a description rating.

Once the reviews have been saved in the system, the results are aggregated into some universal scoring vector. The composite rating is a result of weighted value aggreguation which is specified by the institution.

The mathematical model appears as follows.

Final score=w1ci + w2ci + w3ci +...wnci.

In this case wi represents the weight of criterion i. And ci is the rating of the reviewer on the criterion. The method enhances the consistency of various reviewers. It minimizes differences due to personal biases scoring.

Database Structures and Database Security.

It is a normalized relational schema-based platform based on Supabase Postgres. Users including administrators and reviews together with textbooks, criteria, reviews and audit logs are important entities.

Supabase has Row-level Security rules to control security. These allow the users to navigate on records of other reviewers. Each database query is made by a parameterized query that the client produces. This reduces the possibility of injecting attacks. The textbook files are stored in Supabase Storage. The access is made by means of secure URLs with strict viewing limitations. Review data and comments are in the form of scoring vectors that are expressed in JSON. This format is easy to retrieve in order to see a summary.

Security Workflow

Assessments are based on a simple process of verification. Authentication is seen as verifying things. It establishes that the identity of the reviewer is not just invalid. This is followed by session verification. This is to make sure that the present session links to the right reviewer. Rubric validation is the next, following. It reviews every field in comparison with set standards. Stalling of the chain creates an audit document to administrators. It works to prevent the submission as well.

V. RESULTS AND DISCUSSION

Functional Assessment

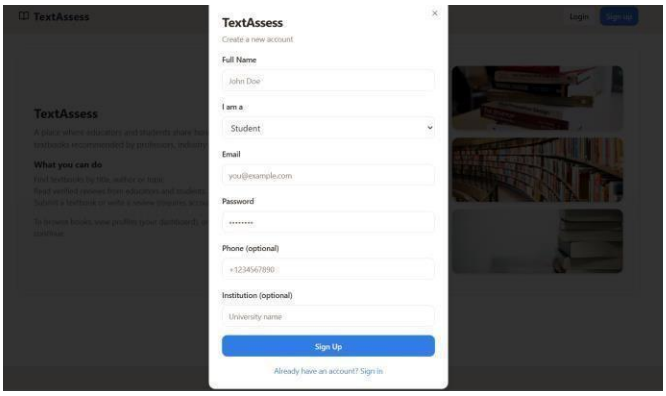
The system maintains the quality of evaluation as time passes by. It achieves this by means of enforced user authentication. It is also based on well-structured rubrics throughout the entire process. The measures will have a steady level of standards in place. The main body of the modular design here is Supabase. This is quite alright when a small team of reviewers is involved. It deals with them with no actual problems. The installation is useful in bigger institutional applications as well. Scalability is effective with the various sizes of groups in practice. The web interface presented is just a simple guided interface and offers usability. Only basic training is required to complete their work through such an interface by administrators and reviewers.

User Interface Overview

The platform has a role based system both to the reviewers and administrators. Both dashboards have easy-to-use navigations and access controls. Immediate information on assessment tasks is updated in real-time. Through this approach, everything is structured without any issues.

1. Login Page

VI. Everyone can enter the page in a secure manner. Supabase uses email and passwords to allow access to users. The system is a verified identification of the user and permission of the full access is given. It avoids unauthentic attempts using token balances and session authentication. Security features are powerful in an effort to block different threat.



TextAssess
Create a new account
Full Name: John Doe
I am a: Student
Email: you@example.com
Password: ••••••••
Phone (optional): +1234567890
Institution (optional): University name

Fig 2: Login page

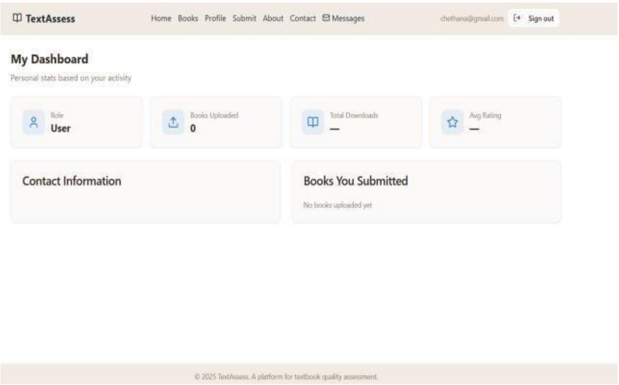
1. Dashboards

The dashboards are flexible according to the role of the user within the system. They offer services that revolve around assessment and submissions. They can also be used in monitoring the general progress. The design is relatively suitable to each of the roles.

a) Administrator Dashboard

This section provides a brief description of users, submissions as well as active evaluation tasks. Administrative panel provides the ability to manage reviewers and criteria. It deals with the general system settings too. The analytics section displays the significant data such as the assessment figures and reviewer involvement. It identifies textbook data trends as well. Key system events are recorded on audit logs to promote transparency. Adding or altering evaluation standards and rubrics is a part of administration. The monitoring of reviews is done sequentially. It also addresses questions of reviewers that arise. All these components connect towards a sound oversight ultimately.

Fig 3: Dashboard



My Dashboard
Personal stats based on your activity

Role: User
Books Uploaded: 0
Total Downloads: —
Avg Rating: —

Contact Information

Books You Submitted
No books uploaded yet

© 2025 TextAssess. A platform for textbook quality assessment.

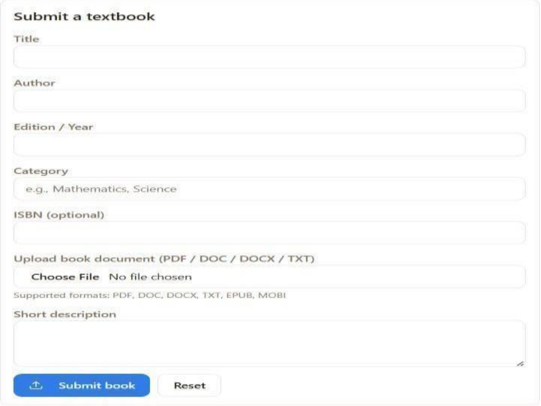
b) *Reviewer Dashboard*

Assessment questionnaires on this area are handled by reviewers. Textbooks are also uploaded there. The interface shows the previous submissions and review tasks allocated. Comments and feedback section is something that assists in orderly notes about textbooks. The rubric tool guides in a simple way through scoring.

Individual analytics display the reviews done and the present progress indicators. The reviews receive the precise assistance they need to continue the work going.

c) Submission Interface

Although this interface allows users to post textbook files of PDF format. It can handle reviewer and rubric rating in entirety. Everything, which is posted in the system, is checked. All the inputs are connected to the tested profile of the reviewer. At the point, the submissions pass forward.



Submit a textbook
Title
Author
Edition / Year
Category: e.g., Mathematics, Science
ISBN (optional)
Upload book document (PDF / DOC / DOCX / TXT)
Choose File No file chosen
Supported formats: PDF, DOC, DOCX, TXT, EPUB, MOBI
Short description

Fig 4: Submission Interface

2. Textbook upload Page
   It is here that textbook documents are posted by reviewers. Such metadata as title, author, academic category, and edition, are collected. The process is coincidental with the core assessment processes and stock in the warehouses. The uploads do not induce any snags to the whole work process.

3. Audits and Analytics
   The system logs include the logins, uploading submission and updating of rubrics. The activity of reviewers and ratings of the textbooks shows significant trends which are shown by dashboard analytics. They are also consistent resultant in terms of ratings. It reminds the administrators of fraud or ineffective log-ins. It flags uneven results too. Follow-ups identify the problems at an initial stage before they become large.

Discussion

At this system, there display benefits of fairness in textbook appraisal. It brings consistency too. Those benefits are pushed along by the use of a structured digital workflow which has rubrics. The platform will minimize errors which normally occur in the old manual review. It does so using regular scoring sheets and a safe place. Authenticated user access is also helpful. The institutions may be expanded, incorporating such tools as in-depth analytics. Without altering the fundamental structure, they may have additional sets of criteria. That is achievable through the modular design. Overall, the approach is pragmatic with respect to balancing oversight, transparency, and usability. It is concerned with actual needs.

VII. CONCLUSION

The following project gives out the bare outline of an online system that grades textbooks. It uses some rubrics to inform such evaluations. The configuration regulates user access and process data in the cloud. All draw textbook reviews all to one central point. That method lessens discrepancies in rating. It also dealt with a feedback that is spread over several locations. Besides that, it addresses the gaps in oversight that had been imposed on the departmental level. The latter issues continued to arise within the former manual procedures.

The answer lies in role-based access controls to control who has access to what. The whole working process is driven by secure login features. The rubrics are the guide in the entire review procedure. This makes sure that there is only a specified number of people who make the evaluations. The same criterion applies to all the reviews. All the information filled by the reviewers is recorded by the platform. It keeps proper records in check. It produces credible recaps of each cycle. That would not be a mistake such as that involved in creating manual processes or unsystematic spreadsheets. Its effectiveness was tested by several review sessions.

The system is working fairly good as it is. Nevertheless, it can be further improved in a number of ways in future. One of them revolves around the inclusion of AI-supported reviews. This would introduce easy AI capabilities of assisting reviewers with locating issues or blank spaces in textbook content. The second strategy will be to develop a mobile application of the system. Assessment might then become easier on the phones or tablets. The cloud expansion is also a great alternative. It would improve storage in the cloud to support large files and also support a higher number of users simultaneously. Strengthening audit tracking also seems to be required. That would require more detailed and accurate logs of all the activities to enhance transparency throughout the board. Collaborative reviewing involves the usage of several reviewers in groups and discussing one textbook. Such updates would be effective in enhancing the capacity of the system to expand and remain dependable. They would adhere to the regulations of safeguarding data in establishments.

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