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*by MD Shahriar Siddique*

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# QUIZ CRAFTERS - A Web-based Quiz Platform

This Dissertation is Submitted in Fulfillment of <sup>18</sup>the  
Requirements for the Degree of

**Bachelor of Science (B.Sc.)**

in

**Computer Science and Engineering (CSE)**

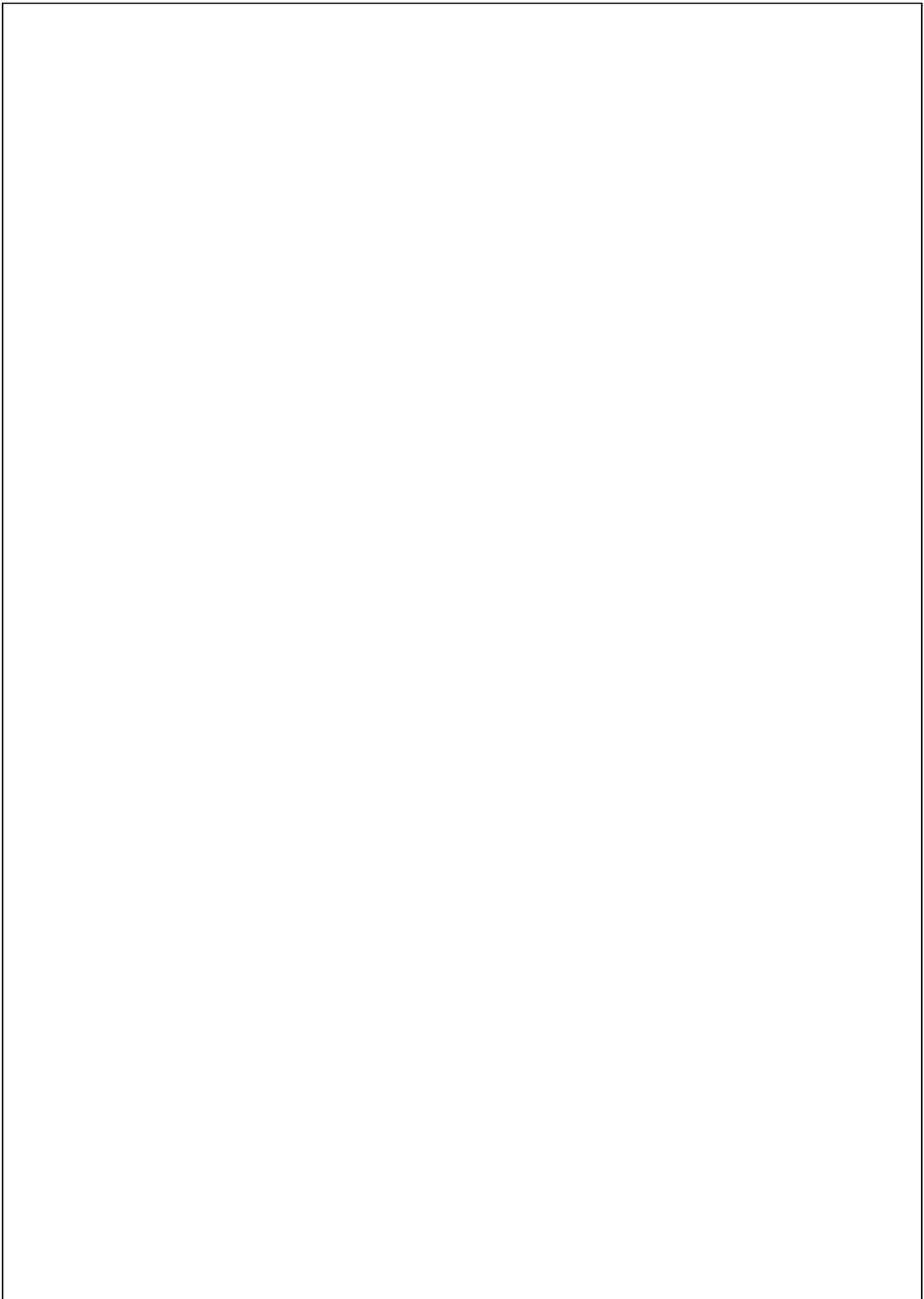
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TO

<sup>36</sup>**FACULTY OF SCIENCE AND ENGINEERING INTERNATIONAL  
ISLAMIC UNIVERSITY CHITTAGONG**

Spring 22



# DECLARATION

We hereby affirm the following statements regarding our project:

1. The project has been successfully completed as part of our undergraduate degree program at International Islamic University Chittagong.
2. The project work <sup>42</sup> does not contain any previously published or third-party content without proper citation.
3. The project work <sup>27</sup> has not been previously submitted for any other degree or diploma at any other university or institution.
4. We have appropriately acknowledged all significant sources of contribution in the project.

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## SUPERVISOR'S DECLARATION

I formally state that I have examined this project and claim it to be of sufficient quality and scope to be granted for the undergraduate degree of Bachelor of Science in Computer Science and Engineering.

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Prof. Dr. Md. Monirul Islam

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Department of Computer Science and Engineering

International Islamic University Chittagong

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## 13 DEDICATION

This project is dedicated to us, our supervisor and all the people who have anyhow contributed to make things possible for us. The team work was satisfactory and the support was incredibly amazing. Our dedicated and most hard-working Supervisor who has been a constant support throughout these months. In this document, the contributions are acknowledged too.

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## ACKNOWLEDGMENT

To start with, All the praises to the Almighty Allah, for his mercy because of which we were able to finish our project despite having so many obstacles. Secondly, <sup>22</sup> we would like to extend our gratitude to our supervisor, Prof. Dr. Md. Monirul Islam for his continuous effort and guidelines from the very beginning of our research.

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## **ETHICAL STATEMENT**

Hereby we state that, none of the unethical practices were used in the completion of our project work. The data we used for the research purpose are original. We carefully checked every citation we used here. The three writers of the work accept all the liabilities for any kind of violation of the project rule.

# ABSTRACT

Amid the diverse array of quiz platforms, a pressing need for a universally accessible and free alternative has become increasingly evident, as prevailing solutions often come burdened with financial constraints. In response to this challenge, Quiz Crafters, our visionary project, endeavors to democratize educational technology by furnishing educators with a cost-effective and feature-rich alternative. Motivated by the limitations experienced with paid platforms like Socrative and driven by a passion to elevate user experience, our platform pledges user-friendliness, real-time engagement, data-driven insights, and customizability— all without imposing financial burdens on educators. In a landscape where the demand for accessible and budget-friendly interactive assessment tools in education is on the rise, Quiz Crafters emerges as a liberating alternative to existing platforms. Acknowledging the restrictions inherent in paid services, particularly exemplified by platforms like Socrative, our mission is to democratize educational technology. In commitment to removing barriers, our quiz-taking website is meticulously crafted to cater to the diverse needs of educators, seamlessly accommodating both intimate classroom settings and expansive lecture halls. Through a dedicated emphasis on inclusivity and innovation, Quiz Crafters aspires to redefine the very landscape of interactive educational assessment. Our aim is to provide a transformative and easily accessible tool, not only for educators but for students as well. This project is a testament to our unwavering dedication to innovation, inclusivity, and the continuous advancement of interactive educational assessment tools.

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# ABBREVIATION

**DFD** : Data Flow Diagram

**UI** : User Interface

**HTML** : Hyper Text Markup Language

**CSS** : Cascading Style Sheet

**JS** : Javascript

**UX** : User Experience

**UML** : Unified Modeling Language

**MUI**: Material UI

**1.1 Research Background:**

In the dynamic landscape of education, the demand for universally accessible and cost-effective interactive assessment tools has become increasingly evident. Recognizing the limitations posed by existing platforms, particularly those burdened with financial constraints, Quiz Crafters emerges as a revolutionary web-based quiz platform designed to democratize educational technology. Our vision is to empower educators by providing a comprehensive, user-friendly, and free alternative, bridging the gap between the growing need for innovative assessment tools and the challenges posed by conventional, paid solutions.

**1.2 Problem Statement:**

Quiz Crafters addresses the pressing financial barriers inherent in many existing quiz assessment platforms, making a distinctive commitment to eliminating financial constraints for educators. In stark contrast to paid services like Socrative, our platform is meticulously designed to ensure that educators, irrespective of budget limitations, can access and leverage a feature-rich quiz-taking website without incurring substantial costs. This commitment is deeply rooted in our core mission of democratizing educational technology, aspiring to make high-quality interactive assessment tools universally accessible.

Our primary objective revolves around democratization, aiming to create a user-friendly, inclusive platform that facilitates real-time engagement, provides data-driven insights, and offers customization options, all while remaining entirely free for educators. This commitment aligns seamlessly with the evolving needs of educational institutions seeking transformative solutions without the financial burdens that often accompany such advancements.

Quiz Crafters doesn't just stop at addressing financial barriers; it goes further by prioritizing scalability and adaptability. We recognize the diverse needs of educators, from those managing small classrooms to those overseeing large lecture halls. The platform is meticulously crafted to be scalable, accommodating a significant number of students

participating in quizzes and exams simultaneously, providing a seamless experience across different educational settings. This commitment to scalability aims to meet the diverse requirements of educational institutions of all sizes. Central to Quiz Crafters is a robust question creation system that supports multiple question types. This innovative approach streamlines the quiz creation process, making it intuitive and efficient for educators to craft assessments aligned with their teaching objectives. The emphasis on versatility aims to cater to the diverse teaching methodologies prevalent in educational settings.

Beyond these features, Quiz Crafters aspires to reshape the landscape of interactive educational assessment, contributing to the advancement of teaching and learning. By creating a universally accessible, entirely free quiz-taking platform, we aim to add a new dimension to the educational landscape. This project invites educators and students to engage in a transformative journey, where accessibility, innovation, and user-centric design converge to redefine the way quizzes are created and experienced in the digital age.

As the educational sector undergoes a profound shift catalyzed by advancements in technology, Quiz Crafters positions itself at the intersection of pedagogy and technology. It stands poised to offer a seamless and innovative solution for educators and learners alike. The commitment to user-centric design ensures that both educators and students can effortlessly access and leverage the platform's robust features within an easy-to-navigate design.

Much like property listings form the core of real estate platforms, Quiz Crafters places a premium on comprehensive quiz creation. Educators, analogous to property sellers, can curate detailed quizzes with diverse question types, fostering a rich learning experience. Students, akin to property buyers, gain access to an extensive database of quizzes, ensuring a varied and engaging learning journey.

In providing unprecedented accessibility and a commitment to accurate information about educational content, Quiz Crafters pledges to offer accurate and up-to-date information. Through innovative features and analytics, educators gain insights into quiz performance trends, enabling them to refine their teaching methodologies and adapt to evolving educational landscapes.

At its essence, Quiz Crafters embodies a vision for innovation and inclusivity, driven by a commitment to advance interactive educational assessment tools. By marrying technology with pedagogical principles, Quiz Crafters invites stakeholders to embark on a transformative journey toward an inclusive, accessible, and cutting-edge educational landscape.

### **1.3 Motivation:**

Quiz Crafters is driven by a profound motivation to empower both educators and students by offering a comprehensive, user-friendly, and free quiz-taking platform. The commitment to breaking financial barriers in education underscores its mission to democratize educational technology, ensuring that educators, irrespective of budget constraints, can access a feature-rich quiz platform. The platform's motivation extends to providing real-time engagement, a user-friendly interface, and data-driven insights for educators, enabling a more effective teaching and learning environment. Recognizing diverse educational settings, Quiz Crafters aims for scalability, accommodating both small classrooms and large lecture halls. Its innovation in educational assessment tools, including diverse question types and a transformative design, seeks to redefine the quiz creation experience. Ultimately, Quiz Crafters aspires to create an accessible and inclusive learning environment, making high-quality educational assessments accessible to all.

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### **1.4 Objective Of the Project:**

Our core objective is to develop a user-friendly, free quiz-taking website, eliminating financial barriers for educators and students. We aspire to accommodate diverse educational settings, ensuring scalability to meet the needs of both small classrooms and large lecture halls. Our commitment extends to providing a robust question creation system supporting multiple question types, streamlining the quiz creation process for educators. By fostering inclusivity, scalability, and efficiency, we aim to redefine the landscape of interactive educational assessments, making high-quality quizzes universally accessible.

This project focuses on the development of new techniques for:

- To develop a quiz-taking website that is both user-friendly and entirely free for educators and students is our primary objective. By removing financial barriers, we intend to ensure that educators, regardless of their budget constraints, can access and benefit from our platform.
- To accommodate a significant number of students participating in quizzes and exams simultaneously, we aim to design the website with scalability as a fundamental feature. This

scalability will cater to the varying needs of educational institutions, from small classrooms to large lecture halls.

- To provide a robust question creation system supporting three key question types: multiple choice, true/false, and short questions. This approach will streamline the quiz creation process, making it intuitive and efficient for professors and teachers to craft assessments aligning with their teaching.

### 1.5 Scope of Project:

“Quiz Crafters” encompasses the development of a comprehensive and user-friendly web-based quiz platform, designed to empower educators and enhance the learning experience for students. Our focus is on creating a feature-rich environment that allows educators to effortlessly create, manage, and conduct quizzes, promoting engagement and real-time interaction. The platform's scalability ensures its adaptability to various educational settings, from small classrooms to large lecture halls, catering to the diverse needs of educational institutions.

The project's scope extends to providing educators with a robust question creation system that supports multiple question types. This emphasis on versatility aims to facilitate the customization of assessments aligned with different teaching methodologies. Additionally, the platform's commitment to data-driven insights for educators broadens its scope, offering analytics that inform teaching strategies and contribute to a more personalized and effective approach to education.

Furthermore, the project envisions breaking financial barriers in education by offering a free and accessible quiz-taking website. The scope is not only limited to the creation and management of quizzes but also encompasses creating an inclusive learning environment that fosters innovation and transforms the educational landscape. In summary, the scope of the project is to develop a holistic web-based quiz platform that not only meets the immediate needs of educators and students but also contributes to the advancement of interactive educational assessments.

## **CHAPTER 2**

### **Literature and existing application review**

#### **2.1 Literature review**

A literature review is a scholarly composition that showcases a comprehensive understanding of academic literature related to a specific topic, providing context and insight. It involves not only summarizing existing material but also critically evaluating it. The term "literature review" is chosen intentionally, emphasizing the evaluative nature of the process rather than being a mere report. This academic endeavor encompasses both the exploration of relevant literature and the synthesis of knowledge, making it a valuable form of scholarly writing [1].

In preparation for our web-based quiz platform, we extensively researched and reviewed similar applications. The primary objective was to craft a platform equipped with enhanced features, ensuring a user-friendly experience for educators and students alike.

#### **2.2 Existing applications review**

There might have many platforms related to e-learning with quiz capabilities. But the project we are going to develop is completely a new and innovative idea. Hence there is no existing system all over similar to it. "Socrative"[2], "Kahoot!"[3], "Quizlet"[4], "Edmodo"[5], "Nearpod"[6] and "Google Forms"[7] are some noticeable sites currently available. Though the concept is the same there are some differences between our project and others.

##### **Socrative**

Socrative is a widely used interactive assessment platform that enables educators to create quizzes, polls, and assessments in real-time. It offers features for instant student feedback, data analytics, and question customization.

It is primarily a paid service, and its cost can be a constraint for budget-conscious educational institutions. While it provides a free version with limited features, the full range of functionality often requires a subscription.

##### **Kahoot!**

Kahoot! stands as an interactive quiz and game-based learning platform designed to captivate students by offering engaging activities such as quizzes, surveys, and challenges. Educators

can create and customize quizzes with multimedia elements, and students can participate using any device with internet access. It promotes active learning through competition and gamification.

While Kahoot! offers a free basic plan, some advanced features are available only in the paid version. Additionally, it is primarily designed for interactive quizzes and may not offer the same range of assessment types as Socrative.

### **Quizlet**

Quizlet is a versatile learning platform that allows educators to create flashcards, quizzes, and study sets. Students can use these resources to review and self-assess their knowledge. Quizlet offers various study modes, including games, to make learning engaging.

While Quizlet is excellent for self-paced learning and review, it may not provide the same real-time assessment and engagement features. It is more focused on study aids rather than live classroom interaction.

### **Edmodo**

Edmodo is a classroom management platform that includes assessment and collaboration tools. Teachers can create quizzes and assignments, share resources, and communicate with students and parents. It's designed to streamline classroom activities and facilitate communication.

Edmodo offers assessment features, but it's more comprehensive, serving as a learning management system (LMS). Some educators may find its extensive functionality overwhelming for basic assessment needs. Additionally, while it has a free plan, certain features are available in the premium version.

### **Nearpod**

Nearpod is an interactive lesson delivery platform that allows teachers to create and deliver engaging multimedia lessons with embedded assessments. Students can participate in real-time polls, quizzes, and discussions as part of the lesson.

Nearpod is more focused on lesson delivery and may be perceived as less flexible for standalone quizzes or assessments. Its primary strength lies in creating immersive lessons with integrated assessment components.

### **Google Forms**

Google Forms serves as a cost-free tool empowering users to craft surveys and quizzes effortlessly. Educators can easily create and share quizzes with students through Google Workspace (formerly G Suite) integration. It's straightforward and widely accessible.

Google Forms lacks some of the advanced features and real-time engagement options found in dedicated assessment platforms. It's a good option for simple quizzes and surveys but may not meet the needs of educators seeking more interactive assessment experiences.

Each of these platforms has its functions and constraints, making them suitable for various educational scenarios. Creating a quiz-taking website comes with challenges such as technical complexity, ensuring a seamless user experience, security and privacy concerns, scalability, content creation tools, real-time features, accessibility, quality assurance, community-building, effective monetization, competition, data analytics, content quality control, regulatory compliance, and ongoing user feedback and improvement. Addressing these challenges demands a dedicated team, robust planning, and continual commitment to platform development and enhancement. The gap lies in creating a universally accessible, entirely free quiz-taking platform that prioritizes scalability for accommodating large user numbers, which aims to provide educators with an exceptionally user-friendly quiz creation process.

### **2.3 Limitation of the existing system:**

Many websites designed for quiz assessments, such as Socrative and Kahoot!, offer free versions with limited features, but to access advanced functionalities, educators often need to subscribe to paid plans. This cost can be a barrier for cash-strapped educational institutions.

Free versions of quiz-taking websites often impose restrictions on the number of students or participants who can join a session or access certain features. This can be challenging for larger classes or organizations. Also, some platforms may offer only basic question types, like true/false questions and multiple-choice, limiting the variety and creativity of assessments that educators can create. Besides, Free versions of platforms often include advertisements, which can be distracting for students and disrupt the learning experience. That's why we are working on it.

## **CHAPTER 3**

### **Methodology**

In the realm of software development, a methodology plays a crucial role as a systematic and structured approach that guides the planning, execution, and delivery of a project. It provides a set of principles, processes, and practices to ensure the efficient and successful development of software applications. Within a research paper, this section serves readers to determine the overall validity and reliability of the study [8]. Serving as the guiding framework orchestrating the intricate dance of project planning, execution, and delivery, the methodology essentially acts as the roadmap for shaping the entire development process, providing a systematic approach to navigate the complexities of bringing a software application to life. In software development, methodologies like Spiral, Agile and Waterfall offer unique approaches to guide the software lifecycle, each with distinct principles and stages for successful product development.

#### **3.1 Process model**

Process models aggregate processes of a similar nature into a cohesive model, providing a description of a process at the type level [9]. The significance of a process model in project management cannot be overstated, as it provides a structured framework that organizes tasks, roles, and processes, ensuring clarity and consistency throughout the project lifecycle. This organized process enhances efficiency by offering predefined workflows and best practices, minimizing the risk of errors, and streamlining team efforts. Methodologies also play a pivotal role in risk management, aiding teams in identifying potential challenges early on and implementing effective mitigation strategies. Clear communication, adaptability, and a focus on continuous improvement are additional benefits that model bring to the table. By providing a well-defined path, methodologies contribute to resource optimization, quality assurance, and ultimately, customer satisfaction. Whether following traditional project management methodologies or embracing spiral approaches, having a methodology is essential for successful project outcomes, fostering a disciplined and organized approach to project execution.

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### 3.2 Recent trends in the software process model

1. Spiral Model
2. Waterfall Model
3. Iterative Development Model
4. Scrum Framework
5. Agile Model
6. Rapid Application Development (RAD)
7. Prototyping:
  - a. Throw away prototyping process model.
  - b. Evolutionary prototyping process model.
8. Incremental Model

### 3.3 Choosing the process model

In the development of "QUIZ CRAFTERS," we opted for the Spiral model to guide our software development process.

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#### 3.3.1 What is the Spiral model?

The Spiral model [10] is a risk-driven software development methodology that amalgamates features from both the waterfall and iterative models. As the name suggests, it follows a spiral path, representing the iterative nature of the process. The model is characterized by a series of repeating cycles, each encompassing planning, risk analysis, engineering, and evaluation phases. These cycles allow for continuous refinement and adaptation to evolving requirements and risks. Unlike the linear progression of the Waterfall model, the Spiral model emphasizes flexibility and accommodates changes throughout the development process. This iterative approach makes it well-suited for projects with high uncertainty and evolving specifications. While offering enhanced risk management and adaptability, the Spiral model demands meticulous documentation and can be resource-intensive compared to more linear models.

The Spiral model, depicted as a spiral with multiple loops in its diagrammatic representation,

is characterized by its flexible nature. The number of loops, representing phases in the software development process, is project-specific and can be adjusted by the project manager. Each loop of the spiral constitutes a complete software development cycle. This model follows a systematic and iterative approach, allowing for adaptability throughout the development process.

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### 3.3.2 Phases in Spiral Model

1. Planning (Requirements Gathering)
2. Risk Analysis
3. Engineering
4. Evaluation

**1. Planning:** In the inception phase of our web-based quiz platform project, we embarked on a thorough planning process to define the project's objectives, set achievable timelines, and allocate resources thoughtfully. This meticulous planning process extended to the creation of a comprehensive project roadmap, meticulously detailing every facet of the project's trajectory. Special emphasis was placed on incorporating adaptability and fostering an iterative development approach, ensuring the project's resilience in the face of evolving requirements and unforeseen challenges. This phase served as the bedrock, setting the tone for the entire project by providing a strategic framework to guide subsequent development stages.

**2. Risk Analysis:** The risk analysis phase involved a thorough examination of potential challenges and uncertainties specific to the quiz platform development. Identifying potential pitfalls allowed for strategic planning and risk mitigation strategies to be integrated into subsequent development cycles.

**3. Engineering:** During the engineering phase, the actual development of the web-based quiz platform took place. The system's architecture, database structures, and interactive features were crafted, ensuring alignment with the project's objectives. The iterative nature of the Spiral model facilitated continuous refinement.



Figure 3.1: Spiral Model [10]

**4. Evaluation:** Each spiral cycle concluded with an evaluation phase, where the developed components were assessed against project requirements. User feedback and testing results played a crucial role in refining and enhancing the platform's functionality and user experience.

**Iterative Cycles:**

The Spiral model incorporates multiple cycles, each revisiting planning, risk analysis, engineering, and evaluation. These iterative cycles allowed for flexibility, adaptation to evolving requirements, and continuous improvement throughout the development process.

**Implementation:**

The implementation phase involved translating the designed components into functional elements of the web-based quiz platform. React.js and Node.js were leveraged for dynamic interactivity, ensuring a responsive and engaging user experience.

**Testing:**

Rigorous testing procedures were employed to scrutinize each module and feature, ensuring seamless functionality and alignment with project expectations. This phase validated the reliability and accuracy of the quiz platform, addressing any potential issues before deployment.

**Deployment:**

Following comprehensive testing, the web-based quiz platform transitioned to production. Users gained access to the platform, experiencing real-time engagement and data-driven insights in a user-friendly environment.

**Maintenance:**

The post-launch phase involved continuous monitoring and swift resolution of any reported issues. Periodic updates and improvements were implemented to enhance the platform's functionality, embodying an ongoing commitment to excellence in interactive educational assessment.

### **3.4 Advantages of Spiral model**

1. Risk Management: The Spiral model excels in risk management, systematically identifying, assessing, and mitigating risks. Iterative cycles allow for early issue detection and resolution, minimizing the impact of challenges.
2. Flexibility and Adaptability: Emphasizing flexibility, the Spiral model accommodates changes at any phase, particularly beneficial in dynamic projects where requirements may evolve.
3. Incremental Development: The model promotes incremental development, allowing continuous refinement of the software product. Each cycle builds upon the previous one for a systematic project evolution.
4. Early Prototyping: The Spiral model supports early prototypes, enabling stakeholders to visualize the evolving software. Prototypes aid in validating design concepts and functionality.

5. Systematic Progress Monitoring: The model facilitates systematic progress monitoring, enabling project managers to track advancements and assess project health through clear milestones.

### <sup>4</sup>**3.5 Disadvantages of Spiral model**

1. Complexity: Managing the model can become intricate, particularly for smaller projects. The detailed planning and risk analysis involved may introduce unnecessary overhead.

2. Not Suitable for Small Projects: The model may not be practical for smaller projects with limited scope, as its iterative and risk-driven approach is better suited for larger endeavors.

3. Documentation Overhead: The model's emphasis on comprehensive documentation can lead to overhead, especially for projects with minimal documentation requirements.

4. Time-Consuming: The iterative cycles and comprehensive planning may make the Spiral model time-consuming, challenging adherence to predefined timelines.

Dependence on Risk Analysis Expertise: Effective risk management relies heavily on the expertise of individuals conducting risk analysis, and inadequate assessment may impact project success.

### **3.6 Why we followed the Spiral model**

1. Risk Mitigation: Employing the Spiral model allows us to systematically identify, assess, and mitigate risks throughout the development process, crucial for ensuring the stability and reliability of our web-based quiz platform.

2. Adaptability to Changes: The flexibility and adaptability of the Spiral model accommodate changes at any phase, providing a responsive approach to evolving requirements, a critical aspect in the dynamic landscape of educational technology.

3. Incremental Development: Our web-based quiz platform benefits from incremental development, allowing continuous refinement and enhancement of the software product. Each cycle builds upon the previous one, ensuring a gradual and systematic evolution of the project.

4. Prototyping for Visualization: Utilizing the early prototyping feature of the Spiral model,

stakeholders can visualize the evolving software, aiding in the validation of design concepts and functionality within the context of a quiz-taking platform.

5. Systematic Progress Monitoring: The Spiral model facilitates systematic progress monitoring, enabling us to track advancements, assess project health, and ensure adherence to predefined timelines in the development of our web-based quiz platform.

6. Complexity Management: The inherent complexity management features of the Spiral model are beneficial for a project like ours, dealing with various functions, real-time engagement, and data-driven insights in the context of an interactive quiz platform.

7. Alignment with Project Goals: The Spiral model aligns with the overarching goals of our web-based quiz platform, emphasizing risk management, adaptability, and incremental development to create a robust and user-friendly educational assessment tool.

## CHAPTER 4

### Requirement Specification & Analysis

#### 4.1 Overview

Requirement specification and analysis play a pivotal role in software development, encompassing the identification, analysis, and modeling of the prospective software system's functionality or "what's." This phase stands out as the most crucial in the software project lifecycle, underscoring the significance of thoroughly conducting requirements specification and analysis. Omitting this phase is not an option, as it lays the foundation for the entire software development process. [11]

##### 1. User Roles and Authentication:

- Establish distinct user roles, including roles for teachers, students, administrators, and others.
- Deploy secure and reliable user authentication and authorization mechanisms to ensure the protection of user accounts and sensitive data.

##### 2. Quiz Creation and Management:

- Create multiple-choice, short question, and true/false questions.
- Add, edit, and delete quiz questions.
- Scale quizzes for small classrooms to large lecture halls.
- Launch quizzes with a unique code for student access.
- Set time limits and control quiz sessions.

##### 3. Real-Time Monitoring:

- Monitor student progress during active quizzes.
- View real-time responses to questions.
- Understand which questions students are currently answering.

##### 4. Reporting and Analysis:

- Access detailed reports for previous quiz sessions.
- Download reports in PDF format for further analysis.
- Manage and analyze individual student quiz results.
- View historical performance metrics for students.

## **4.2 Why Requirement Specification is Needed?**

### **1. Clear Understanding:**

A requirement specification is essential to gain a thorough understanding of the quiz platform's objectives and features, establishing a clear scope for developers and stakeholders alike.

### **2. Stakeholder Alignment:**

Requirement specification fosters alignment among diverse stakeholders, including educators, students, and developers, ensuring a shared vision and common goals for effective collaboration.

### **3. Feasibility Assessment:**

Through the definition of requirements, the development team gains insights into the feasibility of implementing crucial functionalities. This process enables the early identification of potential technical challenges, contributing to a more proactive problem-solving approach.

### **4. Prioritization and Planning:**

The requirement specification aids in prioritizing tasks, creating an efficient project timeline, preventing delays, and ensuring the timely delivery of a functional quiz platform.

### **5. Quality Assurance:**

It lays the groundwork for quality assurance and testing procedures, providing the necessary criteria for testers to validate the implementation of features against specified requirements. This ensures the development of a robust and reliable end product.

### **6. User Satisfaction:**

Ensuring the quiz platform meets the needs and expectations of both educators and students enhances user satisfaction and engagement by delivering a user-friendly and effective assessment tool.

### **7. Risk Management:**

Identification of potential risks and challenges early in the development process allows the

team to develop effective risk mitigation strategies, minimizing their impact on project success.

In summary, a well-defined requirement specification is crucial for the development of the web-based quiz platform. It lays the groundwork for a successful project, aligns stakeholders, assesses feasibility, facilitates effective planning, ensures quality, enhances user satisfaction, and helps manage potential risks.

### 4.3 Requirement Definition

1. User authentication for teachers via secure login credentials without student registration.
2. Quiz creation and management system with support for <sup>38</sup>multiple question types (multiple choice, short answer, true/false).
3. Real-time monitoring of student progress during quizzes.
4. Comprehensive reporting and analysis tools for teachers, including downloadable results in PDF format.

#### 4.3.1 User List of Web-Based Quiz Platform

In the vibrant realm of our web-based quiz platform, diverse user roles bring distinct functionalities, enriching the overall experience:

##### 1) User (Student):

Students are the primary participants in our platform, engaging in quizzes facilitated by their educators. The user-friendly approach allows students to join sessions seamlessly, entering their names without the need for individual registrations. This streamlined login process enhances accessibility and encourages active participation during quiz sessions.

##### 2) Teacher (Educator):

Educators play a central role in shaping the educational landscape of our platform. Empowered with quiz creation capabilities, teachers define questions and set parameters for quiz sessions. The launch of quizzes is a straightforward process, with students joining effortlessly using the provided room code. This feature fosters a controlled and focused learning environment.

In summary, the user list for the web-based quiz platform includes students, teachers, and administrator, each playing a distinctive role in ensuring a smooth and interactive quiz-taking experience. The platform's design prioritizes simplicity, accessibility, and real-time engagement for both educators and students.

#### **4.4 Requirement Validation**

- Collect insights from educators and students through reviews, ensuring the platform meets their educational needs and expectations.
- Undertake a comprehensive technical feasibility analysis to ensure smooth implementation of quiz features within project constraints.
- Verify that the requirements align consistently and completely with the overall project objectives, creating a cohesive platform for teachers and students.
- Align requirements with relevant use cases and user scenarios to guarantee seamless functionality during quiz sessions.
- Ensure compliance with educational standards, data privacy regulations, and security requirements to create a secure and ethical educational environment.
- Validate algorithms for accurate progress tracking, real-time monitoring, and effective quiz dynamics.
- This ensures that the defined specifications align seamlessly with the educational objectives and pedagogical goals of the project.

#### **4.5 Requirement Validation in the software process**

- Conduct collaborative reviews and engage in discussions with educators and students to ensure that the requirements of the quiz platform align seamlessly.
- Ensure the technical viability of quiz features, guaranteeing a robust and scalable platform for educational assessments within project constraints.
- Perform thorough checks for clarity, consistency, and completeness in the requirement specifications, creating a user-friendly and intuitive interface for teachers and students.
- Verify compliance with educational standards, data privacy regulations, and security requirements to uphold a secure and ethical educational environment.
- Validate algorithms for accurate progress tracking, real-time monitoring, and effective quiz dynamics, ensuring a dynamic and engaging educational experience.
- Ensure traceability of requirements to overarching educational objectives and specific use cases, aligning the platform with pedagogical goals.
- Conduct verification processes to confirm that requirements are complete, unambiguous, and testable, laying the foundation for a reliable and efficient quiz-taking system.
- Advance to the execution and testing stages after comprehensive validation and verification of requirements, guaranteeing the platform's preparedness for seamless educational assessments.

#### **4.6 Service and data input:**

Service along with the data inputs for a web-based quiz platform:

##### **1. User Authentication:**

- Teachers have the ability to sign up or log in to the platform securely, gaining access to features for quiz creation and management.
- Students, on the other hand, are not required to sign up; they simply log in with a code provided by their teacher before entering their name to participate in a quiz.

## **2. Quiz Creation and Management:**

- Teachers can create quizzes with <sup>8</sup> various question types, including multiple-choice, true/false questions and short answer.
- Each quiz is assigned a unique code that students use to access and participate in the quiz.
- Teachers have the capability to launch quizzes, set time limits, and monitor real-time progress.

## **3. Question Types:**

- platform supports three <sup>8</sup> question types: multiple-choice, true/false questions and short answer offering versatility in quiz creation.

## **4. Real-Time Monitoring:**

- Teachers can monitor students' progress in real-time during an active quiz, observing how many questions students have answered.

## **5. Results and Analysis:**

- Teachers have access to previous quiz results, allowing them to download comprehensive reports in PDF format.
- This feature aids in post-assessment analysis and contributes to a better understanding of student performance.

## **6. Secure Environment:**

- The platform ensures a secure environment for user data, with encrypted authentication processes for both teachers and students.

## **7. Intuitive User Experience:**

- The platform prioritizes an intuitive and user-friendly experience for both teachers and students, enhancing the overall usability of the system.

## Data input:

1. Teachers provide authentication details during the sign-up or log-in process, including their email, username, and secure password, ensuring secure access to quiz creation and management features.
2. Teachers input quiz details, including questions, types (multiple-choice, true/false questions and short answer), and set time limits. Additionally, they provide a unique quiz code for student access.
3. Teachers specify the type of questions (multiple-choice, true/false and short answer) while creating quizzes, contributing to a diverse set of assessment methods.
4. Teachers receive real-time data on students' progress during an active quiz, including the number of questions answered, providing immediate insights into student engagement.
5. Teachers access detailed reports of previous quiz results in PDF format, enhancing understanding of student performance.
6. The system employs encrypted data inputs during teacher and student log-ins, including secure transmission of login credentials, establishing a safe and protected environment.
7. Teachers efficiently share quiz codes with students, eliminating the need for student sign-ups. Students input the provided code during the login process.

## 4.7 Tools:

### Software Requirements

- OS: Windows operating system
- Front-End: HTML, CSS, JavaScript, MUI, React.js
- Back-End: Node.js, Express.js
- Database: MongoDB
- IDE: VS Code, Studio 3T, Robo 3T
- Browser: Google Chrome
- Host: Localhost/Netlify/Vercel

### Hardware Requirements

- Processor: Intel Core i3 or equivalent
- RAM: 4 GB
- Storage: 500 GB

## 4.8 Feasibility study:

A feasibility study serves as a crucial tool in assessing various factors, including cost-effectiveness and the prospective benefits for your company. This article explores the foundations of a feasibility study centered around a quiz platform, delving into its constituent elements, the advantages it offers, and diverse types of studies [12].

### 1. Technical Feasibility:

**Infrastructure:** The technical infrastructure required for the web-based quiz platform, including servers, databases, and network capabilities, is readily available and scalable.

**Technology Stack:** The chosen technologies (React.js, Node.js, MongoDB) are widely used, well-supported, and suitable for developing a robust and scalable quiz platform.

**Integration:** Feasibility of integrating AI-driven features, real-time monitoring, and secure authentication methods is assessed and found achievable.

**Scalability:** The system architecture is constructed to efficiently manage fluctuating user demands, ensuring technical feasibility and scalability as the user load evolves.

### 2. Financial Feasibility:

**Cost Estimation:** A detailed cost analysis for development, hosting, and maintenance has been conducted, and the project is financially viable within the allocated budget.

**Return on Investment (ROI):** The potential benefits, including widespread adoption by educators and students, suggest a positive ROI over time.

**Revenue Streams:** The platform's free access for educators aligns with the project's objectives, with potential revenue streams explored through premium features or partnerships.

### 3. Legal and Regulatory Feasibility:

**Compliance:** The platform complies with data protection laws and regulations, ensuring user privacy and data security.

**Intellectual Property:** The system places a strong emphasis on safeguarding intellectual property rights, implementing measures to prevent unauthorized usage of content and ensuring adherence to copyright regulations.

**Accessibility:** The platform adheres to accessibility standards, making it inclusive and compliant with legal requirements.

4. **Operational Feasibility:**

**User Training:** The user interface is designed for ease of use, reducing the need for extensive training for both teachers and students.

**Support and Maintenance:** A support system and maintenance plan are in place to address any issues promptly and ensure uninterrupted service.

**Integration with Educational Systems:** Compatibility with existing educational technology and seamless integration into various educational settings is operationally feasible.

5. **User Acceptance Feasibility:**

**User-Friendly Design:** The user interface is intuitive, catering to both tech-savvy and non-tech-savvy users.

**Feedback Mechanism:** Regular feedback from educators and students is incorporated, ensuring continuous improvements and enhancing user acceptance.

6. **Market Feasibility:**

**Educational Demand:** The increasing demand for interactive and user-friendly educational tools, coupled with the shortcomings of existing quiz platforms, supports the market feasibility of the project.

**Competitive Landscape:** Analysis of existing quiz platforms and their limitations reveals an opportunity for a free, scalable, and feature-rich alternative, enhancing market feasibility.

7. **Time Feasibility:**

**Project Timeline:** The development timeline aligns with the project's objectives, ensuring timely delivery of the web-based quiz platform.

**Iterative Development:** The use of the spiral model allows for iterative development, addressing challenges and incorporating feedback efficiently.

8. **Security Feasibility:**

**Data Encryption:** Implementation of secure data transmission and storage practices, including encryption, ensures the security of user data.

**Authentication Measures:** The platform employs robust authentication procedure, enhancing security to prevent unauthorized access and safeguard sensitive information.

9. **Scalability Feasibility:**

**Platform Scalability:** The architecture and design allow for easy scalability to accommodate a growing user base without compromising performance.

**Resource Optimization:** Efficient use of resources, such as server capacity and bandwidth, ensures scalability while maintaining optimal performance.

10. **Environmental Feasibility:**

**Energy Efficiency:** Hosting and operational practices are designed to be energy-efficient, contributing to environmental sustainability.

**Digital Footprint:** The web-based nature of the platform reduces the need for physical resources and minimizes environmental impact.

In conclusion, the feasibility study indicates that the web-based quiz platform is technically, financially, legally, and operationally feasible. The project aligns with market demands, user expectations, and environmental considerations, providing a solid foundation for successful development and implementation.

#### **4.9 Functional Requirements:**

Functional requirements play a pivotal role in delineating the specific functions that a system or its individual elements must be capable of executing. These requirements are meticulously documented in various forms to provide a comprehensive understanding. In the context of a web-based quiz platform, functional requirements elucidate the system's whole

behavior, outlining how it seamlessly integrates with and performs its intended functionalities [13].

#### **4.10 Non-functional Requirements:**

Non-functional requirements form a distinct category, detached from the functional aspects of software, focusing instead on criteria that dictate the system's operation. In the realm of a web-based quiz platform, these non-functional requirements encompass essential elements such as reliability, flexibility, usability, cost, configuration, security, storage, performance, and compliance with regulatory or legal standards [14]. These criteria collectively contribute to shaping the overall effectiveness and quality of the quiz platform beyond its specific functionalities.

#### 4.11 Gantt Chart:

To successfully accomplish this project, defined roles and responsibilities play a pivotal role. Ensuring adherence to these roles is crucial for meeting project timelines and achieving successful outcomes within the stipulated timeframe.

Table 4.1: Gantt chart

<i>Process</i>	Week 1-2	Week 3-4	Week 5-6	Week 7-8	Week 9-10	Week 11-12	Week 12-13	Week 14-15	Week 16-17
<b>1</b> Initial idea	02/09/23								
Feasibility study		16/09/23							
Requirement Analysis			14/10/23						
Confirming feature				28/10/23					
Design					11/11/23				
Coding						25/11/23			
Testing							09/12/23		
Deployment								23/12/23	
Report Writing									06/01/24

## CHAPTER 5

### System Design

Software design is a critical phase involving the conceptualization and formulation of software solutions to address specific problem sets. Central to this process is Software Requirements Analysis (SRA), an integral component of the broader software development cycle. SRA entails the compilation of specifications essential in the realm of software engineering [15].

When dealing with "semi-automated" or user-centered software, the software design process may encompass user experience design, resulting in the creation of a storyboard that aids in defining specifications. Conversely, for fully automated software systems, where there is no user or UI, the software design can be as straightforward as a textual description or a flow chart outlining a predetermined sequence of events [15].

"Quiz CRAFTERS" is a web-based platform that places emphasis on several factors, including minimizing the pressure on devices. This approach aims to reduce the need for complex manipulations, avoid excessive memory usage, and enhance overall performance.

#### **1** 5.1 Design goal of the system

The system is intricately designed to fulfill distinct criteria in terms of performance, maintenance, end-user satisfaction and security, ensuring its overall reliability and effectiveness.

#### **Performance Criteria:**

The system is rigorously defined to ensure optimal functionality and user satisfaction. Swift response times, with the system responding to user requests within milliseconds, are imperative to deliver a seamless user experience. Scalability is a key focus, ensuring the system can adeptly handle increasing user demands and growing data volumes without compromising performance. The system is designed for high throughput, efficiently processing a substantial volume of concurrent requests. Resource optimization is prioritized, aiming for the efficient utilization of computing resources to minimize waste while maximizing overall performance. Additionally, the system strives for high availability,

minimizing downtime and limiting scheduled maintenance windows to ensure uninterrupted service.

#### **Maintenance Criteria:**

Maintenance criteria for the system are meticulously outlined to facilitate ease of updates and modifications. Modularity is emphasized, ensuring that specific components can be seamlessly updated without causing disruptions to others. Robust logging and monitoring mechanisms are to be implemented, allowing for comprehensive tracking of system performance, swift identification of potential issues, and efficient troubleshooting. Automation of routine maintenance tasks is a priority, minimizing manual interventions and mitigating the risk of human errors. Furthermore, version control is essential, enabling precise tracking of changes in the system's components and configurations, and providing the capability for rollbacks when necessary.

#### **Security Criteria:**

Security criteria form a pivotal aspect of the system's design, focusing on safeguarding the platform and its functionalities. Robust authentication mechanisms are paramount, ensuring that only authorized users gain access. Encryption measures are employed for sensitive data, both in transit and at rest, thwarting unauthorized access. To guarantee data integrity, stringent measures are instituted, deterring any form of tampering or unauthorized modifications. Role-based access control is implemented, restricting access to specific features based on user roles and permissions. Periodic security audits and vulnerability assessments are conducted, serving as proactive measures to identify and rectify potential security vulnerabilities, ensuring the system's resilience against emerging threats.

#### **End User Criteria:**

End-user criteria underscore the user-centric design approach, prioritizing an intuitive and easily navigable interface for enhanced user experience. Swift responsiveness to user actions is guaranteed, fostering a seamless and interactive platform interaction. A commitment to accessibility ensures that the system aligns with relevant standards, catering to users with disabilities. Clear and informative error handling mechanisms are implemented to guide users effectively through any issues they encounter. Comprehensive and up-to-date documentation serves as a valuable resource, empowering users to understand and maximize their utilization of the system efficiently.

## 5.2 Database

### MongoDB

MongoDB stands out as a scalable and versatile NoSQL document database platform, addressing the shortcomings of traditional relational databases and other NoSQL solutions. Renowned for its horizontal scaling and load-balancing capabilities, MongoDB provides application developers with an unparalleled degree of flexibility and scalability [16].

#### Indexing:

Indexing approach within the MongoDB database, significantly streamlines and expedites data retrieval or search operations from the data pool. In cases where data is not indexed, the database is required to scan each document based on the specified query, leading to increased time consumption and reduced efficiency [16].

#### Scalability:

MongoDB achieves horizontal scalability through a process known as sharding. Sharding involves distributing data across multiple servers, where extensive data is partitioned into chunks using the shard key. These data chunks are then evenly distributed among shards located on numerous physical servers. This approach enables the addition of new machines to a running database, contributing to MongoDB's ability to efficiently handle larger datasets and increased workloads [16].

#### Replication:

MongoDB ensures high availability and redundancy through replication. This involves creating multiple copies of the data and distributing these copies to different servers. In the event of a server failure, the data can be retrieved from another server, ensuring data availability and minimizing the impact of potential hardware failures.

### Aggregation:

MongoDB facilitates the performance of operations on grouped data, producing a single or computed result. This functionality bears resemblance to the SQL GROUPBY clause. MongoDB offers three distinct aggregation methods: aggregation pipeline, single-purpose aggregation and map-reduce function methods.

## 5.3 Flow Chart:

### 5.3.1 Flow chart for Student Process:

The flowchart delineates a student's interaction with the web-based quiz platform, commencing with a secure sign-in process and progressing through the entry of a specific –

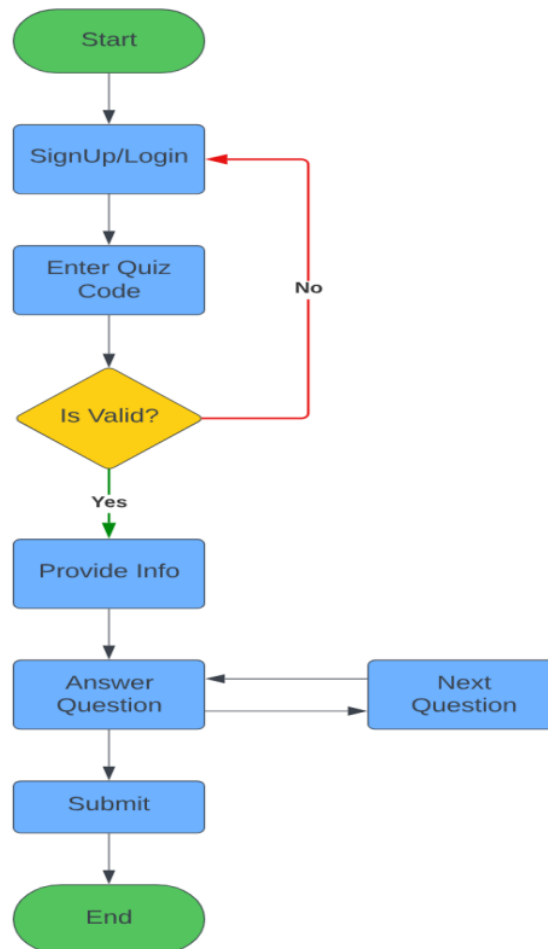


Figure 5.1: Flow chart for Student Process

quiz code. A decision point validates the entered code, guiding the student either to provide their name for personalized participation or back to the login stage for correction. The subsequent journey involves active engagement in the quiz, encompassing various question types. The experience concludes with a user-friendly end point, summarizing the quiz or providing relevant feedback. This intuitive flow ensures a seamless and personalized quiz-taking experience for each student.

### **5.3.2 Flow chart for Teacher Process:**

The flowchart for teachers in the web-based quiz platform orchestrates a user-friendly journey encapsulating the fundamental steps from authentication to quiz management. It commences with teachers signing in, offering the convenience of verifying their registration status. For registered teachers, a seamless transition proceeds to the sign-in step. In instances where teachers are yet to register, an intuitive sign-up process awaits, ensuring inclusivity.

Upon successful registration or sign-in, the platform opens up a spectrum of capabilities, empowering teachers to effortlessly create quizzes, launch them, and dynamically monitor ongoing quiz sessions. The cyclic interplay between “Already Registered?” and “Sign Up” acts as a pivotal checkpoint, promoting fluid navigation while upholding stringent security measures.

This intelligently designed flowchart encapsulates the essence of a teacher’s journey within the quiz platform, underscoring the platform’s commitment to efficiency, security, and an intuitive user experience. As teachers traverse through these delineated steps, they navigate the intricacies of the platform seamlessly, fostering an environment conducive to effective quiz management and student assessment.

Upon entering the realm of the web-based quiz platform, teachers, once authenticated, find themselves not only equipped with the ability to create and launch quizzes but also granted access to additional functionalities. A notable feature includes the option to view and manage their profiles, providing a comprehensive overview of their quiz-related activities and historical data. This facilitates a holistic understanding of their engagement within the platform.

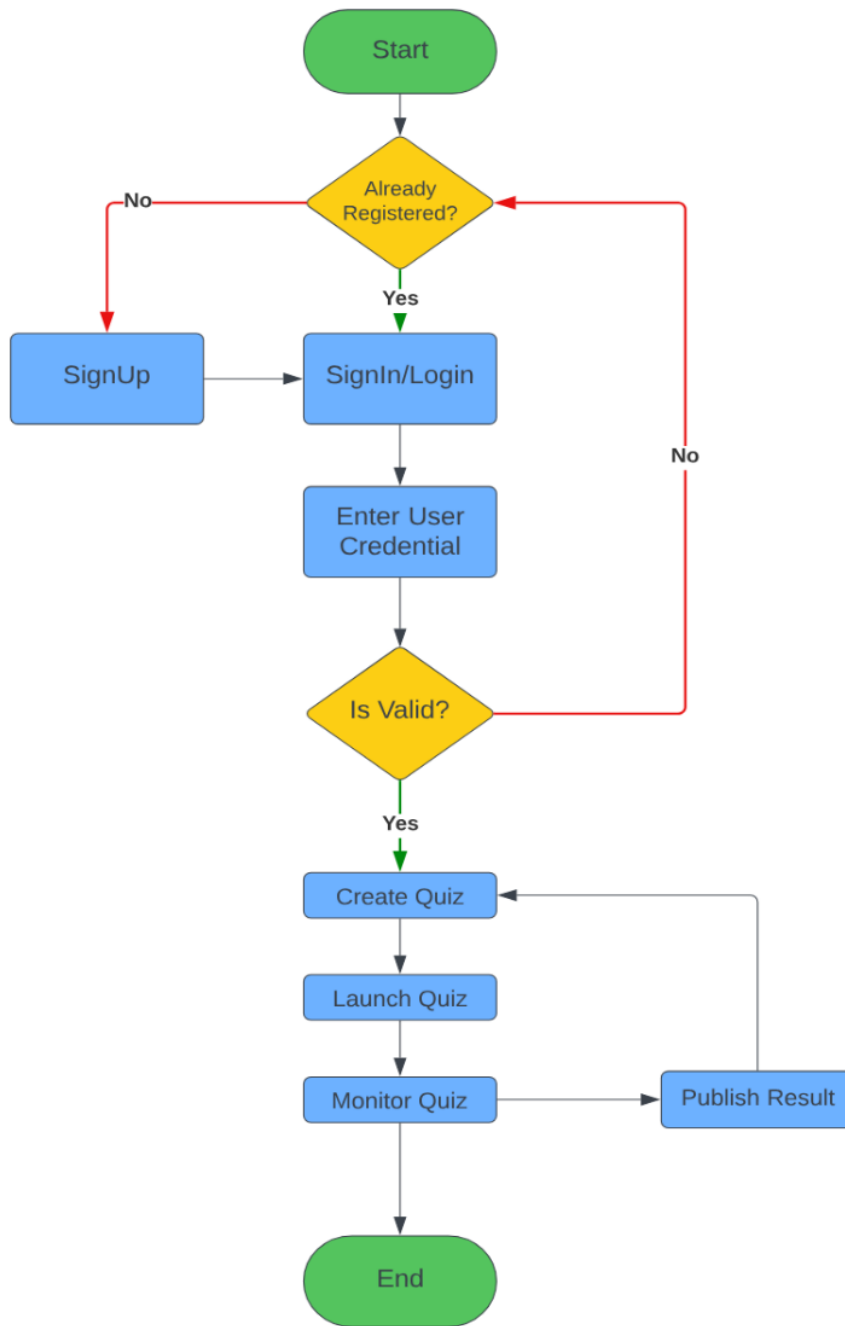


Figure 5.2: Flow chart for Teacher process

## 5.4 Entity relationship diagram

The Entity Relationship (ER) model emerges from a methodical analysis aimed at delineating the data generated and required by processes within a business domain [17].

- ER diagrams play a crucial role in crafting an orderly and efficient database schema.
- ER diagrams contribute to the definition of **primary keys, foreign keys, and constraints**, thus upholding **data integrity**.
- A meticulously **designed ER diagram** enhances comprehension of the database structure, facilitating easier handling of **future modifications or updates**.

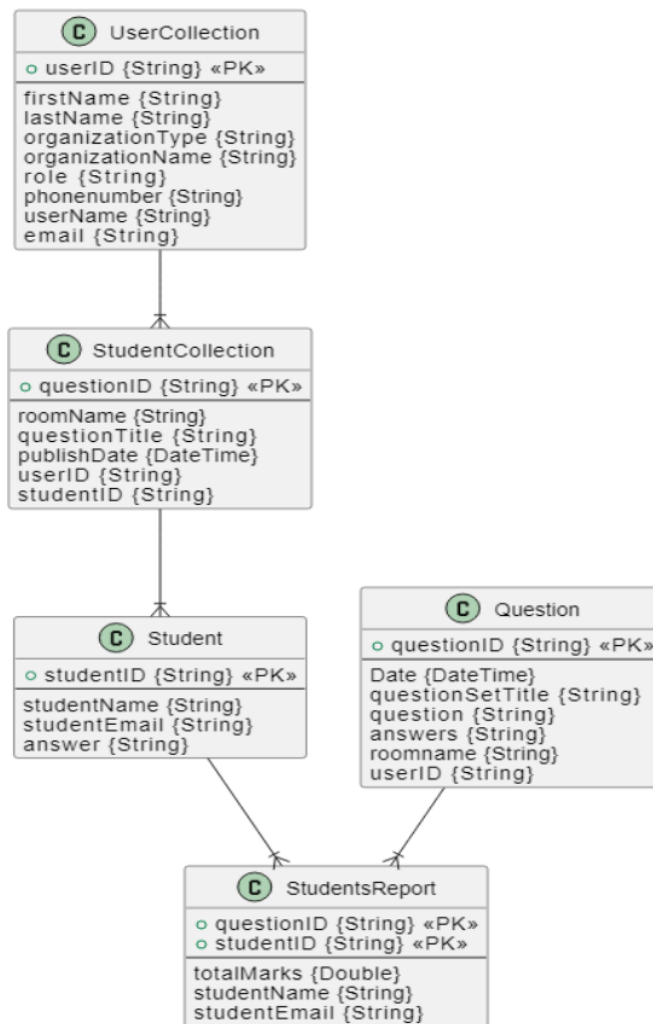


Figure 5.3:ER-Diagram

## 5.5 Data flow diagram

A Data Flow Diagram serves as a visual representation depicting the flow of data within a process or system, typically an information system. This diagram not only illustrates the movement of data but also offers insights into the outputs and inputs of each entity, as well as the process involved. It's important to note that a Data Flow Diagram does not incorporate control flow [18].

### 5.5.1 DFD Level 0

DFD Level 0 diagrams provide a comprehensive overview, encapsulating the entire system scenario into a single representation

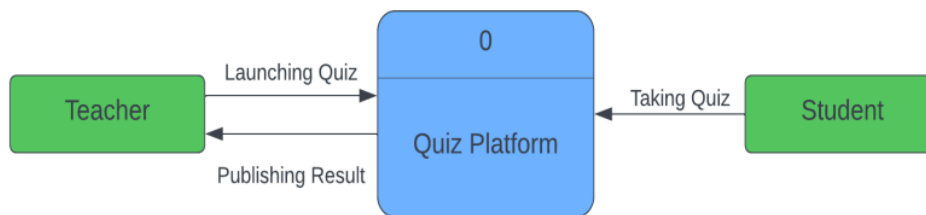


Figure 5.4: DFD Level 0

This represents the Level 0 Data Flow Diagram (DFD) encapsulating the entire application scenario. The DFD Level 0 diagram illustrates the core processes within the Quiz Platform. Positioned centrally, the Quiz Platform serves as the focal point for interactions between Teachers and Students. Teachers engage in crucial activities such as launching quizzes and accessing result publication functionalities, denoted by arrows connecting the Teacher entity to the Quiz Platform. Simultaneously, Students interact with the Quiz Platform by initiating the quiz-taking process, highlighted by an arrow connecting the Student entity to the Quiz Platform. This depiction succinctly captures the primary interactions and workflows at the highest level of the Quiz Platform's data flow architecture.

### 5.5.2 DFD Level 1:

DFD Level 1 offers a more detailed view of the data flow within the system, breaking down the processes identified in the Level 0 DFD into sub-processes. It provides a comprehensive illustration of data flows, storing of data and all the external entities involved in the system at a more granular level.

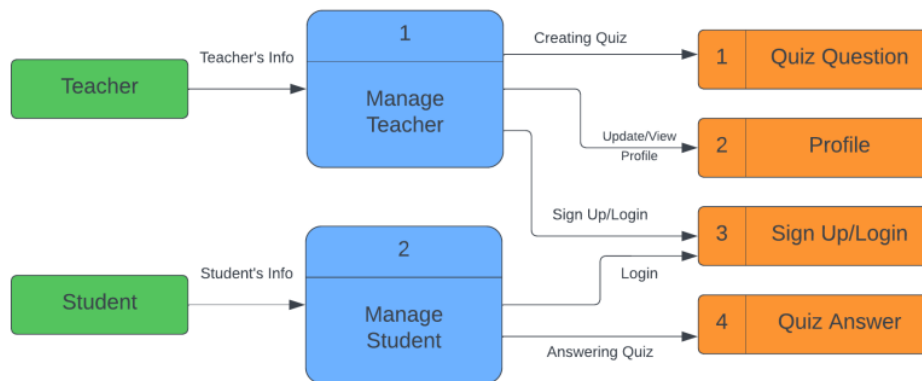


Figure 5.5: DFD Level 1

In the DFD Level 1 diagram, the Quiz Platform is decomposed into two primary processes: “Manage Teacher” and “Manage Student.” These processes represent distinct functionalities within the system, addressing the specific needs and interactions of Teachers and Students.

#### Process 1: Manage Teacher

In the first process, “Manage Teacher,” the focus is on activities related to Teacher functionalities. This includes the handling of Quiz Questions, management of Teacher Profiles, and facilitation of Sign-Up/Login procedures. The process aims to streamline the Teacher’s experience and ensure effective interaction with the platform.

#### Process 2: Manage Student

The second process, “Manage Student,” is dedicated to Student-specific activities. It encompasses functionalities such as Student Login and the submission of Quiz Answers. The process is designed to cater specifically to the requirements of Students, providing them with

a seamless and user-friendly interaction with the Quiz Platform.

Overall, the DFD Level 1 diagram offers a comprehensive view of the Quiz Platform’s workflow, illustrating the tailored processes for Teachers and Students. This decomposition enhances clarity in understanding the system’s functionalities and emphasizes the fluid interaction between Teachers and Students in the educational environment.

### 5.5.3 DFD Level 2 (Process 1.1 – 1.5):

Level 2 Data Flow Diagram (DFD) provides a more intricate visual depiction of all the system's processes in comparison to the Level 1 DFD. This detailed representation further elaborates on the interactions and relationships within the system components.

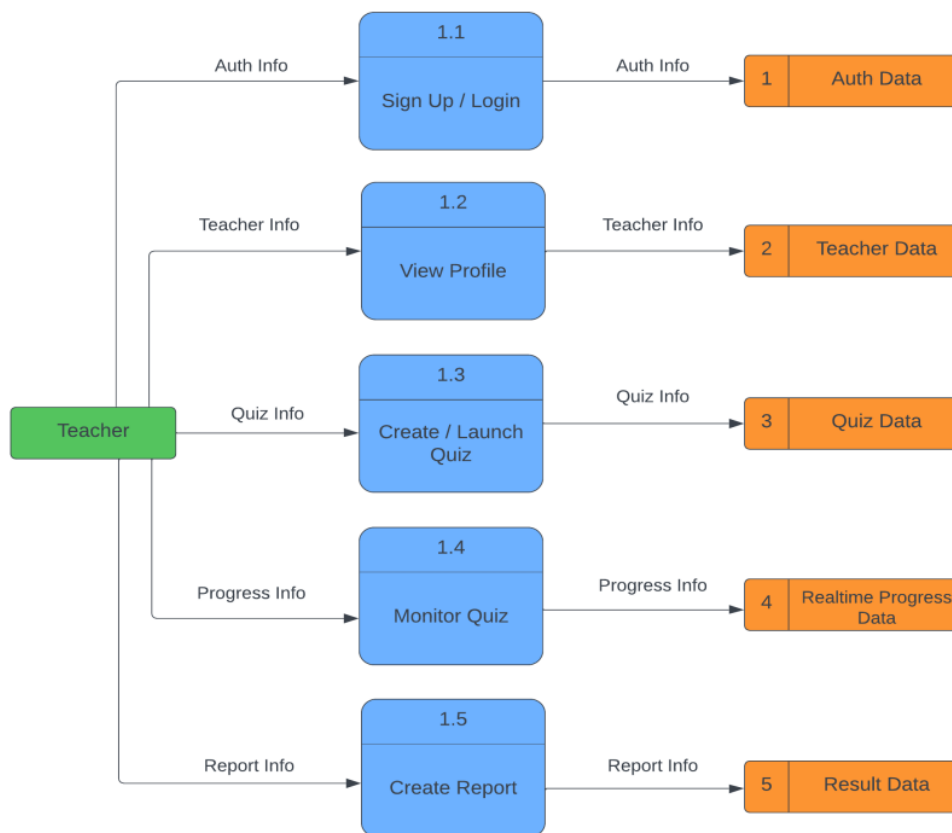


Figure 5.6: DFD Level 2 (Process 1.1 -1.5)

**Process 1.1: Sign Up/Login:**

In this critical process, teachers engage with the system through secure authentication, choosing between Sign-Up or Login actions. Authentication data, including pertinent credentials, ensures a secure and personalized experience for teachers accessing the platform.

**Process 1.2: View Profile:**

Teachers have the capability to view and manage their profiles, enhancing personalization and ensuring that their account information remains accurate and up-to-date.

**Process 1.3: Create/Launch Quiz:**

Teachers take charge of the quiz creation and launch processes, initiating assessments tailored to their educational objectives. Quiz data captures essential details about the quizzes created by teachers.

**Process 1.4: Monitor Quiz:**

This process empowers teachers to actively monitor real-time progress during an ongoing quiz session. Real-time Progress Data provides valuable insights into student performance, aiding teachers in making informed decisions.

**Process 1.5: Create Report:**

Teachers leverage this process to generate comprehensive reports summarizing quiz results. Result Data is instrumental in creating detailed reports that offer insights into student achievements and areas for improvement.

This detailed breakdown of DFD Level 2 processes for teachers emphasizes their pivotal role in shaping and managing the quiz-taking experience. Each process is distinct, contributing to a seamless and efficient educational environment within the Quiz Platform.

## **5.6 UML diagram:**

The Unified Modeling Language (UML) serves as a versatile visual modeling language with the primary aim of offering a standardized approach for representing system designs visually. This diagrammatic approach utilizes a standardized set of notations and symbols, aiding software engineers and designers in comprehending, communicating, and documenting the system's behavior and structure effectively [19].

### **5.6.1 Sequence Diagram:**

The Sequence Diagram, a subtype of UML diagram, proves highly beneficial in grasping the interactions and communications between various components or objects within a system over time. This diagram essentially constructs a step-by-step visual narrative, elucidating the sequence of events occurring within the system [20].

### **5.6.2 Sequence Diagram for Quiz Platform:**

#### **Teacher's Actions:**

- **Registration and Login:**

The teacher initiates the process by registering on the web-based quiz platform. Upon successful registration, the teacher logs in using their credentials.

- **View and Edit Profile:**

After logging in, the teacher has the option to view and edit their profile details. This allows them to manage personal information associated with their account.

- **Creating a Quiz:**

The teacher creates a quiz, specifying details such as quiz title, questions, and other relevant information.

- **Launching Quiz:**

Upon completing the quiz creation, the teacher launches the quiz. The system generates a unique room name associated with the quiz, which will be used by students to access and participate in the quiz.

### Quiz Platform Interaction Flow

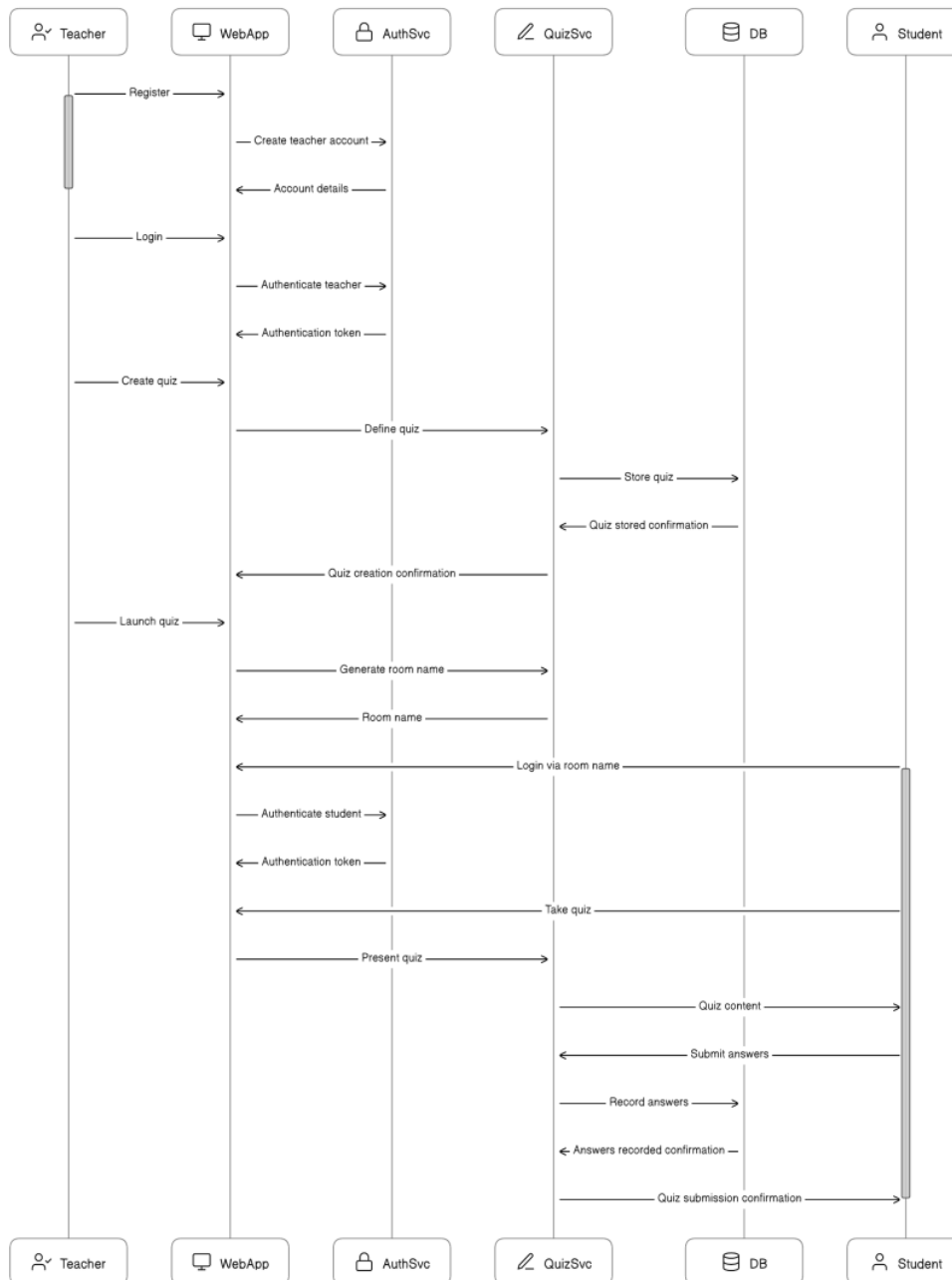


Figure 5.7: Sequence Diagram for Quiz Platform

**Student's Actions:**

- **Viewing Quiz:**

The student accesses the web-based quiz platform and views the available quizzes. They can select a quiz of interest from the list.

- **Taking Quiz:**

Upon choosing a quiz, the student enters the quiz room by providing the designated room name. Inside the quiz room, the student answers the questions within the specified time.

These actions describe the interactions and flow between the teacher and student within the web-based quiz platform. The teacher is involved in the setup, creation, and monitoring of quizzes, while the student engages in viewing and participating in the quizzes created by the teacher.

**5.6.3 Use Case diagram:**

The Use Case diagram serves as an illustrative tool for depicting <sup>33</sup> interactions between actors (users or external systems) and the system. It provides a visual representation of the diverse tasks and functionalities supported by the system. Actors initiate use cases, defining how users <sup>15</sup> interact with the system's features. The use case diagram vividly showcases the interactions between various actors and the integral components of the web-based quiz platform. This visual representation offers a comprehensive view of the roles and functionalities within the system. Here's an explanation of the key components:

**Teacher:**

**Register:** Teachers can register on the platform, providing necessary details to create an account.

**Login:** Teachers can log in using their credentials to access the platform.

**View/Edit Profile:** Once logged in, teachers have the ability to view and edit their profile information.

**Create Quiz:** Teachers can create quizzes, defining questions, options, and setting parameters.

**Launch Quiz:** After creating a quiz, teachers can launch it, generating a unique room name for students.

**Monitor Progress:** Teachers can monitor real-time progress as students answer quiz questions.

**Publish Result:** Upon completion of a quiz, teachers can publish results, generating a PDF report.

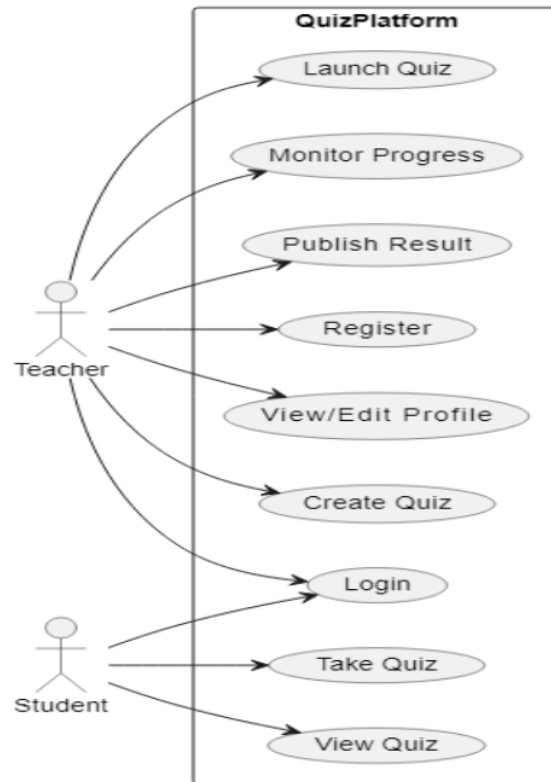


Figure 5.8: Use Case diagram

**Student:**

**Login:** Students log in using the unique room name provided by the teacher to access the quiz.

**View Quiz:** Students can view the quiz questions presented by the teacher.

**Take Quiz:** Students answer questions within the allocated time, with progress monitored by the teacher.

This <sup>39</sup> use case diagram provides an overview of the functionalities available to both teachers and students, showcasing the key interactions within the web-based quiz platform.

## CHAPTER 6

### Implementation

#### 6.1 Overview:

This section offers an in-depth exploration of the experimental results stemming from our system's development. Through a meticulous documentation of each phase, we provide detailed snapshots that encapsulate the step-by-step interactions between teachers and students. The subsequent sections provide a detailed visual depiction of the accomplished results within our web application.

#### 6.2 Web application:

##### 6.2.1 Home (User not signed in):

1. Users have the ability to access the homepage and contact the sales department.
2. Users are provided with the option to sign up or sign in for the purpose of creating or participating in quizzes.
3. The user can view information about developer.



Figure 6.1: Home (User not logged in)

1. When click upon Login user can see the option of Login as a teacher.
2. We can also see the Login option for student to take quiz.
3. We can see a Sign-Up option for teacher.

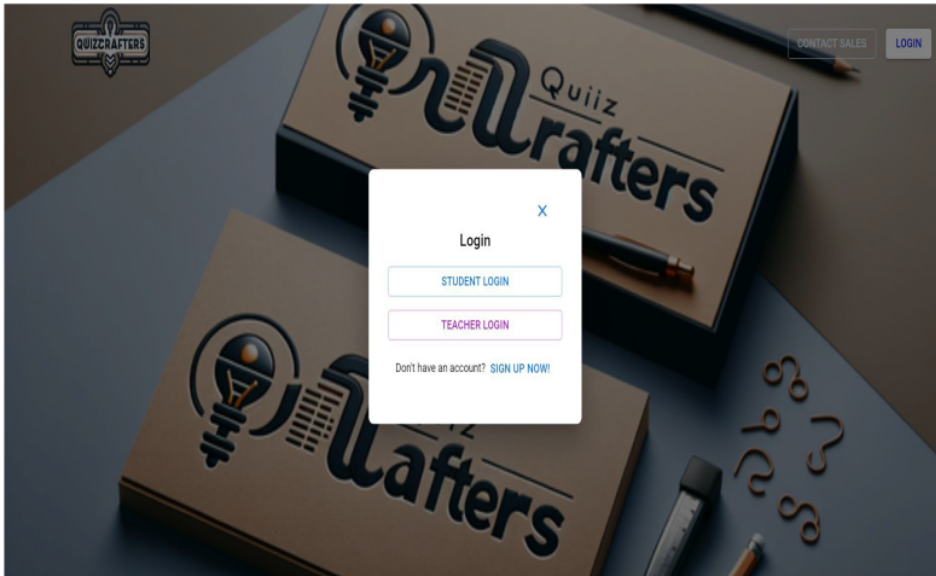


Figure 6.2: Home Upon Clicking Login Option (User not logged in)

### 6.2.2 Register / Login (User):

1. This page serves as the registration portal for teachers.
2. You have the option to register by providing the necessary credentials.

A registration form with a light blue background. It contains six input fields arranged in three rows. The first row has 'First Name' and 'Last Name'. The second row has 'Email' and 'Password'. The third row has 'Confirm Password' and 'Username'. Below the fields is a grey button labeled 'NEXT'.

Figure 6.3: Register as a new user

1. Access the page to enter your credentials and log in as a teacher.
2. Use accurate user credentials for a successful login.

A 'Teacher Login' form with a light blue background. The title 'Teacher Login' is centered at the top. Below it are two input fields: 'Email' and 'Password'. A blue button labeled 'SIGN IN' is positioned below the password field. Below the button is the word 'Or'. Underneath is a white button with the Google logo and the text 'SIGN IN WITH GOOGLE'. At the bottom, there is a link: 'Don't have an account? [SIGN UP](#)'.

<sup>1</sup> Figure 6.4: Login as a user

### 6.2.3 Quiz Launch Tab:

1. Utilize [this page](#) to initiate a quiz through your registered teacher/user account.

Title	Status	
CSE-3611	Published	LIVE
CSE-3638	Unpublished	LIVE
URED-3604	Unpublished	LIVE
CSE-3635	Unpublished	LIVE
MATH-2407	Unpublished	LIVE
EEE-2421	Unpublished	LIVE
CSE-4845	Unpublished	LIVE

Figure 6.5: Quiz Launch Tab

### 6.2.4 Library Tab:

1. Access this page to view a comprehensive list of all quiz records.
2. User or Teacher can create quiz from this page.

<input type="checkbox"/>	Name	Modified date	
<input type="radio"/>	CSE-3611	1/20/2024	DELETE
<input type="radio"/>	CSE-3638	1/20/2024	DELETE
<input type="radio"/>	URED-3604	1/20/2024	DELETE
<input type="radio"/>	CSE-3635	1/20/2024	DELETE
<input type="radio"/>	MATH-2407	1/20/2024	DELETE
<input type="radio"/>	EEE-2421	1/20/2024	DELETE
<input type="radio"/>	CSE-4845	1/20/2024	DELETE

Rows per page: 5 | 1-5 of 7

Figure 6.6: Library tab

3. Created quiz can be searched from here.
4. This page leads to the quiz creation page.

### 6.2.5 Quiz Creation Tab:

1. This page offers to create a new quiz.
2. The user can set a title to his/her quiz.
3. The user can choose between three different type of questions – Multiple choice, Short question and True/False.

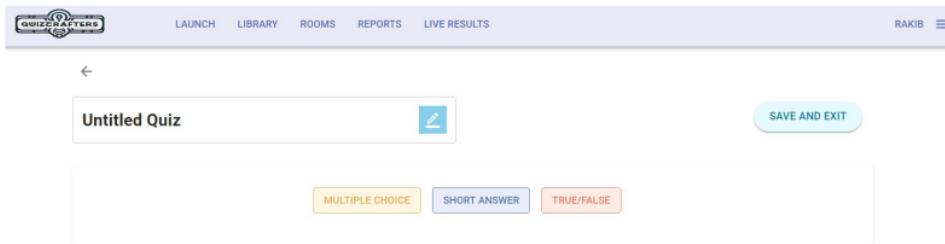


Figure 6.7: Quiz creation tab

4. The user can also set the points to each question and mark or write down the correct answer.

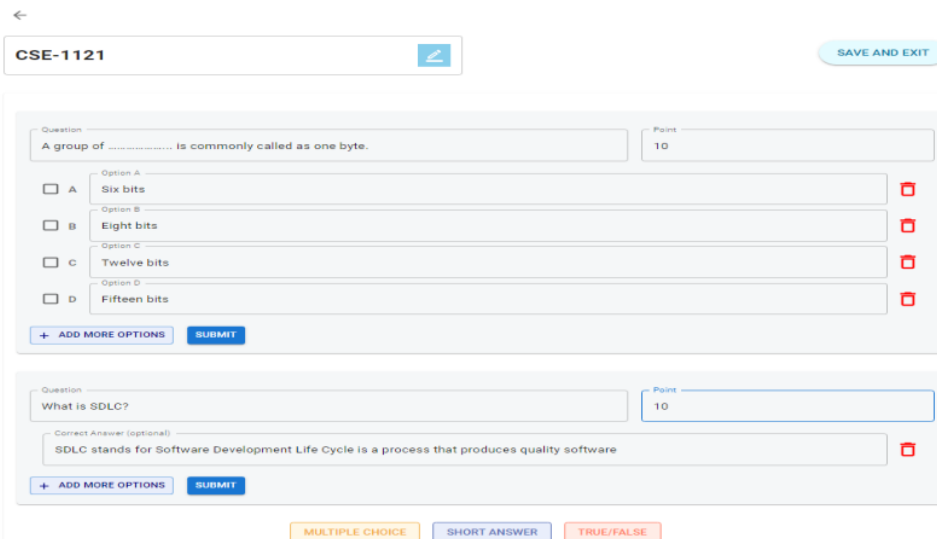


Figure 6.8: Quiz creation tab – Options

## 6.2.6 Room Tab:

1. This page offers to access the room name of quiz created by teacher.
2. After launching a quiz user/teacher can see the detail about the created quiz room through this page.

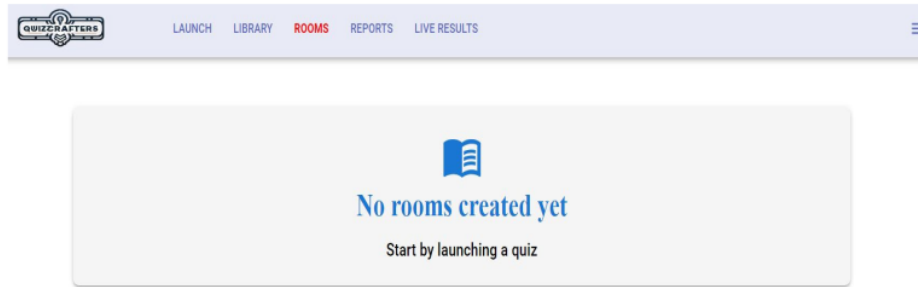


Figure 6.9: Room Tab – Before Live

3. After launching a quiz, from the launch tab a side pop-up will be appeared.

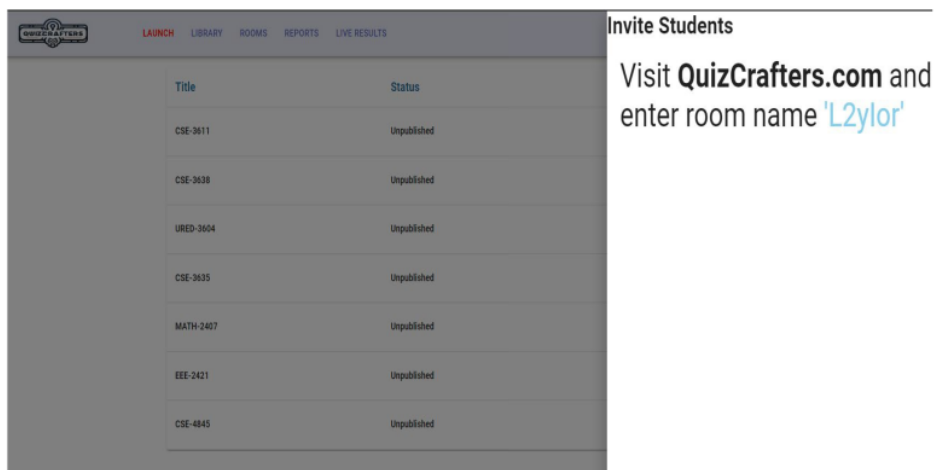
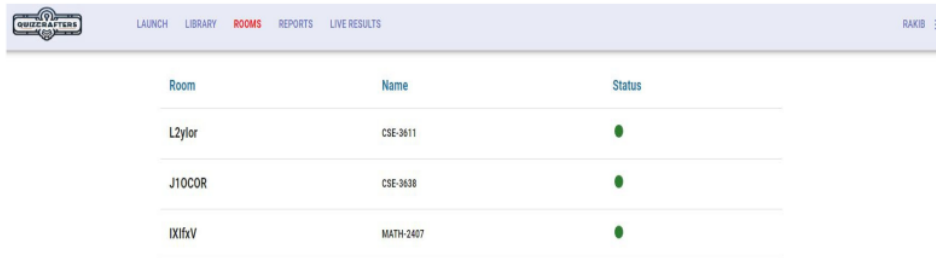


Figure 6.10: Launch tab – Room name pop-up

4. The Rooms interface will be changed and show the room name which have been lived from the launch tab earlier.



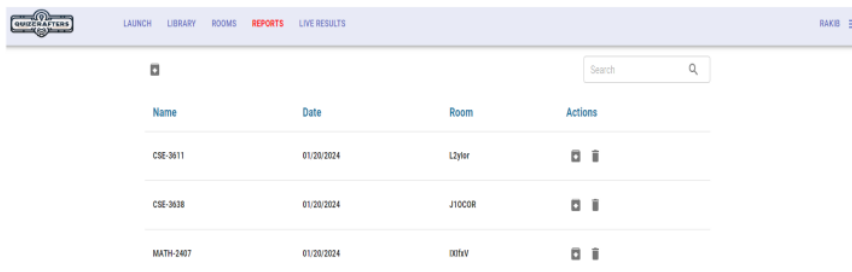
The screenshot shows a web interface with a navigation bar at the top containing 'LAUNCH', 'LIBRARY', 'ROOMS', 'REPORTS', and 'LIVE RESULTS'. The 'ROOMS' tab is active. Below the navigation bar is a table with three columns: 'Room', 'Name', and 'Status'. The table contains three rows of data.

Room	Name	Status
L2ylor	CSE-3611	●
J10COR	CSE-3638	●
IXifxV	MATH-2407	●

Figure 6.11: Rooms Tab – After Live

### 6.2.7 Report Tab:

1. This tab will provide information about the result of the students.
2. The user can print-out the result of the students as a PDF format after providing the Course details.



The screenshot shows a web interface with a navigation bar at the top containing 'LAUNCH', 'LIBRARY', 'ROOMS', 'REPORTS', and 'LIVE RESULTS'. The 'REPORTS' tab is active. Below the navigation bar is a search bar and a table with four columns: 'Name', 'Date', 'Room', and 'Actions'. The table contains three rows of data.

Name	Date	Room	Actions
CSE-3611	01/20/2024	L2ylor	📄 🗑️
CSE-3638	01/20/2024	J10COR	📄 🗑️
MATH-2407	01/20/2024	IXifxV	📄 🗑️

Figure 6.12: Report Tab

## 6.2.8 Live Result Tab:

1. This page offers to monitor the progress of the students in real-time after launching a quiz.
2. The user can view the total number of students along with the students name through this particular page.

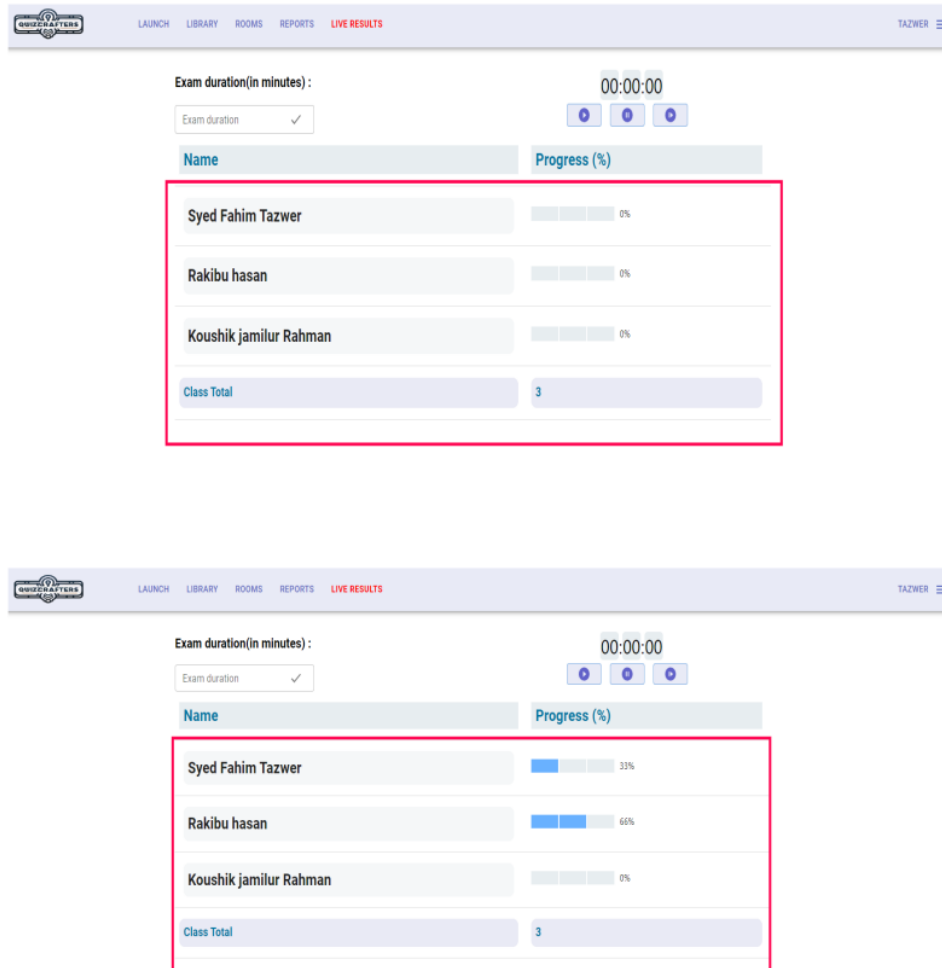


Figure 6.13: Live Result Tab

## 6.2.9 Profile Tab:

1. This tab offers the users to view their information they've given while creating the account.
2. The user can also edit and save the edited version of information through this page.

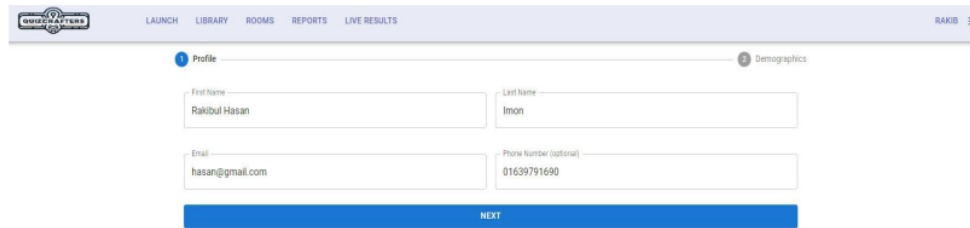


Figure 6.14: Profile Tab

## 6.2.10 Student Login:

1. Student can login through the home page login option which is accompanied with the option of teacher login.

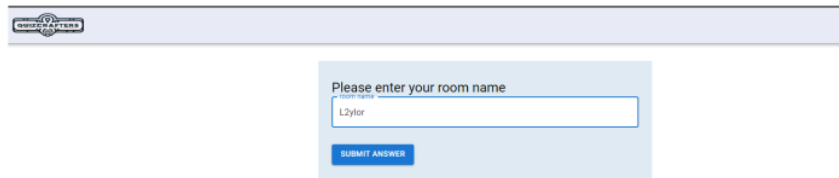


Figure 6.15: Student Login Tab – First Page

2. After the selection of student login, a tab will appear requesting to enter the roomname and then student name and email afterwards.

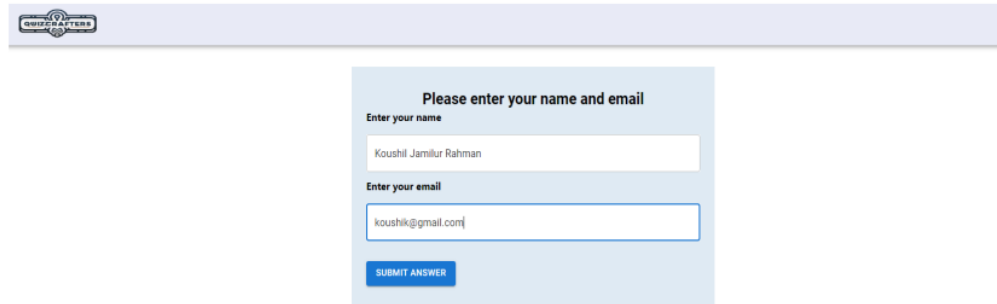


Figure 6.16: Student Login Tab – Second Page

### 6.2.11 Student Quiz Tab:

1. After giving all the information correctly and a successful login student will view a tab waiting for quiz to be started by the teachers.

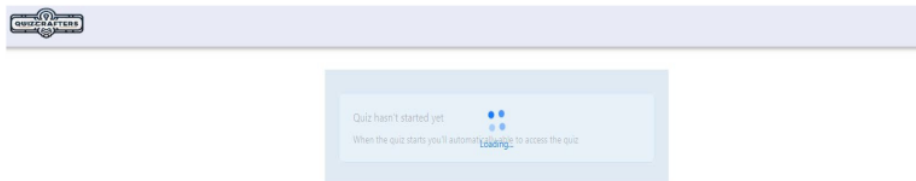


Figure 6.17: Student Quiz Tab – Before quiz being started

2. Once the quiz started with a particular time limit set up by teacher the student will see the quizzes and way to answers those and then submit before the time ends.

Here's the sample of quiz representation and answering procedure of all the question types.

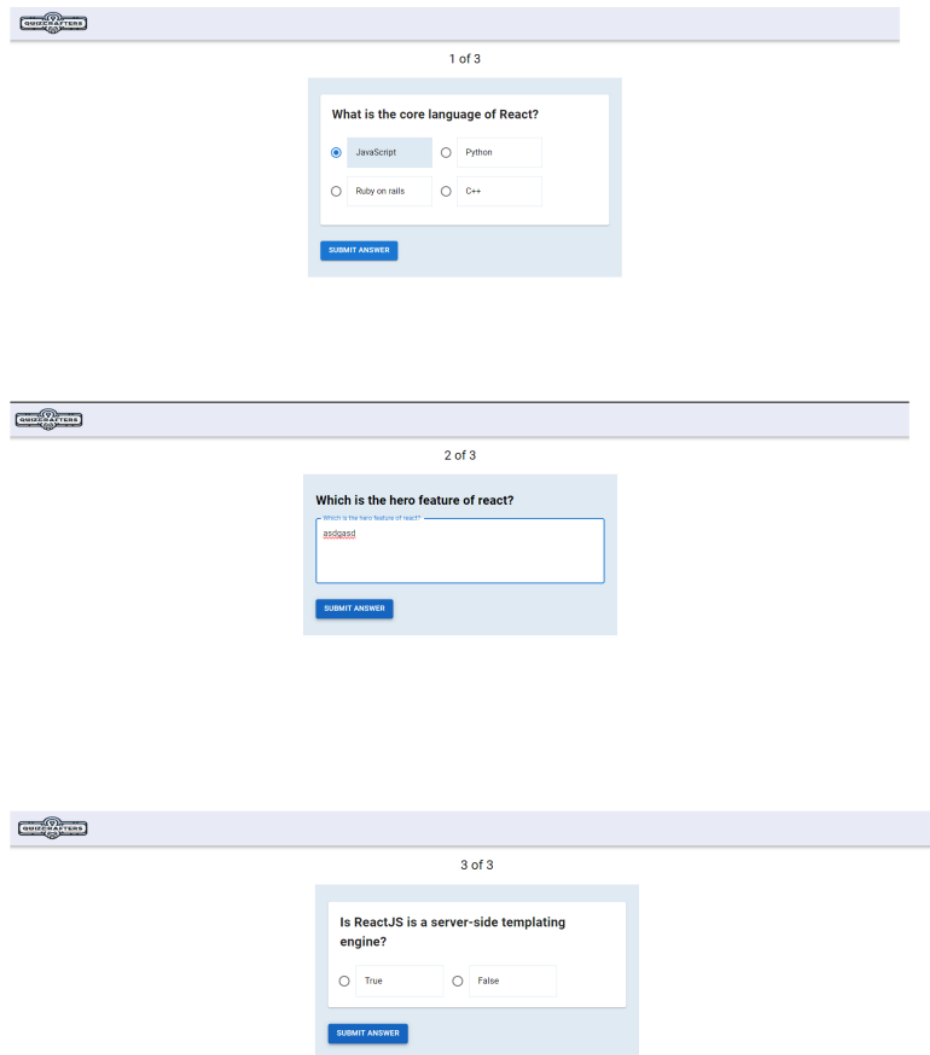


Figure 6.18: Student Quiz Tab – After quiz being started

## CHAPTER 7

### Testing

#### 7.1 Overview:

Software testing serves as an investigation aimed at offering stakeholder's insights into the quality of the product or service under examination. It also provides an unbiased, independent perspective on the software, enabling the business to comprehend and assess the risks associated with software implementation [21].

<sup>3</sup> Software testing can be divided into two steps:

- Verification: It refers to the set of tasks that ensure that the software correctly implements a specific function. It means “Are we building the product right?”.
- Validation: It refers to a different set of tasks that ensure that the software that has been built is traceable to customer requirements. It means “Are we building the right product?”.

#### 7.2 Objectives of Testing

<sup>4</sup> Software testing is a crucial step in the software development life cycle that involves the evaluation of software applications or systems to identify any defects, bugs, or errors that may affect their performance or functionality. It is a complex process that requires a systematic and disciplined approach <sup>5</sup> to ensure that the software meets the requirements and specifications <sup>4</sup> of the end-users. Testing can be done at various levels, including unit testing, integration testing, system testing, acceptance testing, and regression testing. Each level of testing has its own objectives and goals, and the testing strategy used depends on the complexity and scope of the software being tested. Manual testing involves a human tester manually executing test cases to identify defects, whereas <sup>30</sup> automated testing uses tools and scripts to automate the testing process. <sup>35</sup> A combination of both manual and automated testing can also be used to achieve optimal testing results. The ultimate goal of software testing is to deliver high-quality software that is reliable, efficient, and user-friendly, while also ensuring <sup>5</sup> that the software meets the expectations of the end-users.

### 7.3 Testing Methods

<sup>2</sup> The categorization of software testing is a part of diverse testing activities, such as test strategy, test deliverables, a defined test objective, etc. Software testing is the execution of the software to find defects. The purpose of having a testing type is to confirm the AUT (Application Under Test). To start testing, we should have a requirement, application-ready, and necessary resources available. To maintain accountability, we should assign a respective module to different test engineers.

The software testing is mainly divided into two parts, which are as follows:

- Manual Testing
- Automation Testing

Testing any software or an application according to the client's needs without using any automation tool is known as manual testing. In other words, we can say that it is a procedure of verification and validation. Manual testing is used to verify the behavior of an application or software in contradiction of requirements specification. We do not require any precise knowledge of any testing tool to execute the manual test cases. We can easily prepare the test document while performing manual testing on any application. In software testing, manual testing can be further classified into three different types of testing, which are as follows:

- White Box Testing

White box testing is centered on<sup>1</sup> scrutinizing the internal structure and logic of the software. Through a meticulous analysis of code paths and logic, developers can pinpoint potential defects, vulnerabilities, and areas for optimization [23].

- <sup>5</sup> • Black Box Testing

Black box testing is a method that evaluates the functionality of software without considering its internal mechanisms. This testing approach ensures that the software aligns with specified requirements and operates as anticipated from the user's viewpoint [23].

- Grey Box Testing

Gray-box testing combines elements of both white-box testing and black-box testing. Its purpose is to uncover any defects resulting from incorrect structure or improper application usage [23].

## 1 • Unit Testing

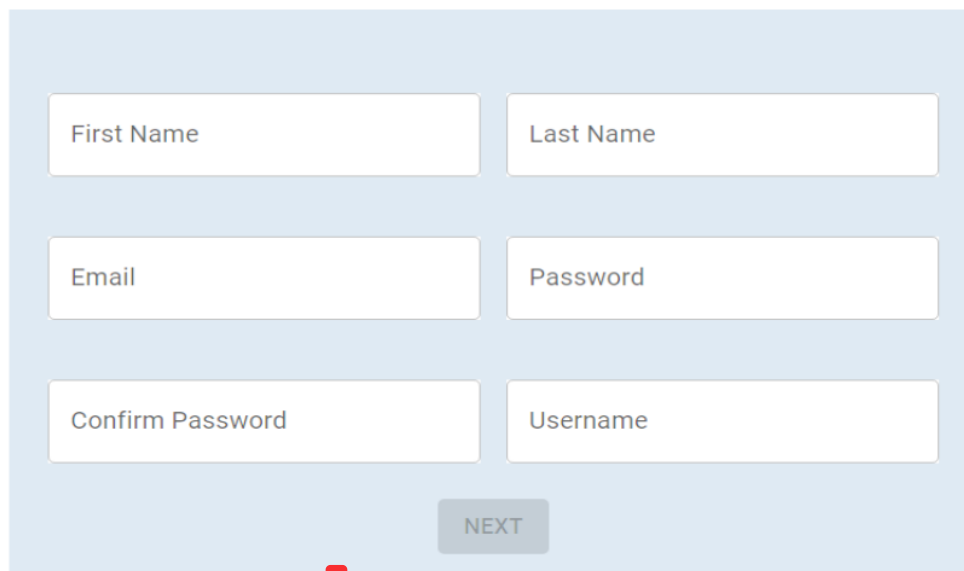
Unit testing is a software testing approach that assesses individual units of source code, comprising program modules, control data, usage procedures, and operating procedures. The goal is to determine the fitness for use of these individual units within the overall software system [22].

### 7.4 Validation Check:

Validation check refers to the process of verifying the accuracy and integrity of data or information to ensure it meets predefined criteria or standards, helping to identify errors or inconsistencies.

#### 7.4.1 Registration (Teacher):

Validation checks for teacher registration includes validating full name email formats, enforcing strong password criteria, and confirming the correctness of personal details.



The image shows a registration form for a teacher. It consists of a light blue rectangular container with six white input fields arranged in three rows. The first row contains 'First Name' and 'Last Name'. The second row contains 'Email' and 'Password'. The third row contains 'Confirm Password' and 'Username'. Below the input fields, centered, is a grey button labeled 'NEXT'.

1 Figure 7.1: Teacher Registration

#### 7.4.2 Registration validation check table:

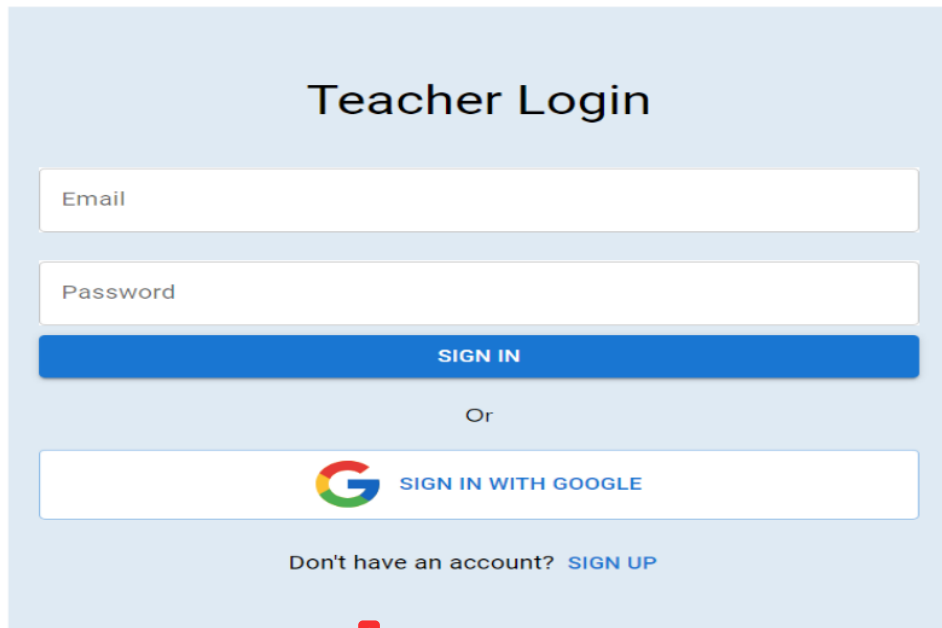
The following table for user/teacher registration outlines the specific fields that need validation and the corresponding criteria to be met.

**1**  
Table 7.1: Registration validation check table for Teacher

Test step	Data field	Test data	Expected Result	Actual output	Verdict
1	First Name, Last Name, Email, Password, username	No input	Next Button not enabled	Next Button not enabled	Passed
2	First Name, Last Name, Email, Password, username	, rakib@gmail.com, 1111,	Next Button not enabled	Next Button not enabled	Passed
3	First Name, Last Name, Email, Password, username	Rakibul Hasan, , 1111,	Next Button not enabled	Next Button not enabled	Passed
4	First Name, Last Name, Email, Password, username	Rakibul Hasan, rakib@gmail.com, ,	Next Button not enabled	Next Button not enabled	Passed
5	First Name, Last Name, Email, Password, username	Rakibul Hasan, rakib@gmail.com, 1111,	Next Button not enabled	Next Button not enabled	Passed
6	First Name, Last Name, Email, Password, username	Rakibul Hasan, rakib@gmail.com, 1111, Rakib	Next button enabled and Redirected to the homepage	Next button enabled and Redirected to the homepage	Passed

### 7.4.3 Login (Teacher):

Validation checks for user login involve verifying the authenticity of user-provided credentials to grant secure access. This includes confirming the correctness of entered emails and validating the corresponding passwords.



1  
Figure 7.2: Teacher Login

#### 7.4.4 Login validation check table:

This validation check table for teacher login outlines the fields that require validation and the associated criteria.

1  
Table 7.2: Login validation check table for teacher

Test step	Data field	Test data	Expected Result	Actual output	Verdict
1	Email address, Password,	No input	Message: "Failed to Log In" is Displayed	Message: "Failed to Log In" is Displayed	Passed
2	Email address, Password,	, 1111,	Message: "Failed to Log In" is Displayed	Message: "Failed to Log In" is Displayed	Passed
3	Email address, Password,	fahim@gmail.com, ,	Message: "Failed to Log In" is Displayed	Message: "Failed to Log In" is Displayed	1 Passed

4	Email address, Password	fahim@gmail.com, 1111	Redirected to the homepage	Redirected to the homepage	Passed
---	----------------------------	--------------------------	----------------------------------	----------------------------------	--------

#### 7.4.5 Login (Student):

Validation checks during student login involve ensuring the accuracy and consistency of provided information to maintain data quality. This includes validating and verifying room number, Name and Email Address.

<sup>1</sup> Figure 7.3: Student Login

#### 7.4.6 Login validation check table:

This table guides the implementation of validation checks during the student login process, contributing to accurate data and reliable accounts. A reference table for validation checks during student login is as follows

<sup>1</sup> Table 7.3: Login validation check table for student

Test step	Data field	Test data	Expected Result	Actual output	Verdict
-----------	------------	-----------	-----------------	---------------	---------

1	Room name, student name, Email address	No input	Message: “Failed to Log In” is Displayed	Message: “Failed to Log In” is Displayed	Passed
2	Room name, student name, Email address	, Koushik Jamilur Rahman, koushik@gmail.com,	Message: “Failed to Log In” is Displayed	Message: “Failed to Log In” is Displayed	Passed
3	Room name, student name, Email address	L2yIor, , koushik@gmail.com,	Message: “Failed to Log In” is Displayed	Message: “Failed to Log In” is Displayed	Passed
4	Room name, student name, Email address	L2yIor, Koushik Jamilur Rahman, ,	Message: “Failed to Log In” is Displayed	Message: “Failed to Log In” is Displayed	Passed
5	Room name, student name, Email address	L2yIor, , ,	Message: “Failed to Log In” is Displayed	Message: “Failed to Log In” is Displayed	Passed
6	Room name, student name, Email address	, , koushik@gmail.com,	Message: “Failed to Log In” is Displayed	Message: “Failed to Log In” is Displayed	Passed
7	Room name, student name, Email address	L2yIor, Koushik Jamilur Rahman, 1 koushik@gmail.com,	Redirected to the quiz	Redirected to the quiz	Passed

### 7.4.7 Quiz Creation (Teacher):

The validation checks for quiz creation by teacher involve verifying the field are filled and correct answers are selected. This includes confirming the field of multiple choices, True false and Short question.

The screenshot shows a quiz creation interface. At the top, there is a course ID field containing 'CSE-1121' and a 'SAVE AND EXIT' button. Below this, there are two question cards. The first card is for a multiple-choice question: 'A group of ..... is commonly called as one byte.' with four options: A (Six bits), B (Eight bits), C (Twelve bits), and D (Fifteen bits). The second card is for a short-answer question: 'What is SDLC?' with a 'Correct Answer (optional)' field containing 'SDLC stands for Software Development Life Cycle is a process that produces quality software'. At the bottom, there are three buttons: 'MULTIPLE CHOICE', 'SHORT ANSWER', and 'TRUE/FALSE'.

Figure 7.4: Quiz Creation (Teacher)

### 7.4.8 Quiz validation check table:

This table serves as a guide for executing validation checks during the quiz process, contributing to secure the process of examination.

<sup>1</sup> Table 7.4: Quiz validation check table

Test step	Data field	Test data	Expected Result	Actual output	Verdict
-----------	------------	-----------	-----------------	---------------	---------

1	Question. Option, Point	No input	Submit non- clickable	Submit non- clickable	Passed
2	Question. Option, Point	Que-1, , 10	Submit non- clickable	Submit non- clickable	Passed
3	Question. Option, Point	Que-1, Option-A, ,	Submit non- clickable	Submit non- clickable	Passed
4	Question. Option, Point	Que-1, Option-A, 10	Redirected to the Launch page	Redirected to the Launch page	Passed

## CHAPTER 8

### Conclusion

#### 8.1 Overview:

We developed a user-friendly web-based quiz system, providing teachers with a seamless experience. They can easily register, create quizzes, monitor student progress in real-time, and efficiently manage their profiles. Students, on the other hand, benefit from a straightforward login process, easy access to quizzes, and a user-friendly interface for answering questions.

Looking forward, opportunities for future enhancements and expansions abound. Further refinements, additional features, and a focus on user feedback will be crucial in ensuring the sustained success and relevance of our web-based quiz platform. With a solid foundation in place, the project serves as a testament to the collaborative efforts and dedication invested by the development team, creating a valuable resource for educational communities.

#### 8.2 Limitations:

1. Teachers may have limited options for customizing the appearance and layout of quizzes, potentially restricting personalization based on individual teaching styles.
2. Students need to enter a specific room name to access quizzes, potentially leading to challenges if they forget or mistype the code.
3. The absence of an admin role might limit administrative controls, necessitating the inclusion of additional roles for improved user management and system oversight.
4. While the platform provides real-time progress monitoring, it may lack in-depth analytics and reporting features that could offer deeper insights into student performance.

#### 8.3 Future work:

1. We will aim to enhance quiz customization options, making the process more efficient for users.
2. We will try to add an account registration option for students to remove room name dependency.
3. We will introduce an admin role with enhanced administrative controls.
4. We plan to enhance the teacher panel with additional features.

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