**StudyHub co.**

Technical Advisory Report

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# Summary

In general

For StudyHub Co., this is a technical advice report aiming at assessing the current technology set up of the platform and providing recommendations for improvement. StudyHub is an advanced online tool that uses artificial intelligence (AI) to generate tests from materials submitted by users. There are three main parts of the paper: scenario analysis, research findings and observations, technology observation, suggestions, and comparison with Quizizz another similar platform.

Introduction

The motivation behind creating StudyHub has been outlined in the introduction section indicating that there was a need for an instructional tool which enables users to test and practice their knowledge using automatically generated quizzes. It also highlights on the selected technological stack comprising Python Flask as backend and Next.js as frontend.

Investigations and Notes

This section provides an in-depth overview of three programming languages which are Golang, C# and Ruby (Ruby on Rails). These languages are discussed taking into account their features, advantages and disadvantages regarding web development and AI integration. Golan is famous for its performance and concurrency support, Ruby on Rails for its object oriented nature and opinionated software architecture while C# for adaptability and strong typing.

## Observation of Technology

The section on technological observation looks at how the StudyHub platform is currently being used. The web application’s front-end, back-end technologies, AI interaction using OpenAI’s API and user interface design will also be discussed. The key concerns are ensuring smooth user experience, efficient data management as well as speed optimization.

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# Introduction

When learning something with a passion, either is a programming language or theory in development processes, it’s always the question that if you understand what you been trying to learn, of course you can test it with a project as designing, searching which programming languages fits it and what frameworks would work to make it better.

Although it can’t be done the same way for theory as you learn it by logic or mechanically by remembering each sentence. What if someone would make a website where you can just practice your knowledge and receive feedback, it would be a great way to know if you are improving or not with the addition of where your answer would be in the material you are already studying.

That’s where the idea is but how can we make it as you need to know what you need to work with to achieve putting together such a website. In this report we have done research and found the answer to that dilemma by seeing what most of the programming languages and AI offer since we have been working with Next.js frontend and backend in combination with Python Flask Framework.

This report will compare three programming languages with the scope of seeing which languages would be good of use.

Comparison

The chapter analyzes StudyHub with another platform called Quizizz that people use to generate quizzes as well. In relation to tailoring, content development, engagement and gamification faculties, stage convenience, user participation, critiques and searching for are the major discrepancies in this regard.

Flaws and Challenges

The report identifies certain AI integration and server infrastructure management issues. Talking about AI responses accuracy assurance, API updates compatibility maintenance mistake recovery and data protection it addresses these difficulties. The hardware need is also highlighted here by the necessity of powerful scalable servers for processing large documents and increasing number of users.

Conclusion

To make StudyHub work better as well as provide a good user experience both software and hardware challenges should be considered. Once these improvements are implemented, StudyHub offers a reliable efficient service that will ensure its top position among the educational technology platforms.

StudyHub is reviewed in this paper, which also presents proposals meant to ensure its future success and growth. StudyHub can meet the requirements of its clients more effectively by concentrating on strong software practices coupled with expandable hardware solutions thereby making it be valuable as an educational resource.

# Research and Observations

## Overview of Ruby (Ruby on Rails)

Ruby essentially is an open-source language with the structure of object-oriented language giving it the ability to be taken apart and reuse parts of it as this allows flexibility like how it’s creator intended.

The language by itself is a high-level programming language but by using the framework Ruby on Rails, that takes care of database and other processes as its software is a “opiniated software” by that it means that it assumes which is the best course of action and designed to encourage that way, letting the programmer be preoccupied with solving/debugging problems making it a great choice for back-end.

Key Features

* Ruby and the Mixin

“Unlike many object-oriented languages, Ruby features single inheritance only, on purpose. But Ruby knows the concept of modules (called Categories in Objective-C). Modules are collections of methods.

Classes can mixin a module and receive all its methods for free. For example, any class which implements each method can mixin the Enumerable module, which adds a pile of methods that use each for looping.”

([RubyLang, https://www.ruby-lang.org/en/about/.org)](https://newuniversity-my.sharepoint.com/personal/pavlo_kharaman_student_nhlstenden_com/Documents/Group_I_Documents_P4/RubyLang,%20https:/www.ruby-lang.org/en/about/.org))

* Active Record

” Active Record is the M in MVC(model view controller) - the model - which is the layer of the system responsible for representing business data and logic. Active Record facilitates the creation and use of business objects whose data requires persistent storage to a database. It is an implementation of the Active Record pattern which itself is a description of an Object Relational Mapping system.”

(Rubyonrails.org, <https://guides.rubyonrails.org/active_record_basics.html>)

## Overview of Golang

Go is a programming language known as Golang, the scope of it is to be simple, efficient and easy to learn. It’s a popular choice for programming web applications due to its “support for concurrency, which is the ability to run multiple tasks simultaneously. Concurrency is achieved in Go the use of Goroutines and Channels, which allow you to write code that can run multiple operations at the same time. This makes Go an ideal choice for building high-performance and scalable network services, as well as for solving complex computational problems.”, besides this, it also has another number of features that makes it as a favorable option to use it for front-end.

Key Features

* Fast compile times

” Go has a fast compiler, which makes it easy to iterate quickly during development.”

* Cross-platform support

“Go can be compiled to run on many different platforms, including Windows, Linux, and macOS.”

* Strong typing

“Go is a statically typed language, which helps catch errors at compile time rather than at runtime.”

(Anita Yadav, <https://www.geeksforgeeks.org/go-programming-language-introduction/>)

## Overview of C# (C sharp)

C# is known for the ability to be a versatile cross platform language like C and C++ but with the use of dot NET frameworks, it can be used both as front-end and back-end.

Key Features

* Debugging package

C# provides strong type checking, array bounds checking, checking attempts of using uninitialized variables and has automatic garbage collection.

* Scalability and updateability

C# can update any application by just replacing the old file with the new ones.

* Type Safe

C#’s code can only access memory locations that it got permission for, this makes it so security is better over the application.

## Technological Observation

Web application

By using Python Flask for the backend and JavaScript for the front end, StudyHub has demonstrated a modern approach to EdTech. This is because of its responsive and user-friendly design which provides seamless experience across devices and screen sizes. The back end utilizes Python Flask to handle strong server-side activities and API integrations. This infrastructure ensures effective data management and processing thus resulting in a smooth user experience even when dealing with large files or complex AI interactions.

AI Interaction

StudyHub’s AI interaction is powered by the OpenAI API enabling quizzes to be built using user-submitted papers. These interactions are enabled by well-structured API requests managed by back-end. For that reason, the system must ensure that these calls are performance optimized so as to minimize latency ensuring prompt and accurate outputs from AI. Continuously monitoring, adjusting, and updating AI-generated material is important to ensure that it remains relevant according to users’ expectations as well as educational needs.

User Interaction

StudyHub's design is centered around user engagement. Users may upload papers and create quizzes with ease because to the platform's straightforward design. At each stage, the user interface offers step-by-step instructions and feedback, guiding users through the procedure. Making sure that interactions run smoothly and that problems are promptly fixed improves the user experience. In order to ensure that the platform changes in response to user demands and preferences, it is also crucial to collect user input for continual enhancements.

## Scenario analysis

Continues to be important for both users’ expectations and needs in education.

User Interaction

StudyHub is designed to keep the user engaged. Its uncomplicated format enables users to upload papers and make quizzes within minutes. The user interface steps at each stage of the process providing direct instructions and giving feedbacks. Enhancing user experience is done by making sure all interactions are smooth and addressing problems promptly. Furthermore, it’s essential to get feedback from consumers so that the platform can continually evolve in response to their requirements and preferences.

## Scenario analysis

User testing

The most crucial step in designing StudyHub was conducting a user test. Ordinary people use this site in order to find out if there are any flaws related to how they can be improved. Such testing identifies any faults or glitches that were not apparent during development stages of the program. It also provides insight into how users interact with the website, what features they find most useful, and areas where improvement is needed.

Results of the analysis

There were several significant conclusions drawn from analyzing the results of user tests. People like how simple it is to submit papers and how quickly quizzes can be created. Nevertheless, some clients have been complaining about occasional time delay.

Conclusion of the Research

The study concludes that even though people like StudyHub, it has to continuously improve in order to maintain and increase user satisfaction. Although AI integration has shown success, still more fine tuning is needed to ensure reliable performance. User feedback plays a great role in giving direction for further improvements and innovations. By addressing the identified pitfalls and focusing on enhancing the user experience, StudyHub can continue growing while offering its users valuable services.

# Recommendations

## Software for programming

Employ Strong Frameworks and Libraries: Backend developers must select popular frameworks like Flask or Django to ensure stability as well as scalability. They should also use dependable libraries and tools that link up with OpenAI’s API for AI incorporation.

Optimize API Calls: Minimizing latencies and making response times faster could be achieved by application of techniques such batching requests or caching frequently asked queries that will optimize OpenAI api calls.

Monitor And Handle Errors: Have comprehensive error handling processes in place to monitor how efficient and reliable the artificial intelligence interactions are. Sentry can be used to quickly identify and fix any issues.

Use software pipelines for Continuous Integration / Continuous Deployment (CI/CD) which automates testing and deployment of software.

This lowers the possibility of defects and downtime by ensuring that any updates or modifications are properly tested before being distributed.

## Hardware for server

The following hardware suggestions are suggested to ensure that the server infrastructure is capable of processing AI outputs effectively:

High Performing Servers: For instance, high performing servers with substantial CPU power, large RAM and fast SSD storage would be required to handle huge amounts of data and demanding AI processes.

Scalable Infrastructure: Use cloud services with scalable infrastructures such as Azure, Google Cloud or Amazon. This will make it easier to scale up or down based on customer demand hence ensuring consistent performance even at peak times.

Use load balancing for traffic so that it is divided fairly between different servers. This ensures high availability by preventing any single server from becoming a bottleneck.

Regular Maintenance and Upgrades: Plan regular maintenance and upgrades for your Server Infrastructure in order to sustain the highest level of performance as well as security with the newest security patches and hardware updates.

## Conclusion of options

In summary, making use of strong programming frameworks; streamlining API interactions; ensuring continuous integration and monitoring would make software side more reliable and efficient. Scalable high-performance.

These upgrades will not only improve the user experience but also guarantee that StudyHub continues to be a state-of-the-art resource for learning that can adapt to its users' changing demands.

Therefore, implementing the advised software and hardware solutions will resolve existing StudyHub platform problems.

# Flaws and Challenges

## Software for programming and connecting AI

Engaging AI with StudyHub platforms also comes with some difficulties. First of all, it is difficult to integrate AI model using OpenAI API especially when one needs to make sure that the answers are accurate and relevant to the papers submitted by users.

Also effective management of response timings and processing API requests which can change depending on difficulty of the content is taken care of by Python Flask backend. Moreover, code should be updated and regularly maintained in order to stay in line with OpenAI API’s latest versions as well fix any possible bugs. In addition, error handling is a crucial part of this system because network interruptions or outages may disrupt services.

Moreover, this requires strong encryption and safe data handling practices that protect user privacy while dealing with AI technology so as to avoid data breaches.

Hardware for server to handle AI outputs  
The hardware required for processing AI outputs can potentially pose serious problems. Quick quizzing and document processing require powerful servers with lots of RAM; thus, it means buying high-performance servers having large memory capacities as well as ability to process information quickly to accomplish this goal.

Another issue is scalability; to avoid slowdowns or crashes, the server architecture must grow as the number of users increases. This may result in higher running expenses. In addition, routine backups, updates, and monitoring are required to keep these servers operating smoothly and effectively.

A dependable and sturdy server configuration is crucial since any outage or performance problems can have a detrimental effect on the user experience.

## Conclusion of options

In a nutshell, implementing AI in the StudyHub is with equal pros and cons except the huge benefits in learning results and auto quiz generator. Soft a integration, compatibility preservation and fault handling are traditional software tasks. But when it comes to hardware, powerful scalable servers matter most.

Combating these challenges requires a combination of careful software engineering and reliable, scalable hardware infrastructure.

With that, StudyHub can provide a convenient AI service which gives the users what they want and is actually efficient.

# Comparison

## StudyHub

**Background and Purpose:**

* Aimed at providing a comprehensive and personalized study environment.
* Uses AI to generate study materials tailored to individual needs.

**Key Features:**

* **AI-Generated Content:** Personalized quizzes and exams based on user-uploaded materials.
* **Engagement Tools:** Leaderboards, progress tracking, community features.
* **Platform and Accessibility:** Web-based with multilingual support.
* **User Interaction:** Immediate feedback, personalized study recommendations, references for incorrect answers.
* **Project Activities and Quality Assurance:** Structured phases including documentation, research, design, coding, testing, and regular feedback from the website.

## Quizizz

**Background and Purpose:**

* Enhances classroom engagement and provides a fun learning experience through quizzes.
* Suitable for both formal and informal educational settings.

**Key Features:**

* **Quiz Creation and Sharing:** Ability to create and share quizzes, large library of pre-made quizzes.
* **Interactive Learning:** Gamified elements like power-ups, memes, and timers.
* **Platform and Accessibility:** Accessible via web and mobile applications, integrates with other educational tools.
* **User Interaction:** Real-time multiplayer quizzes, self-paced learning, immediate feedback.
* **Analytics and Tracking:** Detailed reports and analytics for tracking student progress.

# Comparison Between StudyHub and Quizizz

|  |  |  |
| --- | --- | --- |
| Feature/Aspect | StudyHub | Quizizz |
| Personalization | AI-generated, highly personalized study materials | Custom quizzes, less personalized feedback |
| Content Generation | User-uploaded materials processed by AI | User-generated quizzes, large pre-made library |
| Engagement and Gamification | Leaderboards, community interaction | Gamified elements, power-ups, memes |
| Platform and Accessibility | Web-based, multilingual support | Web and mobile platforms, educational integrations |
| User Interaction | Immediate feedback, study recommendations, references | Real-time quizzes, self-paced learning, feedback |
| Feedback and Tracking | Personalized recommendations, progress tracking | Detailed reports, analytics for teachers |
| Use Cases | Personalized exam preparation, comprehensive study | Engaging, interactive classroom and homework tool |

# Conclusion

To conclude, AI integration in the StudyHub platform can highly optimize learning results and simplify quiz creation. This also brings a range of challenges: server hardware requirements, software programming, you name it. It highlights the importance of robust frameworks, effective API interactions, continuous program monitoring, and error rectification. In terms of hardware, it underlines the need for investment in servers that can scale and deliver high performance to accommodate an increased user base and still provide the highest level of performance at maximum load.

With these proposed improvements in practice, StudyHub can ensure that the platform is more reliable, efficient, and user-friendly. Alongside fixing the challenges and problems in existent, this features-set would eventually make StudyHub emerging as an up-to-date learning resource capable of dynamic change to suit the changing needs of its users. Ideally, to maintain the relevance of the educational technology world, upgrade and on-going user input.

# Appendix

Golang references

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Rubyonrails.org, <https://guides.rubyonrails.org/active_record_basics.html>