Software Requirements Specification

for

Quiz Practice System for Grade 12

Version 0.8

Presented by Group 5

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Summer 2024

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#	Part	Team Member	Date	Update Details
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1. Introduction

1.1. Purpose

The purpose of this document is to provide a detailed specification for the development of a Quiz Practice System for Grade 12 students. The system aims to facilitate fast revision of knowledge by providing an online platform for teachers to manage quizzes and for students to practice them.

1.2. Document Conventions

1.2.1. Typographical and Formatting conventions

- All written texts on the document are in Times New Roman. Normal texts are in 11pt font and are justified. Headings are emboldened with an increased font size.

- Headings have their index precede them.

- Diagrams follow the Unified Modeling Language standard.

- Dates are written in YYYY-MM-DD format.

- Tables have a nearly-black background and white text color for headings, and a black text over white background for other cells.

- All images have a subtitle at the bottom.

1.2.2. Shorthands

- "notification(s)" is sometimes abbreviated as "notif(s)."

- "student(s)" is sometimes abbreviated as "stu(s)."

- "requirement(s)" is sometimes abbreviated as "req(s)"

- "Quiz Practice System" is sometimes abbreviated as "QPS"

1.2.3. Abbreviations

- API: Application Programming Interface: A set of rules and protocols for building and interacting with software applications. It allows different software entities to communicate with each other, facilitating integration and functionality sharing.

- HTML: HyperText Markup Language: The standard language used to create and design documents on the World Wide Web. It structures web content and can include text, images, links, and other multimedia.

- REST: Representational State Transfer (REST) Architecture: An architectural style for designing networked applications, characterized by stateless communication and reliance on standard HTTP methods such as GET, POST, PUT, and DELETE.

- CSS: Cascading Style Sheets: A stylesheet language used to describe the presentation of a document written in HTML or XML. CSS defines how elements are displayed on screen, paper, or other media.

- HTTPS: HyperText Transfer Protocol Secure: An extension of HTTP used for secure communication over a computer network. HTTPS encrypts data exchanged between a user's browser and a website, providing confidentiality and data integrity.

- SQL: Structured Query Language: A standard language used for managing and manipulating relational databases. SQL is used to query, insert, update, and delete data within a database.

1.3. Project Scope

The Quiz Practice System for Grade 12 (QPSFG12) is designed for grade 12 students to practice after class, take mock tests, access study materials, and serve as an assessment tool managed by high school.

- The QPSFG12 will include a web interface to complement the existing educational tools and provide easy access for students and teachers
- The QPSFG12 will feature a user-friendly student interface that allows quick access to practice quizzes, mock tests, and study materials. The system will offer an intuitive dashboard where students can track their progress and review incorrect answers.
- Teachers will benefit from a detailed administrative interface that enables them to create and manage quizzes and monitor student performance. The system will serve as an assessment tool managed by the high school, allowing teachers to collate data on student performance.
- The QPSFG12 will fully utilize the user-notifying capabilities of the web platform to send reminders and progress updates to students. Notifications will be displayed directly on the web interface, ensuring students are always informed of upcoming quizzes, deadlines, and performance summaries.
- The QPSFG12 will integrate with the existing school management system to perform authorization and authentication, retrieve student and teacher data, visualize performance history, and inform the school administration of student progress. The system will also communicate with external educational resources to fetch up-to-date study materials and practice questions.

2. Overall Description
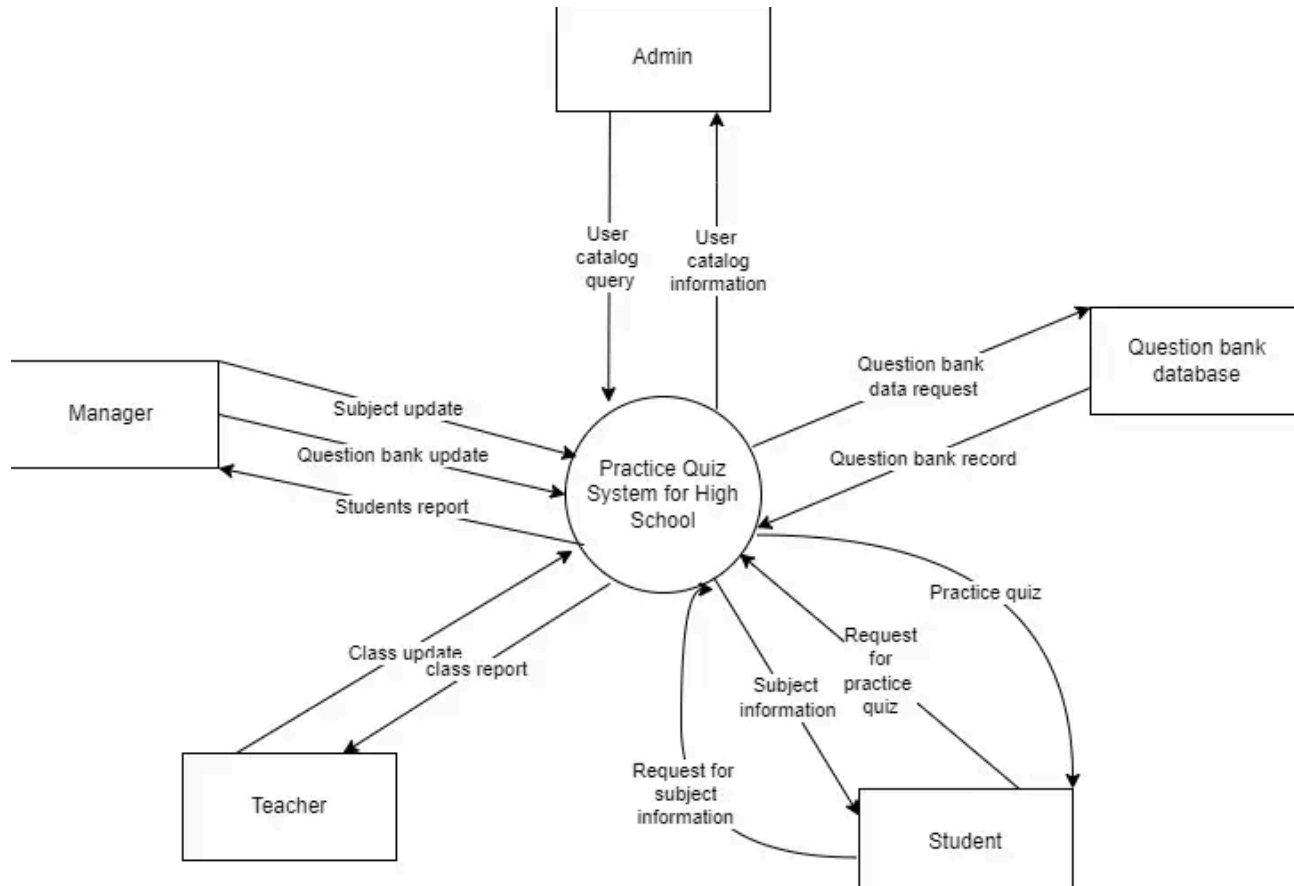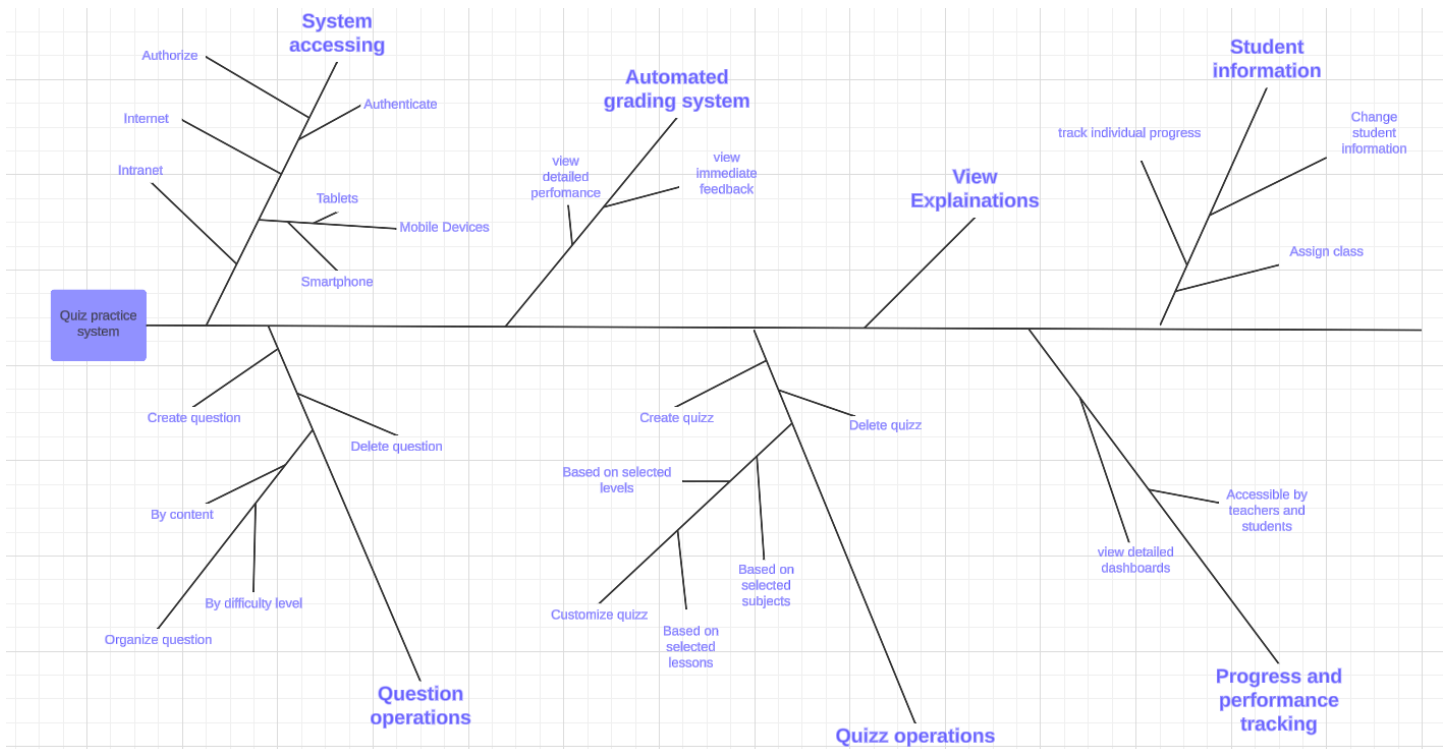
2.1. Product Perspective

Figure 2.1/1. Context diagram of the system.

2.2. Product Features

Figure 2.2/1. Feature tree of the system.

2.3. User Classes and Characteristics

FE-1: Create, manage, and organize practice questions categorized by content and difficulty level.

FE-2: Develop and administer pre-made quizzes for students, covering various subjects and difficulty levels.

FE-3: Allow students to customize quizzes based on selected subjects, lessons, and difficulty levels.

FE-4: Provide automatic grading of quizzes with immediate feedback and detailed reports on performance.

FE-5: Enable students to view explanations for incorrect answers to facilitate learning and improvement.

FE-6: Track student progress and performance through detailed dashboards for both teachers and students.

FE-7: Manage student information, including class assignments and individual progress tracking.

FE-8: Ensure secure access to the system, protecting student data and privacy according to relevant regulations.

2.3.1.Students

- Primary Users: Students are the primary users of the Quiz Pactize System.
- Access Points: They will primarily access the system through a web user interface and mobile app.
- Usage: Students will use the system to take quizzes, review their quiz results, and track their progress over time. They can receive notifications about upcoming quizzes, results, and feedback.
- Interactions: Students will interact with quiz content, submit answers, and view detailed results including correct answers, explanations, and scores.

2.3.2.Teachers

- Primary Users: Teachers are also primary users who create and manage quizzes.
- Access Points: They will use both web and mobile interfaces to access the system.
- Usage: Teachers will design quizzes, assign them to students, and review student performance. They will have tools for creating various types of questions, setting time limits, and providing feedback.
- Interactions: Teachers will interact with student data, analyze performance metrics, and communicate with students regarding their progress and results.

2.3.3.Users (General)

- Secondary Users: This category includes general users who might use the system for viewing public quizzes or educational content.
- Access Points: Web user interface and mobile app.
- Usage: General users might access quizzes for learning purposes without being part of a specific course or class. They can browse available quizzes, attempt them, and see their results.
- Interactions: Interactions will mainly involve attempting quizzes and viewing results, with limited access to performance analytics.

2.3.4.Managers

- Indirect Users: Managers oversee the functioning of the Quiz Pactize System.
- Access Points: Web user interface and dedicated dashboards.
- Usage: Managers will monitor system performance, usage statistics, and overall user engagement. They will ensure the system meets educational standards and user needs.
- Interactions: Managers will interact with system analytics, generate reports, and make decisions based on usage data. They may also handle escalations from teachers or students regarding system issues.

2.3.5.Admins

- Primary Users: Admins have the highest level of access and control over the system.
- Access Points: Web user interface and administrative dashboards.
- Usage: Admins will manage user accounts, system settings, and overall system maintenance. They ensure security, handle user permissions, and troubleshoot system issues.
- Interactions: Admins will interact with all system components, manage user roles, oversee data integrity, and ensure compliance with relevant regulations and standards. They will also respond to technical issues and perform system updates.

2.4. Operating Environment

- OE-01: The application shall be compatible with and accessible on all platforms that the main website supports, including the latest versions of major web browsers (Chrome, Firefox, Edge, and Safari).

- OE-02: The application shall be usable on mobile devices through a dedicated mobile app available on both iOS and Android.

- OE-03: The system shall use Redis for transit status caches and PostgreSQL for storing customer preferences and notifications.

2.5. Design and Implementation Constraints

- CO-01: The system's design, code, and maintenance documentation shall adhere to the high school's Educational Technology Standards.

- CO-02: The system shall be programmed to efficiently handle the volume of student and teacher interactions, ensuring it does not experience slowdowns or downtime during peak usage times.

- CO-03: All HTML shall conform to and utilize the HTML 5.0 standard to ensure compatibility across all modern web browsers.

- CO-04: The system shall support integration with APIs of educational content providers and online resources to fetch up-to-date study materials and practice questions.

- CO-05: The system must maintain detailed logs of all user activities, data requests, and system operations. These logs must be securely stored and accessible for audit purposes by school administrators.

- CO-06: The system must comply with relevant data protection regulations. Compliance with the General Data Protection Regulation (GDPR) and local educational data protection policies is a must.

- CO-07: The system shall allow teachers to prepare and categorize practice questions by content and difficulty level, and manage quiz presets and materials for their classes.

- CO-08: The system shall enable students to take pre-made quizzes or customize quizzes based on the subject and scope of knowledge, with automatic grading and immediate results display.

- CO-09: The system shall allow teachers to manage student information and track their progress throughout the school year, ensuring they can provide targeted support and interventions as needed.

- CO-10: The system shall provide notifications for students directly on the web interface to inform them of upcoming quizzes, deadlines, and performance summaries.

2.6. Assumptions and Dependencies

2.6.1. Assumptions

- **User Authentication:** All users (students, teachers, and administrators) will be authenticated through a secure login process before accessing the system.
- **Internet Access:** The system requires a stable internet connection for all functionalities to work effectively.
- **Device Compatibility:** The system will be compatible with various devices, including desktops, laptops, tablets, and smartphones.
- **Data Security:** All data will be securely stored and transmitted using encryption to protect against unauthorized access.

- **User Roles:** Different user roles (student, teacher, administrator) will have different levels of access and permissions within the system.
- **Question Bank:** Teachers will be responsible for populating and maintaining the question bank.
- **Quiz Creation:** Teachers will have the ability to create and customize quizzes based on the question bank.
- **Automatic Grading:** The system will automatically grade quizzes and provide immediate feedback to students.
- **Data Storage:** All data, including user information, quiz questions, and results, will be stored in a centralized database.
- **System Uptime:** The system is expected to have a high uptime, with scheduled maintenance occurring during off-peak hours.

2.6.2. Dependencies

DP-01: The system will depend on the School's Identity System for user authentication, authorization, and user details for both teachers and students.

DP-02: The system will rely on the Question Bank API to retrieve practice questions categorized by content and difficulty level, as well as to store new questions posted by teachers.

DP-03: The system will depend on the Notification Service to send alerts to students and teachers about quiz availability, reminders for upcoming tests, and notifications about quiz results.

DP-04: The system will interact with the internal Student Information System to manage and update students' information, track their progress, and provide relevant data for progress reports.

DP-05: The system will rely on the School's Grading System to automatically grade quizzes and tests, ensuring consistent and accurate grading criteria.

DP-06: The system will use the Content Management System to store and organize lesson materials, practice questions, and other educational content provided by teachers.

3. Specific Requirements

3.1. Login, Logout, Change Password

3.1.1. Login

-Description: The login functionality allows registered users to access their accounts in the Quiz Pactize System.

-Priority: High

-Functional Requirements:

- Login.Authenticate
  - Credentials: The system shall prompt the user to enter their username and password.
  - Verify: The system shall verify the entered credentials against the stored user data.
  - Invalid: If the credentials are invalid, the system shall display an error message and prompt the user to retry.

- ○ Locked: If the user account is locked due to multiple failed login attempts, the system shall notify the user and provide options to reset the password or contact support.
- Login.Session
  - ○ SessionID: Upon successful login, the system shall create a session ID for the user.
  - ○ Timeout: The system shall set a session timeout period (e.g., 30 minutes of inactivity).
  - ○ Extend: The system shall extend the session if there is user activity before the timeout period ends.
  - ○ Expire: The system shall expire the session after the timeout period of inactivity.

3.1.2.Logout

-Description: The logout functionality allows users to securely log out of their accounts in the Quiz Pactize System.

-Priority: High

-Functional Requirements:

1. Logout.Initiate
   - ○ Action: The system shall provide a logout option accessible from the user interface.
   - ○ Confirm: The system shall prompt the user to confirm their intention to log out.
2. Logout.Session
   - ○ Terminate: The system shall terminate the user's session upon logout.
   - ○ Invalidate: The system shall invalidate the session ID to prevent any further use.
3. Logout.Feedback
   - ○ Message: The system shall display a confirmation message indicating the user has successfully logged out.
4. Logout.Cleanup
   - ○ Cookies: The system shall clear any session cookies stored on the user's device.
   - ○ Token: If the Remember Me token was used, the system shall invalidate the token to ensure it cannot be used for automatic login.

3.1.3.Change Password

-Description: The change password functionality allows users to update their passwords in the Quiz Pactize System.

-Priority: High

-Functional Requirements:

1. ChangePassword.Initiate
   - ○ Access: The system shall provide an option for users to change their password from their account settings.
   - ○ Auth: The system shall require the user to re-enter their current password for verification.
2. ChangePassword.Validate

- CurrentPassword: The system shall verify the entered current password against the stored password.
- Mismatch: If the current password does not match, the system shall display an error message and prompt the user to retry.
3. ChangePassword.NewPassword
    - Prompt: The system shall prompt the user to enter a new password and confirm it by entering it again.
    - Criteria: The system shall enforce password strength criteria (e.g., minimum length, uppercase, lowercase, numbers, special characters).
    - Match: The system shall check that the new password and confirmation match.
    - Reuse: The system shall prevent the user from reusing recent passwords.
4. ChangePassword.Update
    - Store: Upon successful validation, the system shall update the user's password in the database.
    - Confirm: The system shall display a confirmation message indicating the password has been successfully changed.

3.2. Manage User

3.2.1. Description

 -The manage user functionality allows admins to manage user accounts, including creating, updating, deactivating, and viewing user details in the Quiz Pactize System.

 Priority: High

3.2.2. Functional Requirements:

1. ManageUsers.Create
    - Access: The system shall provide an option for admins to create new user accounts.
    - Form: The system shall prompt the admin to enter the required details such as username, email, role (e.g., student, teacher, manager), and initial password.
    - Validate: The system shall validate the entered details for uniqueness (e.g., username and email) and completeness.
    - Save: Upon successful validation, the system shall save the new user details in the database.
    - Notify: The system shall send an email notification to the new user with account activation instructions.
2. ManageUsers.Update
    - Access: The system shall provide an option for admins to update existing user accounts.
    - Search: The system shall allow the admin to search for users by username, email, or role.

○ Form: The system shall display the current details of the selected user and prompt the admin to enter the updated details.

○ Validate: The system shall validate the updated details for uniqueness and completeness.

○ Save: Upon successful validation, the system shall save the updated user details in the database.

○ Notify: The system shall send an email notification to the user informing them of the account updates.

3. ManageUsers.View

○ Access: The system shall provide an option for admins to view user details.

○ Search: The system shall allow the admin to search for users by username, email, or role.

○ Display: The system shall display the selected user's details including username, email, role, account status, and other relevant information.

4. ManageUsers.Roles

○ Access: The system shall provide an option for admins to manage user roles.

○ Assign: The system shall allow admins to assign or change roles for existing users.

○ Permissions: The system shall update the user's permissions based on the assigned role.

3.3. Manage Classes

3.3.1. Description

The system allows admin to manage classes, including adding, editing and deleting a class.

3.3.1. Functional Requirements

1. Class.Add: Adding a new class

Add.Form: The system shall provide a form for the admin to enter class details such as class name, subject, grade level, teacher, and schedule.

Add.Submit: The system shall validate the entered class details and prompt the admin to confirm the addition of the new class.

Add.Confirm: Once confirmed, the system shall save the new class details in the database.

Add.Success: The system shall display a message confirming that the class has been successfully added.

Add.Failure: If there is an error during the addition process, the system shall display an error message and prompt the admin to try again.

2. Class.Edit: Editing an existing class

Edit.Select: The system shall provide a list of existing classes for the admin to select the class they want to edit.

Edit.Form: The system shall display the current details of the selected class in an editable form.

Edit.Submit: The system shall validate the edited details and prompt the admin to confirm the changes.

Edit.Confirm: Once confirmed, the system shall update the class details in the database.

Edit.Success: The system shall display a message confirming that the class details have been successfully updated.

Edit.Failure: If there is an error during the editing process, the system shall display an error message and prompt the admin to try again.

3. Class.Delete: Deleting a class

Delete.Select: The system shall provide a list of existing classes for the admin to select the class they want to delete.

Delete.Confirm: The system shall prompt the admin to confirm the deletion of the selected class.

Delete.Success: Once confirmed, the system shall remove the class from the database and display a message confirming that the class has been successfully deleted.

Delete.Failure: If there is an error during the deletion process, the system shall display an error message and prompt the admin to try again.

4. General Requirements

Admin.Login: The system shall require admin authentication for all class management actions.

Validation: The system shall validate all class details for completeness and correctness before adding or updating records.

3.4. Manage Question

3.1.1. Description

3.1.1. Functional Requirements

3.5. Manage Mock Tests

3.5.1. Description

The system allows admins to manage mock tests, including adding, editing, and deleting a mock test.

3.5.2. Functional Requirements

1.MockTest.Add: Adding a new mock test

Add.Form: The system shall provide a form for the admin to enter mock test details such as test name, subject, grade level, number of questions, difficulty level, and test duration.

Add.Submit: The system shall validate the entered mock test details and prompt the admin to confirm the addition of the new mock test.

Add.Confirm: Once confirmed, the system shall save the new mock test details in the database.

Add.Success: The system shall display a message confirming that the mock test has been successfully added.

Add.Failure: If there is an error during the addition process, the system shall display an error message and prompt the admin to try again.

2.MockTest.Edit: Editing an existing mock test

Edit.Select: The system shall provide a list of existing mock tests for the admin to select the test they want to edit.

Edit.Form: The system shall display the current details of the selected mock test in an editable form.

Edit.Submit: The system shall validate the edited details and prompt the admin to confirm the changes.

Edit.Confirm: Once confirmed, the system shall update the mock test details in the database.

Edit.Success: The system shall display a message confirming that the mock test details have been successfully updated.

Edit.Failure: If there is an error during the editing process, the system shall display an error message and prompt the admin to try again.

3.MockTest.Delete: Deleting a mock test

Delete.Select: The system shall provide a list of existing mock tests for the admin to select the test they want to delete.

Delete.Confirm: The system shall prompt the admin to confirm the deletion of the selected mock test.

Delete.Success: Once confirmed, the system shall remove the mock test from the database and display a message confirming that the mock test has been successfully deleted.

Delete.Failure: If there is an error during the deletion process, the system shall display an error message and prompt the admin to try again.

4.General Requirements

Admin.Login: The system shall require admin authentication for all mock test management actions.

Validation: The system shall validate all mock test details for completeness and correctness before adding or updating records.

3.6. Manage Materials

3.6.1.Description

The manage materials functionality allows teachers and admins to manage educational materials, including creating, updating, deleting, and viewing materials in the Quiz Pactize System.

Priority: High

3.6.2.Functional Requirements

1. ManageMaterials.Create
   - Access: The system shall provide an option for teachers and admins to create new educational materials.
   - Form: The system shall prompt the user to enter the required details such as title, description, type (e.g., quiz, document), and content.
   - Validate: The system shall validate the entered details for completeness.
   - Save: Upon successful validation, the system shall save the new material details in the database.
   - Notify: The system shall send a notification to relevant students about the new material.
2. ManageMaterials.Update
   - Access: The system shall provide an option for teachers and admins to update existing educational materials.
   - Search: The system shall allow the user to search for materials by title, type, or date created.
   - Form: The system shall display the current details of the selected material and prompt the user to enter the updated details.
   - Validate: The system shall validate the updated details for completeness.
   - Save: Upon successful validation, the system shall save the updated material details in the database.
3. ManageMaterials.Delete
   - Access: The system shall provide an option for teachers and admins to delete educational materials.
   - Search: The system shall allow the user to search for materials by title, type, or date created.
   - Confirm: The system shall prompt the user to confirm the deletion of the selected material.
   - Delete: Upon confirmation, the system shall remove the material from the database.
4. ManageMaterials.View
   - Access: The system shall provide an option for teachers, admins, and students to view educational materials.
   - Search: The system shall allow users to search for materials by title, type, or date created.
   - Display: The system shall display the details of the selected material including title, description, type, and content.

3.7. View Student Reports

3.7.1.Description

-The view student reports functionality allows teachers and admins to generate and view reports on student performance and activity in the Quiz Pactize System.

-Priority: High

3.7.2.Functional Requirements

1. ViewReports.Generate
   ○ Access: The system shall provide an option for teachers and admins to generate reports on student performance.
   ○ Criteria: The system shall prompt the user to select criteria for the report, such as date range, specific quizzes, or individual students.
   ○ Types: The system shall offer different types of reports, such as overall performance, quiz-specific performance, and progress over time.
2. ViewReports.Display
   ○ Format: The system shall display the generated report in a readable format, including tables, charts, and graphs where appropriate.
   ○ Details: The report shall include details such as student names, scores, completion times, and any other relevant performance metrics.
3. ViewReports.Export
   ○ Options: The system shall provide options to export the report in various formats, such as PDF, Excel, and CSV.
   ○ Download: The user shall be able to download the report to their local device.
4. ViewReports.Comparisons
   ○ Benchmarking: The system shall allow users to compare student performance against benchmarks, such as class averages or historical performance.
   ○ Visuals: The comparison data shall be presented using visual aids such as bar charts and line graphs.
5. ViewReports.Details
   ○ Drill-down: The system shall allow users to drill down into detailed views of individual student performance, including specific quiz attempts and question-level analysis.
   ○ Feedback: The detailed report shall include any feedback provided by the teacher on specific quizzes or questions.

3.8. Create Questions

3.1.1. Description

The system allows teachers to create new questions, then managers will check and approve those questions.

3.1.1. Functional Requirements

1. Question.Create: Creating a new question

Create.Form: The system shall provide a form for the teacher to enter question details such as question text, answer options, correct answer, difficulty level, and subject.

Form.Single: The system shall allow teachers to enter question details one at a time using a form.

Form.Excel: The system shall provide an option for teachers to upload multiple questions at once using an Excel template.

> Excel.Template: The system shall provide a downloadable Excel template that teachers can use to format their questions.
>
> Excel.Upload: The system shall allow teachers to upload the completed Excel file.
>
> Excel.Validate: The system shall validate the uploaded Excel file for correct formatting and completeness of question details.
>
> Excel.Error: If there are errors in the uploaded file, the system shall throw an exception page

Create.Submit: The system shall validate the entered question details for completeness and correctness.

Create.Confirm: Once validated, the system shall save the new question with a status of "Pending Approval."

2. Question.Approve: Approving or rejecting questions

Approve.List: The system shall provide a list of pending questions for the manager to review.

Approve.View: The system shall allow the manager to view the details of each question, including question text, answer options, correct answer, difficulty level, and subject.

Approve.Action: The system shall provide options for the manager to approve or reject each question.

Approve.Confirm: Once the manager approves or rejects a question, the system shall update the question's status accordingly.

3.General Requirements

Teacher.Login: The system shall require teacher authentication for all question creation and management actions.

Manager.Login: The system shall require manager authentication for all question approval actions.

Validation: The system shall validate all question details for completeness and correctness before saving or updating records.

3.9. Supervise Classes

3.1.1. Description

3.1.1. Functional Requirements

3.10. View Subjects

3.10.1. Description

The view subjects functionality allows users to see a list of all subjects available in the Quiz Practice System.

3.10.2. Functional Requirements
1. Subjects.Access

   ○ Availability: The system shall provide an option to view subjects from the main navigation menu or the dashboard.

   ○ Roles: The system shall ensure that subjects are accessible to students, teachers, and admins.

2. Subjects.Listing

   ○ List.All: The system shall display a list of all subjects available in the system.

   ○ List.Details: Each subject in the list shall include details such as subject name, description, and the number of quizzes available.

3. Subjects.Filters

   ○ Filter.Grade: The system shall allow users to filter the subjects based on grade levels.

   ○ Filter.Teacher: The system shall allow users to filter subjects by the teacher responsible for the subject.

4. Subjects.Navigation

   ○ Nav.Quizzes: Users shall be able to navigate from a subject to a list of quizzes available under that subject.

   ○ Nav.Details: Users shall be able to view detailed information about each subject, including lesson plans and resources.

3.11. View Charts

3.11.1.Description

-The view charts functionality allows users to visualize data related to quizzes, student performance, and overall system usage through various types of charts and graphs in the Quiz Pactize System.

 -Priority: High

3.11.2.Functional Requirements

1. ViewCharts.Access
   ○ Availability: The system shall provide an option to view charts from the dashboard or specific reporting sections.

- ○ Roles: The system shall ensure that charts are accessible to teachers, admins, and students (for their own performance data).
2. ViewCharts.Types
    - ○ Variety: The system shall support various types of charts, including bar charts, line graphs, pie charts, scatter plots, and histograms.
    - ○ Selection: Users shall be able to select the type of chart they want to view based on the data being analyzed.
3. ViewCharts.Criteria
    - ○ Filters: The system shall allow users to filter data for the charts based on criteria such as date range, specific quizzes, student groups, and performance metrics.
    - ○ Update: Charts shall dynamically update to reflect the filtered data.
4. ViewCharts.Performance
    - ○ Scores: The system shall provide charts displaying average scores, highest and lowest scores, and score distributions for quizzes.
    - ○ Progress: The system shall provide line graphs showing student progress over time.
    - ○ Completion Rates: The system shall display bar charts showing quiz completion rates.

4. Data Requirements

4.1. Logical Data Model
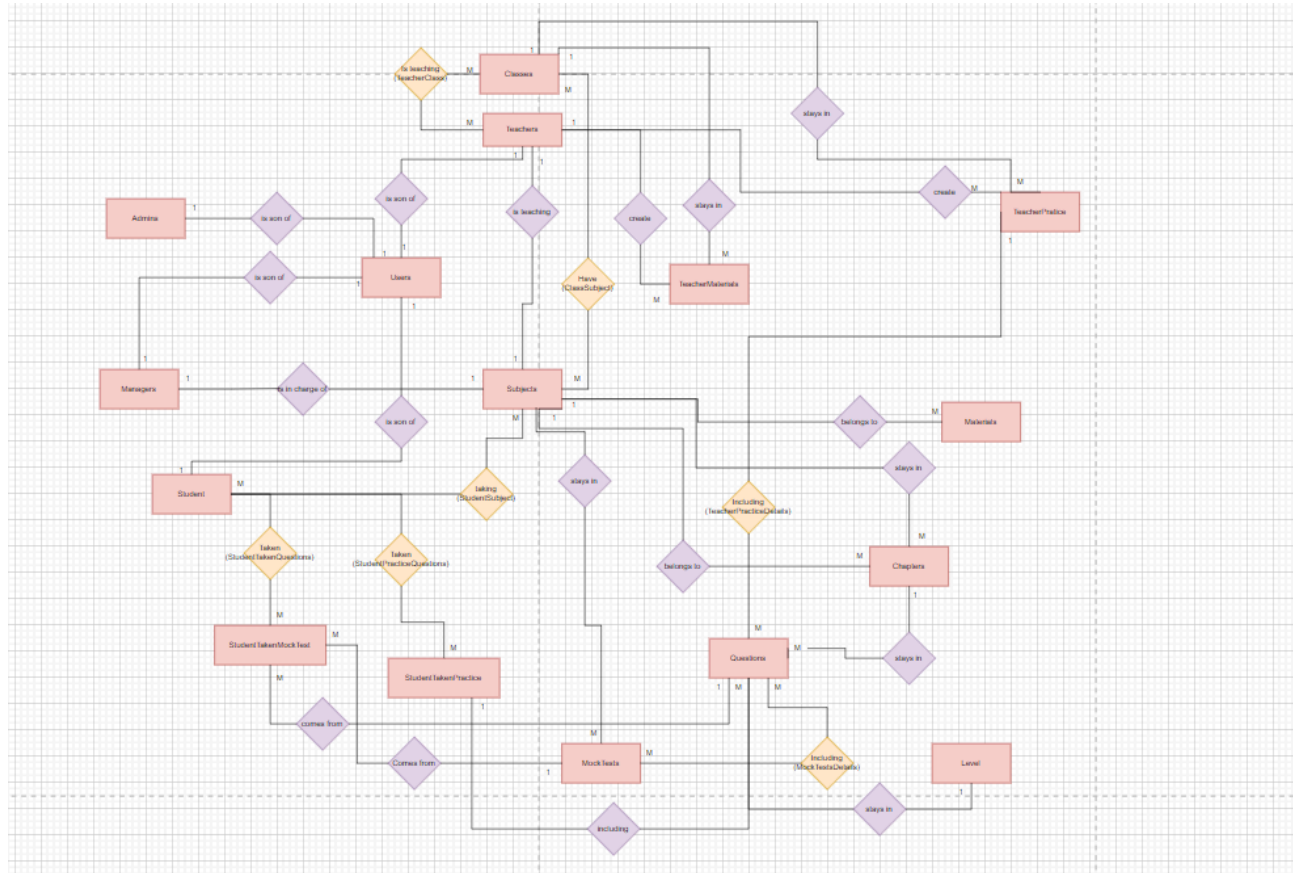
Figure 4.1/1. Entity-relationship diagram of the system.

4.2. Data Dictionary

4.2.1. Structured Data

Data element	Description	Composition
User	Information about user of the system	- User ID - Username - Password - Full name - Useremail - Role - Enabled
Admin	Information about an admin	- User ID - Title

Manager	Information about a manager	- User ID - Subject ID
Teacher	Information about a teacher	- User ID - Subject ID - Class code
Student	Information about a student	- User ID - Class code
Question	Information about a question	- Question ID - Question tittle - Image - Option1 - Option2 - Option3 - Option4 - Answer - Subject ID - Level ID - Status
Subject	Information about a subject	- Subject ID - Subject name - Class code
Class	Information about a class	- Class code - Class name
MockTest	Information about a mock test	- Mock test ID - Mock test tittle - Subject ID - Start - End
Material	Information about a common material	- Material ID - Title - Content - Subject ID - Chapter ID
Chapter	Information about a chapter	- Chapter ID - Chapter name - Subject ID
Level	Information about a level	- Level ID - Level name
TakenPractice	Information about a taken practice	- Taken practice ID - User ID

TakenMockTest	Information about a taken mock test	- Taken mock test ID - User ID - Score - Start time - End time
ClassMaterial	Information about a class material	- Class material ID - Title - Content - Class code - Subject ID
ClassPractice	Information about a class practice	- Class practice ID - Tittle - Class code - Subject ID - Deadline - Publish date

4.2.2. Primitive Data

Data element	Description	Data type	Length	Values
Students				
Student ID	Unique identifier for each student.	integer	up to 10 digits	Nonnegative, system generated
Student name	Full name of the student.	string	8-32 characters	Can only contain letters and digits from the English alphabet
Email	Email address of the student.	string	up to 100 characters	Must be a valid email address
Password	Password for student account.	string	8 - 64 characters	Alphanumeric characters and special symbols
Quiz Results	Record of quiz results for the student.	JSON	Variable	JSON format with quiz IDs, scores, timestamps, etc.
Notifications	Notifications for upcoming quizzes, results, and feedback.	JSON	Variable	JSON format with notification details
Teachers				

Teachers ID	Unique identifier for each teacher	integer	up to 10 digits	Nonnegative, system generated
Teacher Name	Full name of the teacher.	string	8-32 characters	Can only contain letters and digits from the English alphabet
Email	Email address of the teacher.	string	up to 100 characters	Must be a valid email address
Password	Password for teacher account.	string	8 - 64 characters	Alphanumeric characters and special symbols
Created Quizzes	Record of quizzes created by the teacher.	JSON	Variable	JSON format with quiz IDs, titles, questions, etc.
Feedback	Feedback provided by the teacher for student quizzes.	JSON	Variable	JSON format with feedback details
Users (General)				
User ID	Unique identifier for each general user.	integer	up to 10 digits	Nonnegative, system generated
User Name	Full name of the general user.	string	8-32 characters	Can only contain letters and digits from the English alphabet
Email	Email address of the general user.	string	up to 100 characters	Must be a valid email address
Password	Password for general user account.	string	8 - 64 characters	Alphanumeric characters and special symbols
Attempted Quizzes	Record of quizzes attempted by the general user.	JSON	Variable	SON format with quiz IDs, scores, timestamps, etc.
Managers				
Manager ID	Unique identifier for each manager.	integer	up to 10 digits	Nonnegative, system generated
Manager Name	Full name of the manager.	string	8-32 characters	Can only contain letters and digits

				from the English alphabet
Email	Email address of the manager.	string	up to 100 characters	Must be a valid email address
Password	Password for manager account.	string	8 - 64 characters	Alphanumeric characters and special symbols
System Analytics	Analytics data on system performance and user engagement.	JSON	Variable	JSON format with usage statistics, performance metrics, etc.
Admins				
Admin ID	Unique identifier for each admin.	integer	up to 10 digits	Nonnegative, system generated
Admin Name	Full name of the admin.	string	8-32 characters	Can only contain letters and digits from the English alphabet
Email	Email address of the admin.	string	up to 100 characters	Must be a valid email address
Password	Password for admin account.	string	8 - 64 characters	Alphanumeric characters and special symbols
User Roles	Roles assigned to users managed by the admin.	JSON	Variable	JSON format with user IDs, roles, permissions, etc.
System Settings	Configuration settings for the system.	JSON	Variable	JSON format with system parameters, settings values, etc.
Delivery				
Delivery ID	The identifier for a delivery in the system.	integer	up to 10 digits	Nonnegative, system generated
Tracking number	The tracking identifier for the package in transit	string	up to 32 characters	Can only contain letters and digits from the English alphabet

Initial expected arrival date	The expected arrival date of a package calculated by the carrier from delivery creation	date		
Destination address	The address for the destination of a delivery	string	up to 1024 characters	Administrative divisions separated by a comma.
Destination coordinates	The coordinates for the destination of a delivery	coordinate pair		Must represent an EPSG:4326 coordinate.
Recipient name	The name of the person who is receiving the order.	string	up to 1024 characters	
Recipient phone number	The phone number of the person who is receiving the order	string	up to 20 characters	Must be a valid phone number
Status				
Time	The time of a status of a delivery	date time		
Package state	The state of a status of a delivery	state value		Valid values are: Preparing, Entering, Traversing, Exiting, Arriving, Faulted, Arrived
Location address	The address of the location of the package in a transit status.	string	up to 1024 characters	Administrative divisions separated by a comma.
Location coordinates	The coordinates of the location of the package in a transit status	coordinate pair		Must represent an EPSG:4326 coordinate.
Estimated arrival date	The estimated arrival date of a delivery	date		
Note	Notes about the transit status	string	up to 1024 characters	
Feedback				
Topic	The topic of the delivery feedback	topic value		Valid values are: TODO

Details	The details of the feedback	string	up to 2048 characters	
Time	The time at which the feedback was made	datetime		

4.3. Reports

Report ID:	QUIZ-RPT-1
Report Title:	Student Quiz History
Report Purpose:	A student wants to see a list of all quizzes they have previously taken over a specified time period up to nine months prior to the current date, so they can review their performance and track their progress.
Priority:	High
Report Users:	Students
Data Sources:	Database of previously taken quizzes
Frequency and Disposition;	Report is generated on demand by a Student. Data in the report is static. Report is displayed on the user's web browser screen on a computer, tablet, or smartphone. It can be printed if the display device permits printing.
Latency:	Complete report must be displayed to Student within 3 seconds after it is requested.
Visual Layout:	Landscape mode
Header and Footer:	Report header shall contain the report title, Student''s name, and date range specified. If printed, report footer shall show the page number.
Report Body:	Fields shown and column headings: ● Quiz Number ● Quiz Date ● Subject ● Scope of Knowledge (topics covered) ● Total Questions ● Correct Answers ● Incorrect Answers ● Score Selection Criteria: date range specified by Student Sort Criteria: reverse chronological order
End-of-Report Indicator:	None
Interactivity:	Student can drill down to see detailed information for each quiz, including questions, answers, and explanations for incorrect answers
Security Access Restrictions:	A Student may retrieve only their own quiz history

4.4. Data Acquisition, Integrity, Retention, and Disposal

The Quiz Practice System will acquire, maintain, and manage data related to quizzes, user performance, and system usage. This section outlines the requirements and policies for data acquisition, integrity, retention, and disposal to ensure the system's reliability and compliance with data protection standards.

4.4.1 Data Acquisition

● **DA-01**: The Quiz Practice System will acquire data from internal system interactions and inputs provided by users, including students, teachers, and admins.

- **DA-02**: The system will be proactive in gathering data through automatic logging of user activities, quiz attempts, and performance metrics. This will also include manual data inputs from users such as quiz creation and updates by teachers.

- **DA-03**: The system shall integrate with external educational resources and databases to acquire supplementary data that enhances quiz content and learning materials.

- **DA-04**: Data acquisition processes will include user authentication to ensure that data is collected from verified and authorized users.

4.4.2 Data Integrity

- **DI-01**: The Quiz Practice System will implement data accuracy verification techniques to ensure that the data entered by users and acquired from external sources is accurate and up-to-date. This will include input validation, data normalization, and error-checking algorithms.

- **DI-02**: The system will perform regular backups of all critical data, including quiz content, user performance data, and system logs. Backups will be stored in a secure, off-site location, and incremental backups will be created every hour.

- **DI-03**: The system shall use encryption to protect data integrity during transmission and storage, ensuring that data remains unaltered and secure from unauthorized access.

- **DI-04**: The system will implement audit trails to monitor and record all data changes, including additions, modifications, and deletions. This will help in identifying and rectifying data inconsistencies.

- **DI-05**: The system will periodically run data integrity checks to identify and correct any discrepancies in the database. These checks will include data reconciliation processes to ensure consistency between different data sets.

- **DI-06**: User access controls will be enforced to ensure that only authorized personnel can alter critical data, minimizing the risk of data corruption and maintaining data integrity.

- **DI-07**: The system shall provide data validation feedback to users during data entry to ensure that incorrect or incomplete data is promptly identified and corrected.

4.4.3. Data Retention

- **DR-01: Student Data:**
  - **Active Students:** Data related to currently enrolled students will be retained as long as they are actively using the system.
- **DR-02:Quiz and Assessment Data:**
  - **Completed Quizzes:** Records of completed quizzes, including scores, answers, and feedback, will be retained for five years. This enables the tracking of student progress over time.
  - **Quiz Content:** The questions and structure of quizzes will be retained indefinitely to support ongoing use, analysis, and improvement of quiz materials.

4.4.4. Data Disposal

- **User Data:** Upon request, user data will be permanently deleted from the database. Archived data will also be purged as per retention policies.

- **Quiz Data:** At the end of each academic year, quiz data older than one year will be archived and eventually purged after a specified retention period.

- **Logs:** System logs will be periodically purged based on the retention policy to free up storage space.

5. External Interface Requirements

5.1. User Interfaces

- UI-01: The interface shall follow the design language of the school's digital platform, including font choices, sizes, decoration, shapes of elements (buttons, checkboxes, etc.), and coloring.

- UI-02: The Dashboard page shall be accessible from any page within the interface using an always accessible navigation bar.

- UI-03: Transitions between pages shall display a progress bar or a loading animation to indicate that a page is loading.

- UI-04: The system shall provide clear and actionable messages in case of errors.

- UI-05: Links to other pages or detailed views (e.g., quiz details, user profiles) shall have an indication such as an animation or color change when hovered over or clicked on.

- UI-06: The status of items (e.g., quizzes, user actions) shall be color-coded to aid in quickly identifying their completion status.

  UI-06.1: Completed items are colored green.

  UI-06.2: Items in progress are colored yellow.

  UI-06.3: Items that need attention or are overdue are colored red.

  UI-06.4: If no status is available, the text "Unknown status" is shown in gray.

5.2. Software Interfaces

5.2.1. Manage User System

- **Description**: The Quiz Practice System shall interface with an external User Profile Management System to manage user details and roles.
- **Operations**:
    - **SI-1.2.1**: The system shall update user profile details (e.g., name, email) through a programmatic interface.

○ **SI-1.2.2**: The system shall retrieve user role information to control access to various system features.
○ **SI-1.2.3**: The system shall allow admins to create and delete user accounts through the profile management API.

5.2.2. Manage Question bank and material system

● **Description**: The Quiz Practice System shall interface with a Content Management System to handle the creation, storage, and retrieval of quiz questions and educational materials.
● **Operations**:
   ○ **SI-2.1.1**: The system shall allow teachers and admins to create and upload questions and materials through the CMS API.
   ○ **SI-2.1.2**: The system shall retrieve questions and materials based on specific criteria (e.g., topic, difficulty level) from the CMS.
   ○ **SI-2.1.3**: The system shall update or delete existing questions and materials through the CMS interface.

5.2.3. Take quiz system

● **Description**: The Take Quiz System (TQS) shall enable students to take mock tests, practice quizzes, and class quizzes assigned by teachers.
● **Operations**:
   ○ **SI-3.1.1**: The system shall display a list of available quizzes to students, including mock tests, practice quizzes, and class quizzes assigned by teachers.
   ○ **SI-3.1.2**: The system shall allow students to start the quiz at their convenience, provided it is within the allowed time frame set.
   ○ **SI-3.1.3**:.The system shall allow students to navigate between questions, review their answers, and mark questions for review.
   ○ **SI-3.1.3**:. The system shall provide a countdown timer to keep students informed of the remaining time.
   ○ **SI-3.1.3**:.The system shall allow students to submit the quiz when completed or when the time expires.
   ○ **SI-3.1.3**:. The system shall automatically grade the quiz upon submission, based on predefined correct answers.
   ○ **SI-3.1.3**:.The system shall immediately display quiz results to students, including their score and a breakdown of correct and incorrect answers.

5.3. Communication Interfaces

CI-01: The system shall send an email notification to the Student to notify them of upcoming quizzes, deadlines, and new study materials.

CI-02: The system shall send an email notification to the Student to remind them of their progress and any pending actions required, such as incomplete quizzes or missed deadlines.

CI-03: The system shall send an email notification to the Administrator with regular reports on user activity statistics.

CI-04: The system shall send an email notification to the Teacher to notify them when a Student has completed a quiz, including the student's performance summary.

5.4. Hardware Interfaces

HI-1: The system should be accessible through standard hardware devices, including desktop computers, laptops, tablets, and smartphones.

HI-2: The system should be optimized to perform well on various hardware configurations, considering factors like processing power, memory, and screen resolutions.

6. Quality Attributes

6.1. Usability

- **QU-01**: The interface shall be intuitive and familiar to students and teachers, allowing them to learn how to navigate the app within their first few uses.
- **QU-02**: Users should immediately be able to see their dashboard with relevant information (e.g., quiz results, upcoming quizzes, and recent activities) upon logging in.
- **QU-03**: At least 95% of users shall be able to start and complete quizzes without encountering errors or system failures.
- **QU-04**: The web interface shall support quick navigation through quizzes and results using the keyboard's page navigation buttons (page up, page down, home, end).
- **QU-05**: The web interface shall enable users to intuitively navigate charts and visualizations using either the keyboard or mouse (e.g., arrows or click and drag to move around, control and plus/minus or mouse wheel to zoom in and out).
- **QU-06**: The interface shall be optimized for all devices (desktop, mobile, tablet) to avoid awkward layouts or elements that require extra gestures like zooming.

6.2. Performance

- **QP-01**: The dashboard should load within 2 seconds for users with up to 50 quiz results. The current performance analytics should be available within 3 seconds after the dashboard is shown.
- **QP-02**: The system shall achieve a 99.5% uptime on average days, and 95% during peak usage times such as exam periods.
- **QP-03**: The system shall accommodate a total of 1000 concurrent users during school hours (8 AM to 4 PM local time), with an estimated average session time of 20 minutes.
- **QP-04**: The system should handle a 20% increase in peak hour quiz attempts and submissions without significant performance degradation (e.g., exceeding response time targets).
- **QP-05**: The system should be designed with the ability to scale up resources to accommodate future growth in user base and quiz volume.

6.3. Security

- **SEC-1:** All network transactions involving personally identifiable information (PII) or academic data shall be encrypted.
- **SEC-2:** Users shall be required to log in to the system for all operations.

- **SEC-3:** Only authorized shall be permitted to create, edit, and disable users. Only authorized managers shall be permitted to create, edit, and approve questions, manage materials, and create quiz presets. Only authorized teachers shall be permitted to supervise students in their classes.
- **SEC-4:** The system shall permit students to view only their own quiz results and progress records.
- **SEC-5:** Teachers shall have access only to the data of students within their assigned classes.
- **SEC-6:** The system shall log all user activities related to question creation, quiz management, and student data access for auditing purposes.
- **SEC-7:** The system shall ensure compliance with relevant data protection regulations.
- **SEC-8:** Role-based access control (RBAC) shall be implemented to ensure that users have access only to the functionalities and data relevant to their roles.

6.4. Safety

- **User Data Protection**: The system must ensure the protection of user data, particularly personal information and academic records. All data transmissions should be encrypted using industry-standard protocols such as SSL/TLS to prevent unauthorized access and data breaches.
- **Data Backup**: The system must implement regular data backup procedures to protect against data loss due to hardware failures, software malfunctions, or other unforeseen incidents. Backups should be performed daily and stored in a secure, offsite location.
- **Access Control**: The system should employ robust access control mechanisms to restrict access to sensitive data and functionalities. Only authorized users, such as administrators and teachers, should have access to certain system capabilities.
- **System Monitoring and Logging**: Continuous monitoring of the system for unusual activities or potential security threats is required. The system should log all user activities and system events to facilitate auditing and incident response.
- **User Authentication**: Users must be authenticated using secure methods such as two-factor authentication (2FA) to ensure that only legitimate users can access the system.
- **Fail-Safe Mechanisms**: The system should include fail-safe mechanisms to ensure that in the event of a failure, the system can recover without data loss or corruption. This includes maintaining the integrity of ongoing quizzes and saving progress periodically.
- **Compliance with Regulations**: The system must comply with relevant local and international regulations regarding data privacy and security, such as GDPR, COPPA, or FERPA, to protect student data.
- **Emergency Procedures**: The system must have clear procedures for handling emergencies, such as data breaches or hardware failures. These procedures should include immediate containment actions, notification protocols, and steps for recovery and mitigation.

6.4. Availability

- **AVL-1**: The system shall be available at least 99% of the time, with a focus on high availability during peak usage hours between 7:00 AM and 10:00 PM.
- **AVL-2**: Scheduled maintenance windows will be clearly communicated to all users at least 48 hours in advance and will not occur during peak hours (7:00 AM to 10:00 PM) to minimize disruption.

6.5. Robustness

- **ROB-01: Error Handling:** The system shall display user-friendly error messages and log detailed information for developers to diagnose and fix issues. It should also provide suggestions for users to recover from errors.
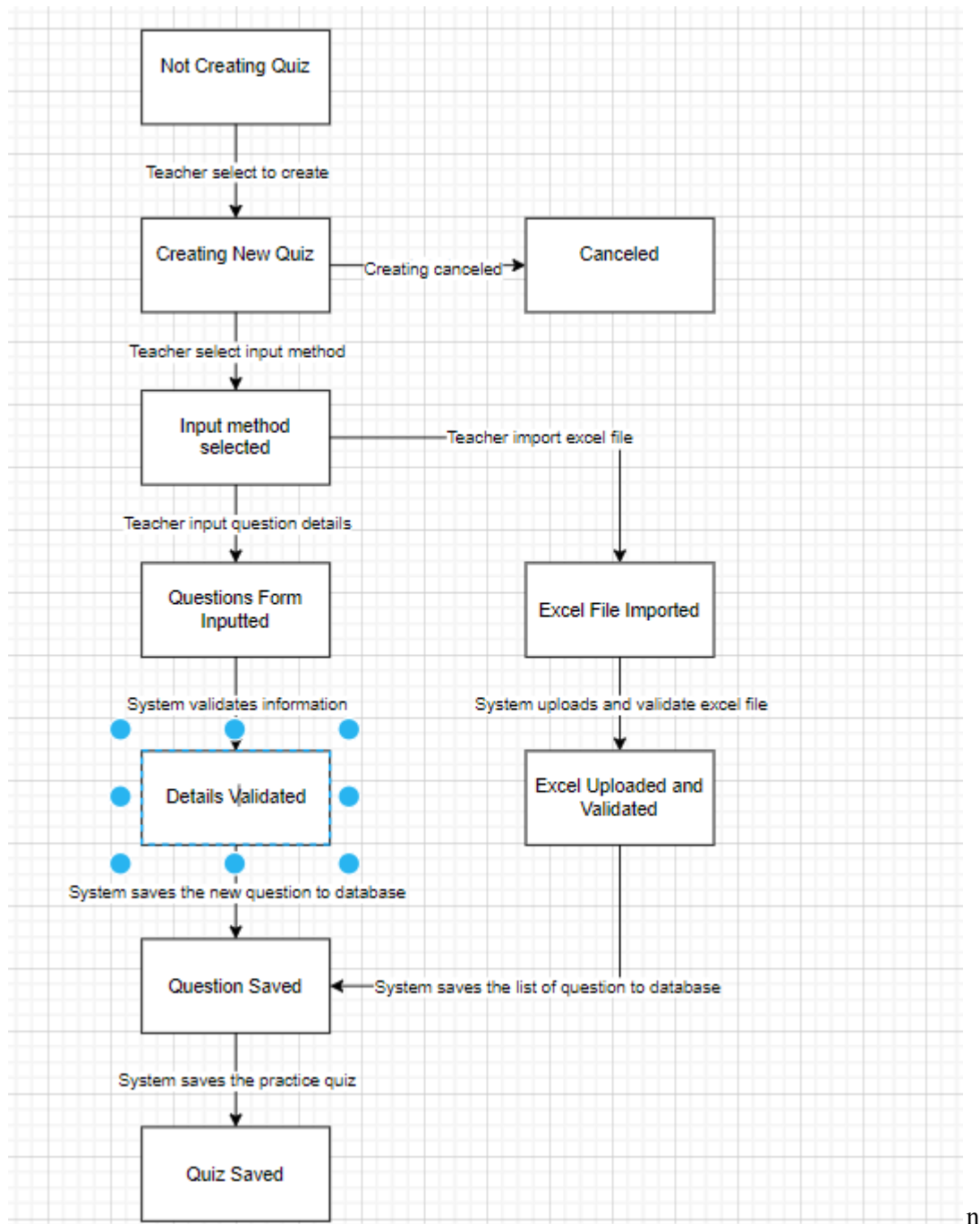
- **ROB-02: Fault Tolerance:** The system shall have redundancy for critical components to prevent single points of failure and automatically switch to backup components in case of a failure, maintaining data integrity and consistency during failover operations.
- **ROB-03: Data Recovery:** The system shall perform regular data backups, store them in a secure off-site location, and have a tested data recovery plan to restore data in case of loss or corruption.

7. Appendix

7.1. Admin: create a student
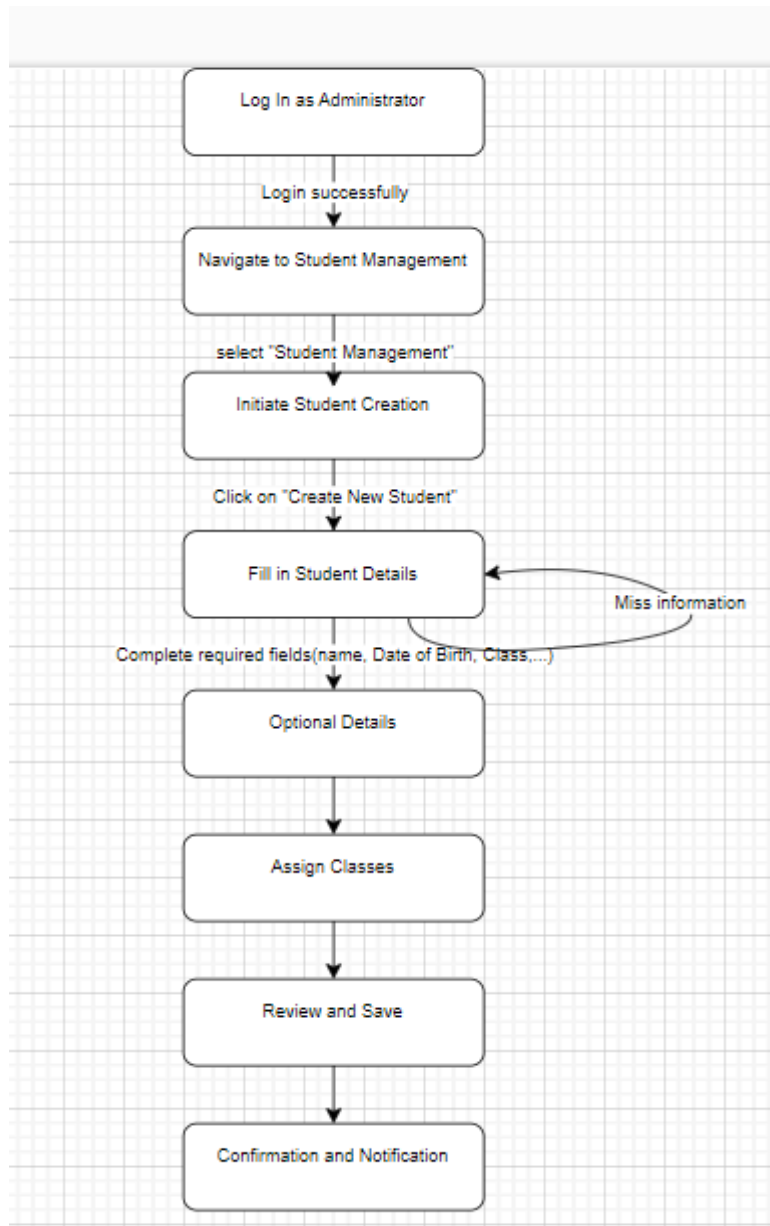
7.2. Teacher: Create a practiceQuiz

n

7.3. Student: take a mock test