AN ENGINEERING PROJECT REPORT

On

coreQ - COMMUNITY for REPRISING QUALITATIVE RESEARCH

Submitted By

Gajananda Mani Adhikari	200111
Nischal Khanal	200120
Ujjwal Dhakal	200148

Under the Supervision of

Ranjan Raj Aryal

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CERTIFICATE

The undersigned certify that they have read & recommended to the Department of Electronics & Communication / IT & Computer , a second year project work entitled “coreQ - COMMUNITY for REPRISING QUALITATIVE RESEARCH” submitted by Gajananda Mani Adhikari - 200111, Nischal Khanal - 200120, Ujjwal Dhakal - 200148 in partial fulfillment of the requirements for the degree of Bachelor of Engineering.

Ranjan Raj Aryal (Asst. Professor)
(Project Supervisor)
Department of ICT.
Cosmos College of Management and Technology

(External Examiner)
Designation:
Name of Institute:

Bibek Ropakheti
Head of the Department
Department of IT and Computer Engineering
Cosmos College of Management and Technology

Acknowledgement

The warm response received by this proposal, both from teachers and students, has encouraged the learning group to present our ideas and vision within time. Every topic of this proposal has been written in simple and lucid language so that any one going through it will be clearly able to understand the subject. Similarly, the context has been revised thoroughly to make it more comprehensive.

We would like to express our sincere gratitude to our supervisor **Asst. Prof. Ranjan Raj Aryal** for his guidance and support throughout the work. Our deepest appreciation to the entire team of Cosmos College of Management and Technology, for granting us this valuable opportunity and helping us reach our milestone by giving valuable feedbacks and suggestions. For the improvement of the subject matter of this proposed project, constructive criticism, suggestions and feedbacks for the improvement of this project would be highly appreciated.

- Team coreQ

Abstract

This proposal outlines the creation of a platform called coreQ (Community for Reprising Qualitative Research) aimed at inspiring college students to share their knowledge, innovative ideas, and project files within their college domain. The platform will serve as a hub for students to find peers with various fields of interest, form project teams, and participate in competitions. Additionally, it will address the lack of a digitized platform for sharing and discussing innovative ideas, providing query assistance, and facilitating communication among students, seniors, peers, and teachers outside of regular coursework. The objective is to foster collaboration, showcase projects, and enhance job placement prospects.

The proposal outlines specific objectives, such as building a user-friendly website, allowing registration and sharing of research articles and original ideas, facilitating open-source projects, and involving teachers as supervisors and resource providers. The project is build with MERN.

Keywords: *Community Platform, coreQ, Database, MERN, Express.js, Mongoose, MongoDB, Node.js, NoSQL, React, Tailwind CSS, UI/UX, Web Application*

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List of Abbreviations

AJAX	Asynchronous JavaScript and XML
API	Application Programming Interface
CI/CD	Continuous Integration/Continuous Deployment
CLI	Command Line Interface
CRON	Time-Based Job Scheduler
CRUD	Create, Read, Update, Delete (database operations)
CSS	Cascading Style Sheets
coreQ	COMMUNITY for REPRISING QUALITATIVE RESEARCH
DB	Database
DNS	Domain Name System
DOM	Document Object Model
GUI	Graphical User Interface
HTML	HyperText Markup Language
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
JWT	JSON Web Token
JSON	JavaScript Object Notation
NoSQL	Not Only SQL
ORM	Object-Relational Mapping
REST	Representational State Transfer
SCI	Software Configuration Item
SDK	Software Development Kit
SEO	Search Engine Optimization
SSH	Secure Shell
TCP/IP	Transmission Control Protocol/Internet Protocol
UI/UX	User Interface/User Experience
URL	Uniform Resource Locator

Chapter 1

Introduction

1.1 Introduction to the Project

A social media platform exclusively designed for students serves as a dedicated hub where they can connect, engage, and share knowledge within their college community. It goes beyond the traditional concept of social media by focusing on academic and intellectual interactions. This platform provides students with a space to ask queries, seek assistance, and receive feedback from their peers and mentors. It facilitates the sharing of research articles, academic resources, and innovative ideas, enabling students to showcase their intellectual pursuits and contribute to a collaborative learning environment. By offering a centralized hub for student-exclusive discussions, this social media platform becomes a vital tool for fostering engagement, collaboration, and intellectual growth among students in colleges.
In today's digital age, the importance of fostering a vibrant and dynamic student community within colleges cannot be overstated. Students are not only seeking academic excellence but also crave opportunities to explore their passions, collaborate with peers, and engage in interdisciplinary projects. However, traditional academic settings often fall short in providing a dedicated space for students to connect, share ideas, and collaborate effectively. This has led to the need for a student-specific community platform in colleges, where students can come together, interact, and unleash their creative potential.

1.2 Team Members/Plan Followed

Our project "coreQ" was developed collaboratively by the following team members:

- **Gajananda M. Adhikari:** Designing and Documentation
- **Nischal Khanal:** Frontend Development
- **Ujjwal Dhakal:** Backend Development

We followed a well-structured plan throughout the project's development, ensuring efficient coordination and timely completion of tasks. Our plan included the following key elements:

1. **Project Scope Definition:** We defined the project's scope, objectives, and requirements, ensuring a clear understanding of its goals.

2. **Design and Prototyping:** We created wireframes and mockups to visualize the user interface and user experience (UI/UX) design. We used Figma for the work of designing and prototyping for ease of use, availability of various toolkit and intuitive sharing of the design within the collborators.

3. **Technology Stack Selection:** We opted for the MERN (MongoDB, Express.js, React.js, Node.js) stack, which provides a robust and flexible foundation for web application development.
   Leveraging Node.js and Express.js, we developed the backend components of the platform, focusing on user authentication, data storage, and API development.
   We used React.js for frontend development, ensuring a responsive and user-friendly interface.
   MongoDB was chosen as our database system, offering scalability and flexibility for managing user data and content.

4. **Software Development:** We found Agile to be fit for the development of our project following which the project underwent multiple phases of prototyping, incorporating user experiences, navigation, and essential functionalities.

1.3 Application of Project

coreQ finds its application in creating a vibrant and dynamic student community within colleges. It provides students with a space to connect, collaborate, and share their academic and research pursuits. The project aims to offer the following applications:

- **Enhanced Student Engagement:** coreQ fosters student engagement by providing a platform for intellectual discussions, research sharing, and interdisciplinary collaborations.
- **Academic Knowledge Sharing:** Students can share research articles, academic resources, and innovative ideas, contributing to a collaborative learning environment.
- **Personal and Professional Growth:** By showcasing their intellectual pursuits and achievements, students can enhance their visibility within the college community, potentially improving their job placement prospects and personal growth.
- **User-Friendly Interface:** The project focuses on a simple, minimal, and uncluttered design, ensuring a seamless user experience.

Chapter 2

Literature Review

2.1 Digital Platforms for Knowledge Sharing and Collaboration

Numerous digital platforms have been developed to facilitate knowledge sharing and collaboration among students and professionals. These platforms offer features such as project sharing, discussion forums, and collaboration tools. Examples include GitHub, Slack, and Trello. Research shows that such platforms enhance collaboration, foster interdisciplinary interactions, and promote innovative thinking **[1]**.

2.2 Educational Social Networking Platforms

Educational social networking platforms have emerged as valuable tools for students to connect, collaborate, and share resources within an academic setting. These platforms often provide features such as user profiles, group formation, and resource sharing. Examples include Edmodo, Schoology, and Moodle. Research suggests that these platforms promote student engagement, knowledge sharing, and collaborative learning experiences **[2]**.

2.3 Online Communities for Research and Innovation

Online communities dedicated to research and innovation have gained popularity as spaces for knowledge exchange and collaboration. These communities bring together individuals with similar interests and allow them to share ideas, seek feedback, and collaborate on projects. Platforms like ResearchGate and Academia.edu have successfully created networks of researchers and academics, facilitating collaboration and knowledge dissemination whilst still not fostering the real environment **[3]**.

2.4 The Role of Teachers in Digital Learning Environments

Integrating teachers within digital learning environments has proven beneficial in facilitating mentorship, guidance, and collaboration. Research suggests that teacher involvement in online platforms positively impacts student learning outcomes and engagement **[4]**. By leveraging the

expertise and support of teachers, the coreQ platform can create a conducive environment for students' personal and professional growth.

2.5 Culture for Scientific Research

The majority (64%) stated that research activities were more important than outreach and qualitative data suggested a role for the research assessment exercise in encouraging a narrow focus on publishing papers. It was noteworthy that 20% of this sample agreed that scientists who participated in engagement were less well regarded by other scientists and subsequent interview data provided comments that public engagement was done by those who were 'not good enough' for an academic career. **[5]**

2.6 Gamification of Education

Gamification, the application of game elements and mechanics in non-game contexts, has gained significant attention in the field of education. Gamification techniques have been employed to enhance student engagement, motivation, and learning outcomes. By incorporating game-like elements such as points, badges, leaderboards, and challenges, educators have found that students become more actively involved in the learning process.

Research studies have shown that gamification in education can improve student participation, collaboration, and knowledge retention. By introducing elements of competition, achievement, and rewards, gamification creates an immersive and interactive learning environment. Students are motivated to actively seek knowledge, solve problems, and overcome challenges, as they are driven by intrinsic and extrinsic rewards. **[6]**

Chapter 3

System Analysis

3.1 Current Challenges

3.1.1 Lack of Specialized Features

Existing platforms, including general social networks and academic research platforms, do not offer the specialized features required to facilitate interdisciplinary collaborations among college students. This signifies a gap in the current offerings.

3.1.2 Ineffectiveness of Traditional Modes

Traditional modes of communication and collaboration, such as physical notice boards or informal gatherings, are considered ineffective and limited in their ability to foster meaningful interactions among students. These methods are deemed outdated.

3.1.3 Underutilization of Technology

There is untapped potential in leveraging technology to enhance connectivity and communication among students. The power of technology can be harnessed to improve how students connect and collaborate.

3.1.4 Lack of Awareness

Students often remain unaware of the diverse skills and interests of their peers. There is a need for a platform that helps students discover and utilize the talents and expertise of their fellow students.

3.1.5 Limitations in Knowledge Sharing

The absence of a structured platform inhibits the sharing and dissemination of knowledge. Students struggle to showcase their achievements, research findings, or project outcomes effectively, impacting their visibility and recognition within the college community.

3.1.6 Impact on Future Prospects

The lack of exposure and recognition can have significant repercussions on students' job placement prospects and personal and professional growth.

3.2 Requirements Analysis

In this section, we detail the specific requirements identified during the analysis phase. These requirements will serve as the foundation for the design and development of coreQ.

3.2.1 Interdisciplinary Collaboration

coreQ must provide features and tools that facilitate interdisciplinary collaboration among college students, going beyond the capabilities of existing platforms.

3.2.2 Effective Communication

Efficient and meaningful communication tools should be integrated into the platform to replace or enhance traditional modes of interaction.

3.2.3 Technological Integration

The platform must leverage technology to create a seamless and user-friendly environment for students to connect and collaborate.

3.2.4 User Discovery

coreQ should include features that help students discover the skills, interests, and achievements of their peers.

3.2.5 Knowledge Sharing

A structured platform for sharing and disseminating knowledge, including research findings and project outcomes, should be a core feature of coreQ.

3.2.6 Visibility and Recognition

The platform must prioritize increasing students' visibility and recognition within the college community, with a potential impact on their future prospects.

Chapter 4

System Development

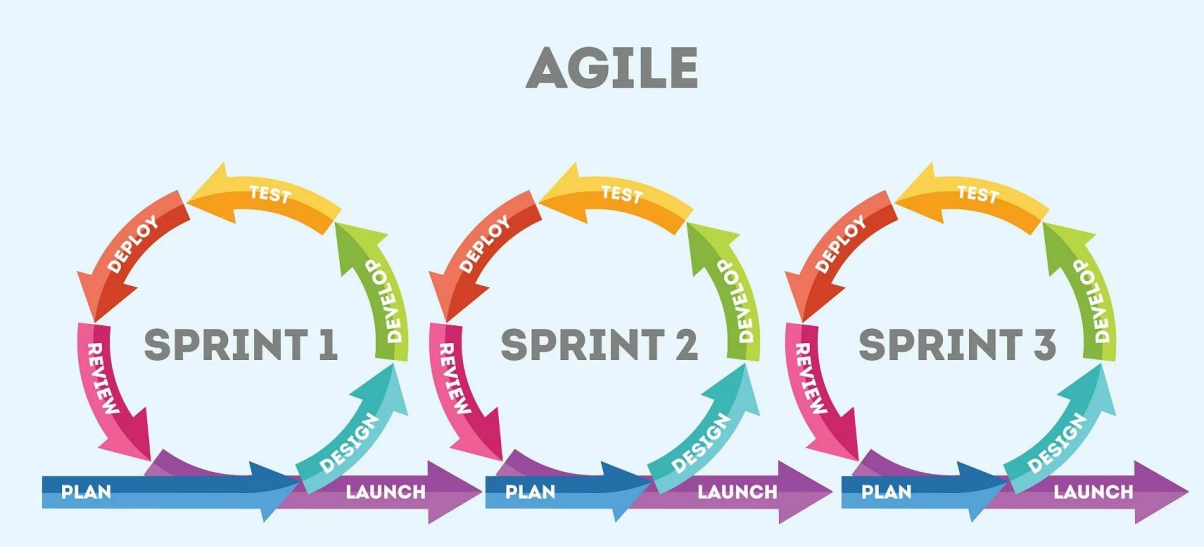

Figure 4.1: AGILE

4.1 Development Phases

We worked with Agile model. We have released different versions of our product committing ourselves into predefined sprint. We were able to use GitHub for our SCI and version control. GitHub also helped us release different versions for our project which helped us in testing and tracking our progress.

4.1.1 Project Initiation

The project was initiated where the concept of coreQ was defined and its objectives were outlined. This phase involved the formation of the project team and the allocation of responsibilities.

4.1.2 Requirement Analysis

In this phase, a comprehensive analysis of the platform's requirements was conducted. User stories, functional and non-functional requirements, and technical specifications were documented. We oriented our requirement as per the feasibility with regards to research articles.

4.1.3 System Design

System design involved creating the architectural blueprints of coreQ. This included defining the database structure, user interface design, and system components.

4.1.4 Prototyping

A prototype of coreQ was developed using Figma. This prototype served as a visual representation of the platform, allowing for user feedback and refinement.

4.1.5 Development and Coding

The actual coding and development of coreQ took place in this phase. The platform was built using the MERN stack, with React for the frontend, Node.js for the backend, and MongoDB for the database.

4.1.6 Testing and Quality Assurance

A rigorous testing phase was executed to identify and rectify bugs and issues. Both unit testing and user testing were conducted to ensure the platform's reliability.

4.2 Tools and Technologies

4.2.1 Frontend

The frontend of coreQ was developed using React.js, a popular JavaScript framework for building user interfaces. Tailwind CSS was used for styling, providing a clean and responsive design.

4.2.2 Backend

Node.js was selected for the backend development of coreQ. It provided a scalable and efficient runtime environment. Express.js was used to build the RESTful API for seamless communication between the frontend and backend.

Following dependenceies are used in our project:

- bcrypt: 5.1.0
- cookie-parser: 1.4.6
- cors: 2.8.5
- dotenv: 16.1.4

- express: 4.18.2
- express-interceptor: 1.2.0
- express-session: 1.17.3
- jsonwebtoken: 9.0.0
- mongoose: 7.2.3
- multer: 1.4.5-lts.1

4.2.3 Database

MongoDB, a NoSQL database, was chosen to store and manage data in a flexible and schema-less format. MongoDB Atlas, a cloud-based service, was used for database hosting.

4.2.4 Prototype Design

Figma, an online design and prototyping tool, was employed to create the visual prototype of coreQ. It allowed for collaborative design and user testing.

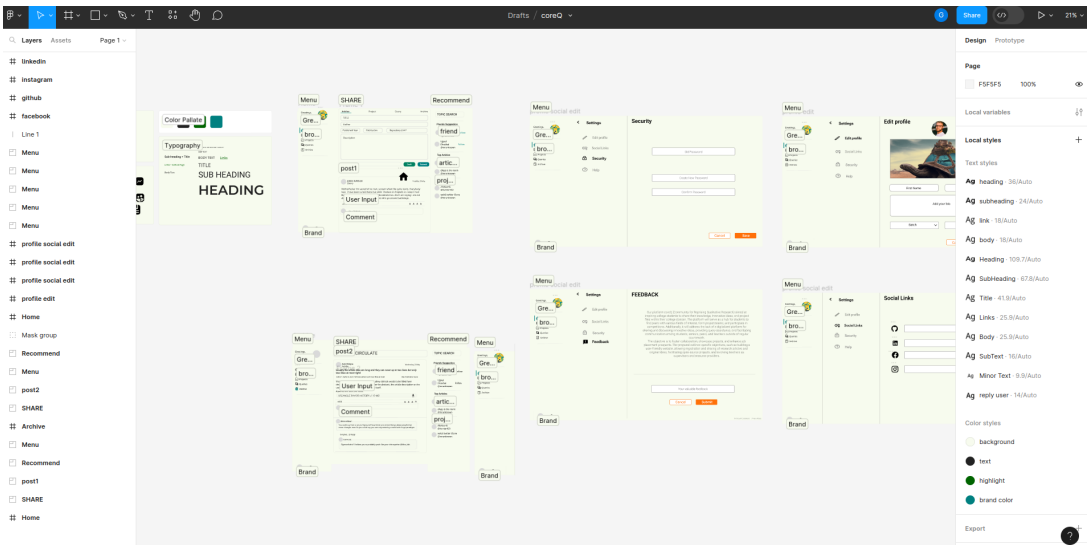

Figure 4.2: coreQ Prototype

Chapter 5

Design Philosophy

Design philosophy is an essential element of UX design. The statement of ideas and beliefs guides the development of a product or service, ensuring that its goal is achieved meaningfully and with methodical intent. It provides a framework for designers to focus on their user's needs by keeping their experience in mind throughout the process. The philosophy should be reflected in all design elements so that each part works together to efficiently produce products or services that meet users' requirements.

By considering the underlying message behind what we're creating and unpacking potential issues and complications early, we can firmly uphold our design philosophy as we build out your product.

Figure 5.1: A good design

We have considered the design philosophy and molded our prototype to be user friendly, for intuitive experience and used color scheme having people/students who are interested in research field in our mind. Even our system supports pdf and text only, removing any distracting media files to have seamless and research favorable design.

Chapter 6

Methodology

In this chapter, we describe the research and development methodology followed throughout the project. This includes the methods used for research and analysis, user research techniques, prototype development, system design, user creation, and more.

6.1 Research and Analysis Methods

For this project, we employed various research and analysis methods to gather insights and make informed decisions. Our research methods included:

- Literature Review: We conducted an extensive review of existing platforms and similar initiatives to identify best practices and potential challenges.
- Market Analysis: An analysis of the current market for educational and collaborative platforms helped us understand the competitive landscape, in our case i.e. Cosmos Journal Paper and cosmozone.
- Competitor Analysis: We studied the features and functionalities of existing platforms to identify gaps and opportunities, i.e. academia, researchgate, discord, etc.

6.2 Prototype Development

The development of the project prototype followed a structured approach:

- Wireframing: We created wireframes to visualize the layout and flow of the application.
- Mockup Design: Using tools like Figma, we designed mockups to represent the final look and feel.
- Prototype: The project evolved from wireframes to a clickable prototype with core features.

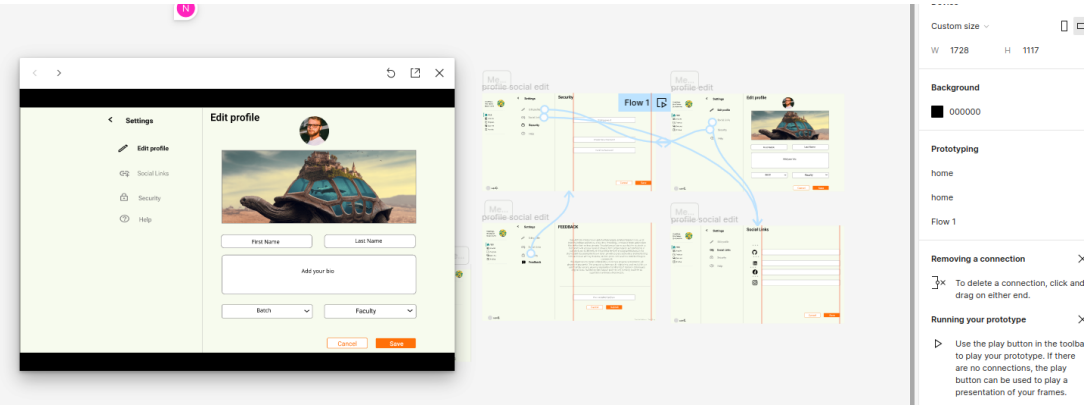

Figure 6.1: Wireframing Prototyping

6.3 System Design and Database

Our system design emphasized scalability and user-friendliness. The database schema was designed using MongoDB to ensure flexibility. Key considerations included:

- User Data: User registration is a straightforward process with college email domain constraints. Passwords are securely encrypted using bcrypt. JWT tokens are used for user authentication during login.
- Performance: The system was optimized for performance to handle a growing user base. The system can be deployed and with our development process, it can handle growing traffic with node.js capability totally secured.

Chapter 7

Project Block Diagram

7.1 Extrenal Entities

1. **Users:** External entities include the primary users of the system, including students, mentors, and academic supervisors.

7.2 Processes

1. **User Registration and Authentication:** When a user registers on the platform, their registration information (username, email, password) is processed for authentication. Authentication checks ensure secure access to the system.

2. **Profile Creation and Updates:** Users can create and update their profiles by adding personal information, including name, semester, faculty, social media links, and profile pictures.

3. **Content Posting:** Users can create and post various types of content, such as articles, projects, queries, and archives. This process includes adding content details and attachments (PDFs, images).

4. **Content Interactions:** Users can interact with posted content by upvoting, downvoting, and saving. These interactions are processed and recorded.

5. **Search and Recommendation:** The system processes user queries, searches for content based on keywords and tags, and recommends are done in random.

7.3 Data Stores

1. **User Database:** Stores user registration information, profiles, and user-specific data.

2. **Content Database:** Stores various types of user-generated content, including articles, projects, queries, and archives.

3. **Interaction Database:** Records user interactions with content, such as upvotes, comments, and shares.

7.4 Data Flows

1. **User Registration Data:** Flows from users during the registration process to the User Database for storage.

2. **User Authentication Data:** Flows from the User Database to the Authentication process to verify user credentials.

3. **Profile Data:** Flows from users to the User Database to create and update profiles.

4. **Content Posting Data:** Flows from users to the Content Database when creating and posting content.

5. **Content Interaction Data:** Flows from users to the Interaction Database when users interact with content (upvotes, comments).

6. **Search:** Flow from users to the Search to retrieve content.

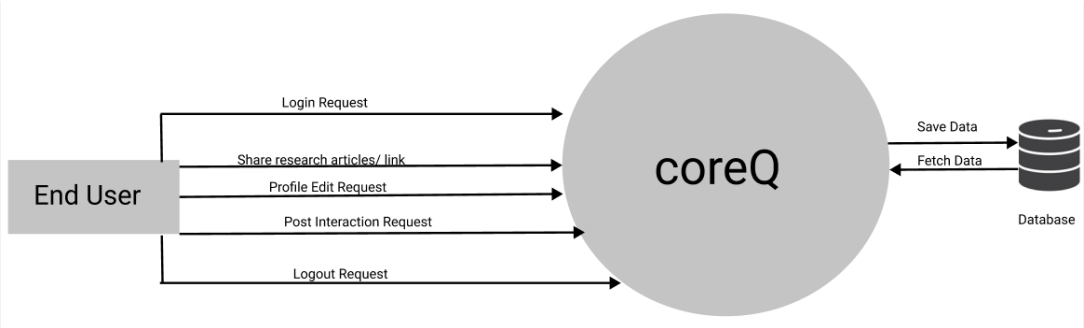

Figure 7.1: Block Diagram

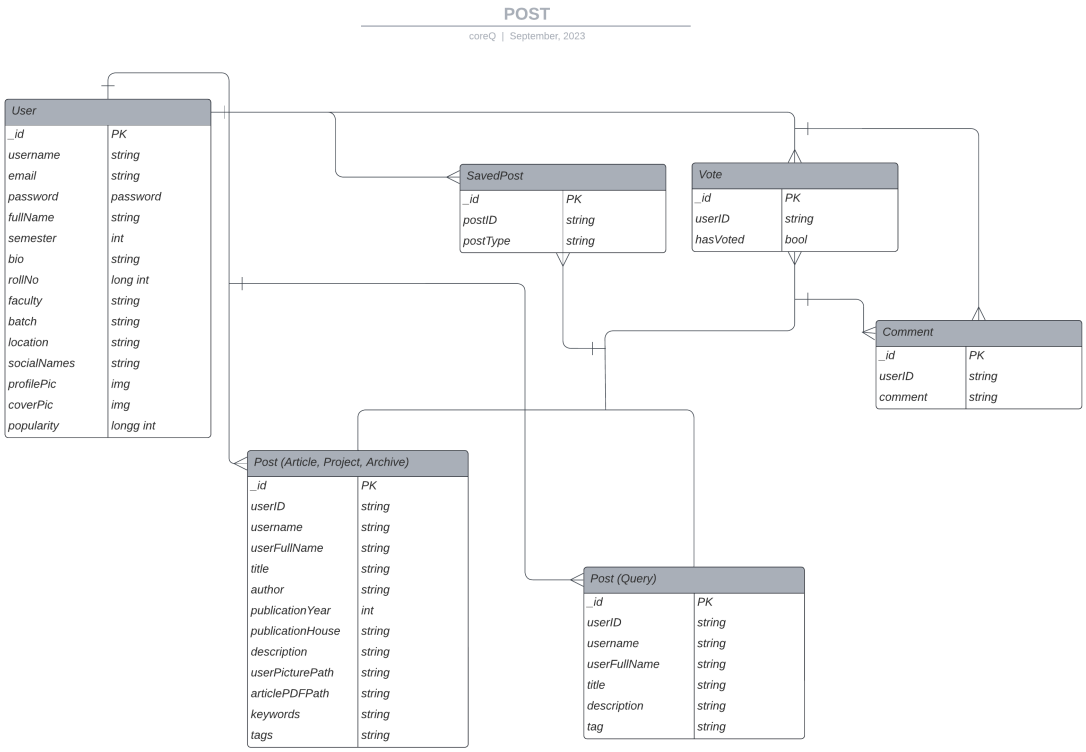

Figure 7.2: ER Diagram

Chapter 8

Working Principle

8.1 User Interaction

8.1.1 User Creation

User can only sign up using college email and each login is supervised by token system while their password are in encrypted form unknown to even database admin.

8.1.2 Home Page and Other Page Designs

The user interface design was centered around providing an intuitive and visually appealing experience. The home page showcased a personalized feed, project recommendations, and friend suggestions.

8.1.3 Profile and Edit Profile Pages

User profiles displayed essential information and allowed users to add or modify details. A user could also view other users' profiles and their own, fostering a sense of community.

8.1.4 Posting Articles and Text

User are able to post the article or link(text) in 4 different sections: Archive [academic project report pdf or link], Queries[questions related to topic], Project[project related pdf] and Article[Research paper pdf or link].

8.2 Integration

At the core of our integration strategy is **Express.js**, a widely-used Node.js framework. Express.js acted as the foundation upon which we built our API endpoints. It provided a structured and efficient approach to routing and handling HTTP requests, ensuring that data flows smoothly between the frontend and backend. By leveraging Express.js, we were able to establish a robust and organized API structure.

To interact with our **MongoDB** database, we employed the **Mongoose ODM (Object-Document Mapping)** library. Mongoose simplified the integration of our backend with the database, allowing us to define models, schema structures, and perform database operations

with ease. This integration layer ensured that data storage and retrieval were efficient and followed a well-defined structure.

For securing our APIs and implementing user authentication, we turned to **JSON Web Tokens (JWT)**. JWTs played a pivotal role in ensuring that the data transmitted between the frontend and backend remained secure and tamper-proof. Users were assigned tokens upon successful login, which were subsequently used to authenticate and authorize their requests. This integration of JWTs added a layer of security to our API endpoints.

Cors (Cross-Origin Resource Sharing) emerged as another key integration component. It facilitated communication between our frontend, hosted on one domain, and our backend, hosted on another. By configuring CORS, we allowed cross-origin requests, enabling the frontend to access resources from the backend securely.

In addition to these fundamental dependencies, our integration also encompassed various **npm packages** for auxiliary functionalities. For instance, **Nodemon** was employed during development to monitor changes in our codebase and automatically restart the server, ensuring a smooth development workflow. Additionally, **dotenv** allowed us to manage environment variables, enhancing the security and configurability of our backend.

Chapter 9

Problems Encountered

9.1 File and Picture Integration

One of the significant challenges we encountered was integrating file and picture uploads seamlessly into our system. Users needed the ability to upload various file types, including documents and images. To address this challenge, we implemented a robust file handling system that included server-side validation and storage.

9.2 Login Session Creation

Creating and managing login sessions presented complexities, particularly in handling user authentication and session persistence. We resolved this challenge by implementing industry-standard authentication protocols and libraries. Our system employed JSON Web Tokens (JWT) for secure user authentication and session management. This approach not only ensured the security of user data but also provided a seamless login experience.

9.3 Tracking Following and Follower Counts

Another significant challenge we encountered revolved around tracking and maintaining accurate following and follower counts for users. To address this challenge, we implemented a specialized system for tracking and updating following and follower counts in real-time. By optimizing database queries and utilizing caching mechanisms, we ensured that users always had up-to-date information on their connections.

9.4 Consistent Integration and API Communication

Throughout the development process, maintaining consistent communication between the backend and frontend via API was an ongoing challenge. Ensuring that data flowed seamlessly and reliably required a standardized approach and clear conventions. To overcome this challenge, we established rigorous coding and documentation practices. This included defining clear API endpoints, request/response formats, and error handling procedures. By adhering to these conventions and conducting regular code reviews, we ensured that integration issues were minimized.

Chapter 10

Future Enhancements

10.1 Archive Authorization for Academic Supervisors

To cater to the academic needs of students, implementing an ”Archive Authorization” feature is essential. This feature will allow academic supervisors to review and authorize research archives submitted by students. By providing this functionality, the platform can serve as an official repository for academic projects, adding credibility to the content.

10.2 Share Post Functionality

One of the key future enhancements is the implementation of a ”Share Post” functionality. This feature will allow users to share interesting articles, projects, or queries with their peers within the platform.

10.3 Chat System Integration

This real-time communication feature will enable users to engage in direct conversations with their peers, mentors, or project collaborators. It can facilitate quick information exchange, project discussions, and academic support, enhancing the overall user experience.

10.4 Recommendation System

A recommendation system can be developed to enhance user engagement. By analyzing user preferences, interactions, and content, the system can suggest relevant articles, projects, or queries to individual users. This personalized approach will encourage users to explore a wider range of topics and connect with like-minded peers.

10.5 Direct Sign-up

Simplifying the registration process can be achieved by integrating authentication with services like Password.js. This enhancement will enable users to sign up directly using their Facebook or Google accounts, streamlining the onboarding process and making it more convenient for new users.

10.6 Reward and Recognition

Implementing a reward and recognition system can incentivize user participation and contributions:

10.6.1 Gamification Elements

Introduce gamification elements such as badges, points, and leaderboards. Users can earn rewards and recognition for their active participation, contributions, and achievements on the platform.

10.6.2 Acknowledgments and Certificates

Recognize users' contributions by providing certificates or acknowledgments for their valuable research, project collaborations, or active engagement on the platform.

Chapter 11

Conclusion

The development of the coreQ (Community for Reprising Qualitative Research) platform has made significant progress, thanks to the dedication and hard work of our team. We are grateful for the support and guidance received from our supervisor, Asst. Prof. Ranjan Raj Aryal, and the entire team at Cosmos College of Management and Technology.

During this project, we've achieved significant milestones. For UI/UX, we've crafted user-friendly prototypes in Figma, while our frontend relies on React.js and Tailwind CSS for a sleek appearance. Key pages like registration, login, and more have been carefully designed and developed.

On the backend, Node.js powers our server, extended with Express.js. We've created user registration, profile setup, and essential API endpoints. MongoDB manages our NoSQL database, conveniently hosted on MongoDB Atlas.

Our progress includes UI/UX design, frontend development, backend implementation, and database integration. We've delivered a visually appealing website with functional components.

User feedback will be vital as we evolve the platform to better serve the college student community, fostering research and collaboration.

In conclusion, we are proud of the progress made thus far in developing the coreQ platform. We are committed to refining and expanding its features to provide college students with a dynamic and collaborative space for qualitative research reprisal. We appreciate the support and feedback received, and we look forward to further improving the platform based on valuable insights and suggestions.

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