DEVELOPING A WEB-BASED PLATFORM THAT WILL AID PROGRAMMERS IN SOLVING PROGRAMMING ERRORS.

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

NDUNG'U ALEX META

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A project submitted to the department of COMPUTER SCIENCE in the school of COMPUTER SCIENCE AND INFORMATION TECHNOLOGY in partial fulfillment of the requirements for the award of the degree of BACHELOR OF SCIENCE IN COMPUTER SCIENCE of DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY.

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DECLARATION

This proposal is my original work and has not been presented for any other award to the best of my knowledge.

Name: ….....

Signature: ..... Date: .....

This proposal has been submitted for examination with my approval as supervisor.

Name: ….....

Signature: ..... Date: .....

DEDICATION

I dedicate my Final Year Project to my family and friends. A special feeling of gratitude to my loving parents, Wilson Meta and Joyce Muniu whose words of encouragement and push for tenacity ring in my ears.

I also dedicate my Final Year Project to my friends who supported me throughout the process and gave me ideas on how to improve the project.

ACKNOWLEDGEMENT

I wish to first thank the Almighty God for the strength and support He has given me throughout the research and development of this project. I would also like to thank my family and friends for their support offered during this period. May God bless you all.

ABSTRACT

A bug is an error or flaw in a computer program. Every programmer spends a substantial amount of time fixing these errors throughout the development life cycle. However, it is at times very frustrating to find solutions and could even take weeks to fix. This study focuses on developing a platform where programmers can easily find the solutions they are looking for.

The functional and non-functional requirements were generated from data collected from the questionnaires, record reviews and interviews carried out. Agile methodology was used to develop the system since it allows changes far into the development cycle. Figma was the tool used to design the user interface of the website. Due to the huge amounts of data expected to be processed in the platform, python programming language was chosen since it is flexible and fast in handling huge amounts of data. For the database, PostgreSQL was selected since it is fast and easy to configure and design.

Testing involved two steps in every sprint in the agile methodology. The first was going through the code with a fine-tooth comb to find any errors made in the process of the sprint. The second phase involved user response where several users engaged with the system and pointed out the mistakes they observed. Such kinds of platforms should be built to ensure adequate resources are available for programmers to correct these mistakes

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CHAPTER ONE

1 INTRODUCTION

1.1 Background

Debugging, in computer programming and engineering, is a multistep process that involves identifying a problem, isolating the source of the problem, and then either correcting the problem or determining a way to work around it(Matt Heusser, n.d.). Despite the level of experience, it takes a substantial amount of time to make sure one's code is bug-free. The engineering and design of the code plays a key factor in either preventing or causing lots of stress and force in the development life cycle(O'Dell, n.d.). Also, the more lines of code there are, the higher the chances of spending more time debugging.

For beginners, it can get tough and frustrating to debug their code since they have not grasped the rules behind the language, they are programming in. Despite there being tools like *Stack Overflow* and *Code Project* to help them debug their code, it still takes time because they must first understand how these tools work.

Most of the time, these tools are not welcoming for unaccustomed users. Since they have been there a long time, they have been advanced to suit the high demand. As a result, they become too much for inexperienced users even if there are available tutorials online. This implies that they will not use the power of these tools to their fullest potential.

Posting questions in these tools does not necessarily imply that they will be answered. This is because there are millions of questions being asked simultaneously. Moreover, there is no assurance that after you ask your question, you will get the exact answer you are looking for. In other circumstances, users on these platforms who consider themselves experts ignore questions that they judge as simple.

Platforms like *Stack Overflow* have a reputation system that favors the experts and destroys the beginners. Newcomers who ask questions that seem simple or ignorant are voted down harshly. This negates the purpose that these platforms were built. Other platforms like *Quora* and *Reddit* have shifted from being question-and-answer forums to social media-like platforms. As a result, so much irrelevant data is floating in their databases hence frustrating the process of answer finding.

A huge bunch of users go into these platforms to pour out their anger. There are so many cases of cyberbullying and social critics. This destroys serious users who genuinely want to find answers. In addition, it becomes difficult to genuinely interact with these platforms due to the fear of critics.

Locally, most programmers do not even bother to ask questions on these platforms when they are faced with errors. Instead, they prefer scrolling through samples of answers related to their question in hopes of getting a suitable answer. This method is slow and tedious which in turn slows their project's development life cycle. Other developers prefer to ask for help from colleagues. This is relatively effective but only if by chance these colleagues are more experienced in that language or happen to know the answer.

1.2 Statement of the problem

A software bug is an error, flaw, or fault in the design, development, or operation of computer software that causes it to produce an incorrect or unexpected result, or to behave in unintended ways(*What Are Software Bugs? | TotalView*, n.d.). There is absolutely no way to know how long debugging takes, it could be minutes, hours, or even days.

Despite there being available tools like *Stack Overflow* and *Code Project* to help programmers debug their code, it is still a very painful process. There is no assurance that if you ask questions in these forums, you will get a response. Furthermore, you might get answers but they end up all being irrelevant.

This tool will provide a platform where all kinds of developers despite their level of experience will be able to interact and get answers to the problems they might have. Unlike other platforms, this tool will have a live chat module which will greatly increase the chances for these developers to get the answers they might be looking for.

1.3 Objectives

1.3.1 General Objective

To provide a platform for programmers to ask and answer questions concerning programming with services that will enhance one-to-one engagement.

Specific Objectives

(i) To evaluate how the structure and composition of a programming question affect how effectively it is answered.

(ii) To evaluate how the syntax and rules of a programming language affect the way a question in that language is structured.

(iii) To evaluate how interactive services like chats improve engagement in the programming community.

(iv) To investigate how to share screen complements gaps left by other interactive services.

(v) To evaluate how effective online payment services are and how often users unlock premium services in online platforms.

1.4 Research Questions

(i) How does the structure and composition of a programming question affect how effectively it is answered?

(ii) How do the syntax and rules of a programming language affect the way a question in that language is structured?

(iii) How do interactive services like chats improve engagement in the programming community?

(iv) How would a share screen module complement the gaps left by other interactive services?

(v) How effective are online payment services and how often do users unlock premium services on online platforms?

1.5 Justification

Software development is a huge factor affecting the growth and development of the economy in the world today. This implies that the smoother the process of software development is, the more the economy grows. Bugs are inevitable factors that hinder the rapid release of the software(*10 Reasons Why There Are Software Bugs/Defects in Software*, n.d.). This tool will aid developers to find solutions to the bugs they face. The addition of the live chat and screen share will further aid those with questions to find precise answers from other developers.

1.6 Scope

This study mainly focuses on software developers. Despite the level of experience, bugs are a universal factor that hinders the rapid delivery of software from these developers. Furthermore, beginners who are starting programming will greatly benefit from this study since they will be able to interact with more experienced programmers.

2 LITERATURE REVIEW

2.1 Introduction

There are a couple of questions-and-answers platforms already available. For this study, we will consider *Stack Overflow*, *Code Project*, *Reddit*, and *Quora*.

2.2 Case Studies

2.2.1 Case Study 1: Stack Overflow

Stack Overflow is a question-and-answer website for professional and enthusiast programmers(Sachs Jason, n.d.). Developers use tags referring to technologies to label questions to support searching and filtering. Furthermore, it has machine learning models like a random forest to further classify questions depending on the tags from different users.

It has a reputation system in which a user earns points when they either answer questions correctly or ask questions that need lots of research. This system plays a key role in creating job opportunities for these them. The downside to this is that the reverse also happens. If a user asks a question that can be referred to as easy, they are voted down. It could even escalate to the point where their account is closed.

Their ask-questions template offers lots of options. From code blocks, bold writings, and even italics. However, these options are all cramped up in one section hence this page is considered somewhat intimidating. The best approach would have been to separate these options which would make it easy to use and interact with. Their view answer template is detailed and well-designed hence understanding the questions is amazingly easy.

2.2.2 Case Study 2: Quora

Quora is a community-based questions and answers website and app(Montti Roger, n.d.). Every piece of content on the site is generated by users, meaning it is created, edited, and organized by the same people that use the website. It allows users to create social networks and follow topics that interest them. Questions can only be asked and answered by people who have an account already created.

Quora's ask questions section is more of a pop-up rather than a whole template. This means that the style in which you can pose your questions is greatly limited. For instance, there is no way to add a code block as you would in *Stack Overflow*. Also, compared to *Stack Overflow* where you only can ask questions, here you can also create a post which is more of a social media platform feature.

The space feature enables you to create communities and curate collections around specific topics of interest. Here, users can discuss topics to which they have a common liking to hence creating a sense of community. Another feature of Quora is the voting option. If a user sees a response that they think perfectly answers the question presented, they can upvote it. On the other hand, if they see an answer that is inaccurate and uninformative, they can downvote it.

The number of upvotes and downvotes on a particular response will affect its visibility. If a response has a lot of upvotes, it is seen as valid and Quora will push it to the top of the response list. If an answer has more downvotes, users see it as invalid and Quora will not prioritize it for others to see.

2.2.3 Case Study 3: Reddit

Reddit is a vast network of communities that are created, run, and populated by you, the Reddit users(*Content Policy - Reddit*, n.d.). Also, it is a platform where users can ask and answer questions which are the form of posts. Unlike *Stack Overflow* which is all about programming, Reddit incorporates all kinds of questions, even the unprofessional caliber.

It has an amazing design compared to *Stack Overflow* which is cramped. Everything is typically straightforward when you log in. The create post page has lots of items that you could add to your post from images, videos, and even code snippets. A user can either select markdown mode or fancy pants mode depending on how much information will be in your post or question. However, due to this many options, it could get kind of frustrating for a beginner since there is no preview option.

For a programmer, using Reddit would get very frustrating since most of its users are after social media services and entertainment. This sort of question could even get voted down which would bury it in tones and tones of data hence it would end up not getting answered. The only solution would be to join or create a coding community in which all the content would be about a particular programming language.

2.2.4 Case Study 4: Code Project

Code Project is a community for computer programmers with articles on different topics and programming languages(*CodeProject. A Guide. - CodeProject*, n.d.). Here, programmers can ask and answer programming questions related to any language. They can read articles related to any language and topic they choose. Also, they can start or join discussions related to programming.

The home page after logging in is majorly made up of articles. However, it is cramped and awfully hard to distinguish exactly what you want. Users can filter the articles they wish to read by clicking on the keyword they are interested in. This is barely effective since it drops all the data on you for you to travel through the pages and find what you want. The search bar is at the top right which is too tiny to use.

Asking a question template is relatively easy to use. It has a section where you type the question followed by what you have tried which is a nice approach compared to the rest of the case studies. However, like Stack Overflow, a user has all the options crumped together in one little space. Unlike Reddit, here you can preview your question and make the relevant changes. Also, a user can create a discussion if that question requires a forum to find the solution. Unfortunately, the discussion page is poorly designed hence very difficult to follow through with the conversation.

2.3 Summary

All of our case studies are perfect examples of question-and-answer forums. However, there are also big differences between them. Both *Code Project* and *Stack Overflow* are majorly dedicated to software developers while *Quora* and *Reddit* are more of social media platforms. They also have a couple of similarities especially when it comes to the design of the add questions section.

The interface designs of both *Stack Overflow* and *Code Project* have so many flaws. For example, both of this platform's home pages are cramped with data that is not easy to interpret especially for beginners. *Quora* and *Reddit* on the other hand are shifting to be more like social media platforms hence it is getting harder and harder to get answers from them.

2.4 Research Gap

All these case studies bring an idea of community and discussion, however, there is no help beyond this. The one who has asked the question has to scroll through all of the answers to find the most correct answer.

2.5 Proposed Methodology

To close this gap, a live chat system accompanied by a screen share service would ease the process of finding the correct answer. Programmers would not need to necessarily scroll through so many questions, they would only have to get clarification directly from those who've supplied the answers.

3 METHODOLOGY

3.1 Introduction

System methodology structures, plans, and controls the process of developing an information system. It improves the system development productivity and quality by providing means of improving the management and control of the software development process. This chapter entails the fact-finding techniques and the development life cycle involved in system development.

3.2 Fact-Finding Techniques

Fact-finding techniques are a process of collection of data and information based on techniques that contain a sampling of existing documents, research, observation, questionnaires, interviews, prototyping, and joint requirements planning(*Fact Finding Techniques || Fact Finding Techniques for Requirements*, n.d.). The fact-finding techniques used for the research were interviews, record reviews, and questionnaires. These techniques were used in the early stage of the System Development Life Cycle which included the system analysis phase, design, and post-implementation review.

3.2.1 Interviews

An interview is the most used technique to collect information from face-to-face interviews. The purpose of the interview was to find, verify, and clarify facts, motivate end-users involved, identify requirements, and gather ideas and opinions(*Fact Finding Techniques || Fact Finding Techniques for Requirements*, n.d.). Both newbies and experienced programmers were interviewed to identify how bugs affect their productivity. The interviews mainly took place in universities where there is a vast number of programming students. Also, developers from established companies were interviewed to have a better understanding of both worlds.

3.2.2 Record Review and Background Reading

The information related to the system is published in the sources like websites, newspapers, magazines, journals, documents, etc. This record review helps the analyst to get valuable information about the system. Various websites visited included the stack overflow website, code project website, and Quora.

3.2.3 Questionnaires

Questionnaires are useful fact-finding techniques to collect information from many users. Users fill in the questions which are given by the system analyst and then give the answers back to the system analyst. Google forms is a free online software that allows users to create questionnaires and send them to other users(*The Beginner's Guide to Google Forms*, n.d.). The only requirement is a google account. This greatly aided data collection since most of the programmers uses their google account to sign into platforms like GitHub and Stack Overflow.

3.3 Software Design – Software Development Procedures

The system-development life cycle enables developers to transform a newly-developed project into an operational one. Agile methodology was used in the implementation of this system. It is a project management framework that breaks projects down into several dynamic phases, commonly known as sprints.

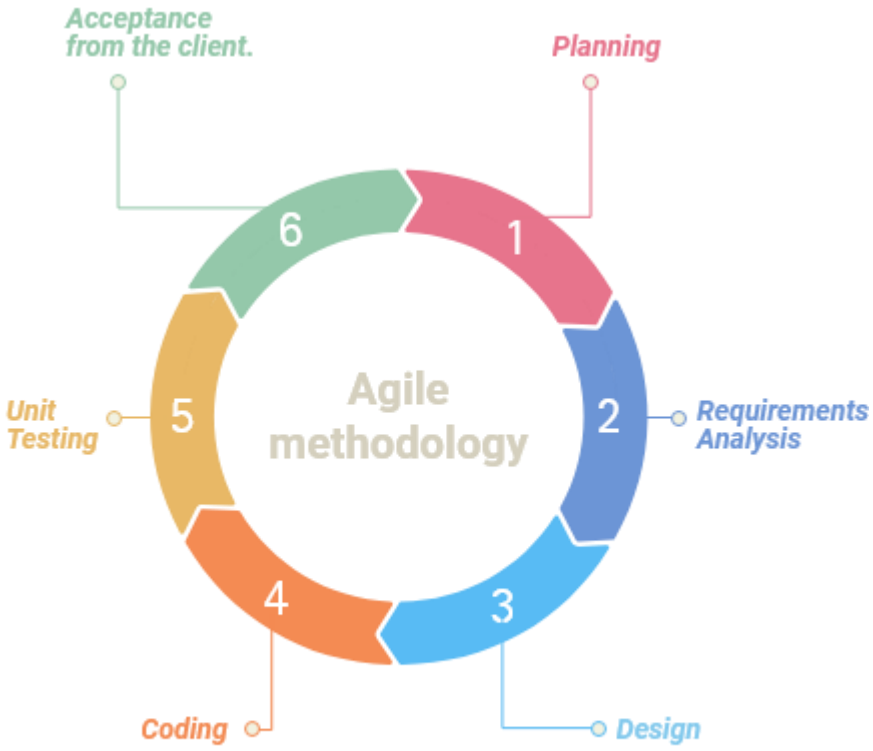

Figure 1 Agile Cycle

3.3.1 Planning Stage

It is the phase in which the developer plans for the upcoming project. It helps to define the problem and scope of any existing systems, as well as determine the objectives for their new systems. By developing an effective outline for the upcoming development cycle, they'll theoretically catch problems before they affect development. Fonts and themes to be used in the

design stage were selected, requirements were outlined, and appropriate tools to accomplish the development were chosen.

3.3.2 Analysis Stage

The analysis stage includes gathering all the specific details required for a new system as well as determining the first ideas for prototypes.

The developer may:

- Define any prototype system requirements.
- Evaluate alternatives to existing prototypes.
- Perform research and analysis to determine the needs of end-users.

The requirements were analyzed to generate the functional and non-functional requirements.

3.3.3 Design Stage

The design stage is a necessary precursor to the main developer stage. Developers will first outline the details for the overall application, alongside specific aspects, such as its:

- User interfaces
- System interfaces
- Network and network requirements
- Databases

Figma was the tool used to design the UX and UI of the system and *inter* was the font applied.

3.3.4 Development Stage

The development stage is the part where the developer writes code and builds the application according to the earlier design documents and outlined specifications. The product program code is built per the design document specifications. In theory, all of the prior planning

and outlining should make the actual development phase relatively straightforward. Visual Studio Code was the editor used in the coding process. It is built by Microsoft and is compatible with Windows, Linux, and Mac. PostgreSQL, which is an open-source database that has a strong reputation for its reliability, flexibility, and support of open technical standards was used. Django written in python was the framework the platform was built on.

3.3.5 Testing Stage

Building software is not the end. Now it is tested to make sure that there aren't any bugs and that the end-user experience will not negatively be affected at any point. During the testing stage, the developer goes over their software with a fine-tooth comb, noting any bugs or defects that need to be tracked, fixed, and later retested.

3.3.6 Implementation and Integration Stage

After testing, the overall design for the software will come together. Different modules or designs will be integrated into the primary source code through developer efforts, usually by leveraging training environments to detect further errors or defects. The information system is integrated into its environment and eventually installed. After passing this stage, the software is theoretically ready for market and may be provided to any end-users.

3.3.7 Maintenance Stage

The SDLC doesn't end when software reaches the market. The developer now moves into maintenance mode and begins practicing any activities required to handle issues reported by end-users. Furthermore, the developer is responsible for implementing any changes that the software might need after deployment. This can include handling residual bugs that were not able to be patched before launch or resolving new issues that crop up due to user reports. Larger systems may require longer maintenance stages compared to smaller systems.

3.4 Preliminary Data Processing and analysis

The objectives of preliminary data analysis are to edit the data to prepare it for further analysis, describe the key features of the data, and summarize the results(*8. Chapter 7 - Data Preparation and Preliminary Data Analysis*, n.d.).

3.4.1 Editing

The usual first step in data preparation is to edit the raw data collected through the questionnaire. Editing detects errors and omissions, corrects them where possible, and certifies that minimum data quality standards have been achieved. The purpose of editing is to generate data that is: accurate; consistent with the intent of the question and other information in the survey; uniformly entered; complete; and arranged to simplify coding and tabulation. Since Google Forms was the questionaries used, minimum errors in answering occurred hence no need for editing.

3.4.2 Coding

Coding involves assigning numbers or other symbols to answers so the responses can be grouped into a limited number of classes or categories. Specifically, coding entails the assignment of numerical values to each response for each question within the survey. The classifying of data into limited categories sacrifices some data detail but is necessary for efficient analysis. The google forms response panel automatically transforms the responses into a form that can be statistically analyzed.

3.4.3 Data Entry

Once the questionnaire is coded appropriately, researchers input the data into a statistical software package. This process is called data entry. There are various methods of data entry. Manual data entry or keyboarding remains a mainstay for researchers who need to create a data file immediately and store it in a minimal space on a variety of media. Manual data entry is highly error-prone when complex data is being entered and therefore it becomes necessary to verify the data or at least a portion of it. The advantage of google forms is that data entry is not necessary since as the responses are coming in, they are automatically entered and classified.

3.4.4 Data Cleaning

Data cleaning focuses on error detection and consistency checks as well as the treatment of missing responses. The first step in the data cleaning process is to check each variable for data that are out of the range or otherwise called logically inconsistent data. Such data must be corrected as they can hamper the overall analysis process.

Descriptive statistics, as the name suggests, describe the characteristics of the data as well as provide an initial analysis of any violations of the assumptions underlying the statistical techniques. It also helps in addressing specific research questions(*8. Chapter 7 - Data Preparation and Preliminary Data Analysis*, n.d.). This analysis is important because many advance statistical tests are sensitive to violations in the data.

The descriptive tests provide clarity to the researchers as to where and how the violations are occurring within the dataset. Descriptive statistics include the mean, standard deviation, range of scores, skewness, and kurtosis. With the use of google forms, these statistics are calculated without the researcher's involvement and accurate results are given back in form of pie charts and bar graphs.

4 ANALYSIS AND DESIGN

4.1 Introduction

A system is a group of interacting or interrelated elements that act according to a set of rules to form a unified whole(Bogan Christine, n.d.). A system, surrounded and influenced by its environment, is described by its boundaries, structure, and purpose and expressed in its functioning(Bogan Christine, n.d.). Systems are subjects of the study of systems theory(Bogan Christine, n.d.).

System analysis can be defined as a deep analysis of a part of the structure of a module that has been designed before(Pedamkar, n.d.-b). It is conducted to study a system or its parts to identify its objectives. Also is a problem-solving technique that improves the system and ensures that all the components of the system work efficiently to accomplish their purpose. System design means making any module or a part of the structure from scratch and building it completely without estimation(Pedamkar, n.d.-b).

4.2 Requirement Analysis

Requirements analysis or requirements engineering is a process used to determine the needs and expectations of a new product(Ramachandran Saranya, 2022). It involves frequent communication with the stakeholders and end-users of the product to define expectations, resolve conflicts, and document all the key requirements.

4.2.1 Functional Requirements

They indicate what a software system must do and how it must function; they are product features that focus on user needs(Jafari Ladan, 2020). Functional requirements are a part of requirement analysis (also known as requirements engineering), which is an interdisciplinary field of engineering that concerns the design and maintenance of complex systems(*What Is Functional Requirements? - Definition from WhatIs.Com*, 2022).

Functional requirements describe the desired end function of a system operating within normal parameters, to assure the design is adequate to make the desired product and the end product reaches its potential the design to meet user expectations(*What Is Functional Requirements? - Definition from WhatIs.Com*, 2022).

Functional Requirement	Description	Example
Authorization Levels	These functions determine various system access levels and decide who can CRUD (change, read, update, or delete) information.	• Users can create an account but cannot delete the account. • The admin can delete users from the system. • Users can post questions and delete them but only after the consent of the admin. • Users can post answers to the questions asked. • Admin can create languages to be used as tags by users. • Admin can create frameworks associated with these languages.
External interfaces	These functions concern the external interface of systems other than the main system.	• User should either get authenticated via GitHub API or LinkedIn API. • Payment for the premium feature should be either via PayPal or M-Pesa.

Search/Reporting Requirements	This section of requirements will tell you how users can search and retrieve data.	• A robust machine learning search engine should be available for users to find questions and answers. • The admin should be able to search for specific users.
Databases	The elements and formats you should use when defining what data needs storing in a system.	The following will be stored in the database: • Users/Profiles • Questions • Answers • Chats • Payment Transactions • Languages • Frameworks
Transaction corrections, adjustments, and cancellations	These requirements examine every transaction's entry, changing, deleting, canceling, and error checking.	• Users will make payments for the premium feature via PayPal or M-Pesa • Users should be able to cancel the premium payment transaction. • Users should be able to change their payment credentials.

4.2.2 Non-functional Requirements

A nonfunctional requirement is an attribute that dictates how a system operates. It makes applications or software run more efficiently and illustrates the system's quality (9 Nonfunctional Requirements Examples | Indeed.Com, n.d.). Nonfunctional requirements differ from functional requirements in the following ways:

- **Mandatory vs Non-Mandatory** - In contrast to functional requirements, nonfunctional features are not mandatory for a system to operate. Instead, these features can help differentiate an application from other products on the market (9 Nonfunctional Requirements Examples | Indeed.Com, 2021).
- **Basic operations vs Additional features** - Functional requirements encompass what a system does, while nonfunctional requirements cover how a system completes a task. For example, the functional duty of a camera is to take pictures. The nonfunctional duty is to take pictures with enhanced focus and clarity (9 Nonfunctional Requirements Examples | Indeed.Com, 2021).
- **Intended Purpose vs Customer Expectations -** While functional requirements focus on the purpose of an application, nonfunctional requirements center on the users' expectations, such as the product's performance (9 Nonfunctional Requirements Examples | Indeed.Com, 2021).

Non-Functional Requirements	**Description**	**Examples**
Speed	Speed determines how fast an application responds to commands	• The search engine incorporates machine learning to aid in categorizing the result of the search. • Data from the database is retrieved via Ajax calls which speeds up the get process.

		• Data is posted via Ajax call so that the page doesn't refresh after a submission.
Security	Security features are necessary to protect sensitive information in the application.	• The system requires users to create accounts so that they can ask and answer questions. • Authentication is done via GitHub or LinkedIn API since they are well-built and secure.
Portability	Portability means how effectively a system performs in one environment compared to another.	• The website is highly responsive and hence can be used on different-sized devices.
Compatibility	Highly compatible systems typically function well when other applications are running on a device.	• The website loads in all available web search engines.
Usability	Usability refers to the ability to use a particular product	• The website has informative icons to help the user navigate through the pages easily.
Localization	A localized application has features that match the	• The website uses English as its prime

	geographical location of its users	language since most of the programmers are conversant with it.

4.3 Data Analysis

Data analysis is the process of collecting, modeling, and analyzing data to extract insights that support decision-making(Calzon Bernardita, 2022). The following bar graphs and pie charts represent the data obtained from the questionnaires and interviews.

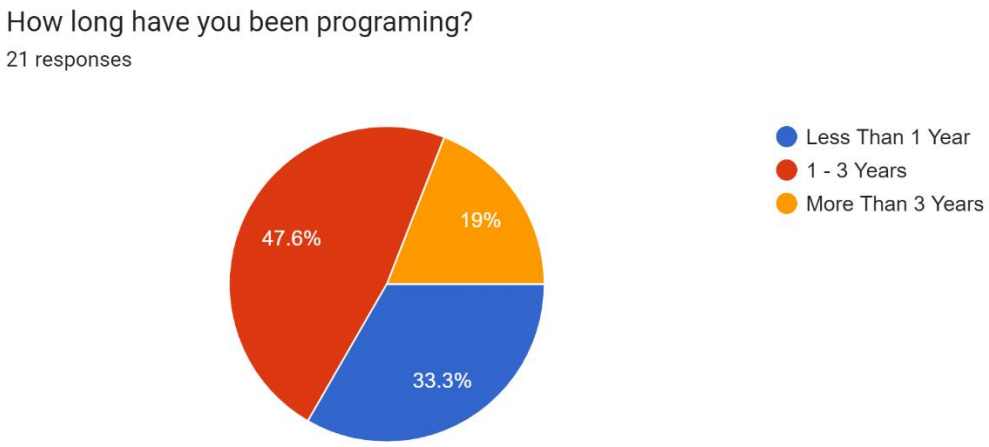

Figure 2 How long have you been programming?

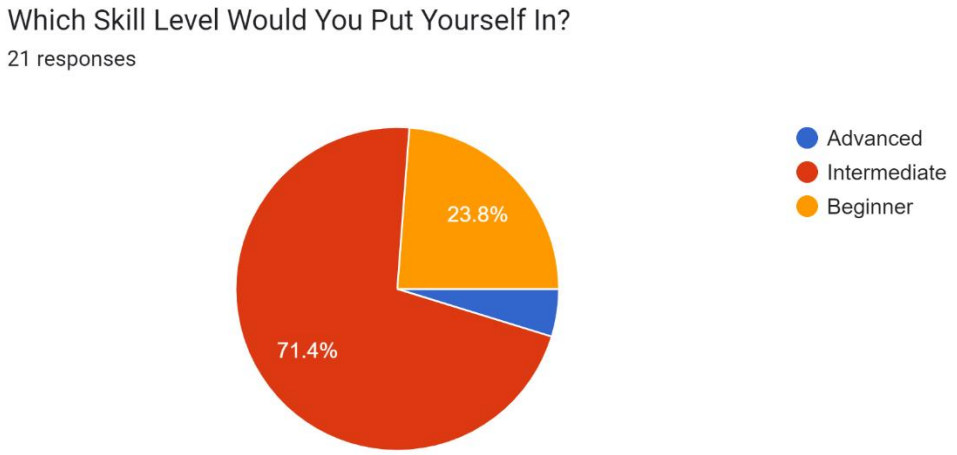

Figure 3 Which skill level would you put yourself in

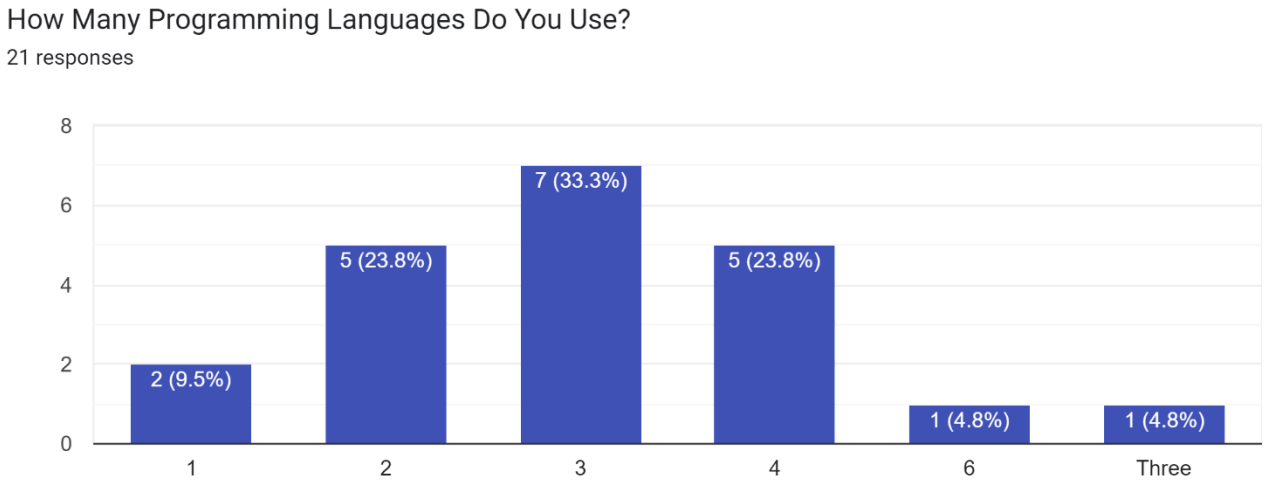

Figure 4 How Many Programming Languages Do You use

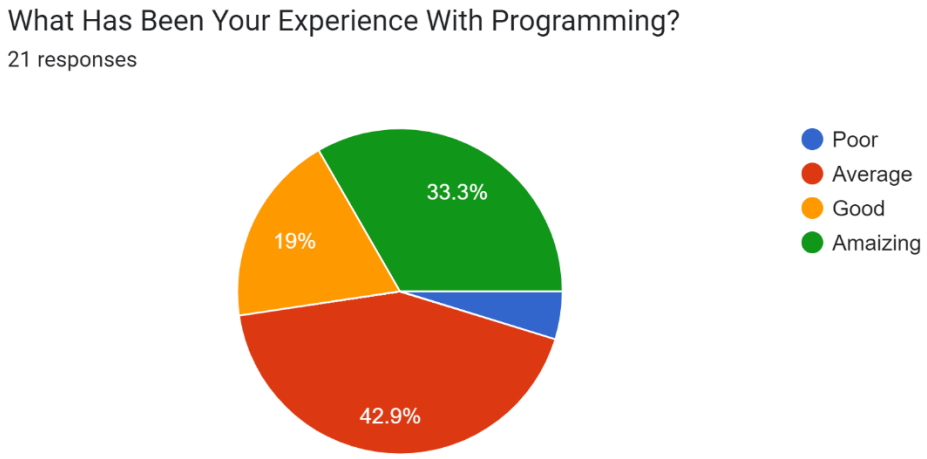

Figure 5 What has been your experience with programming

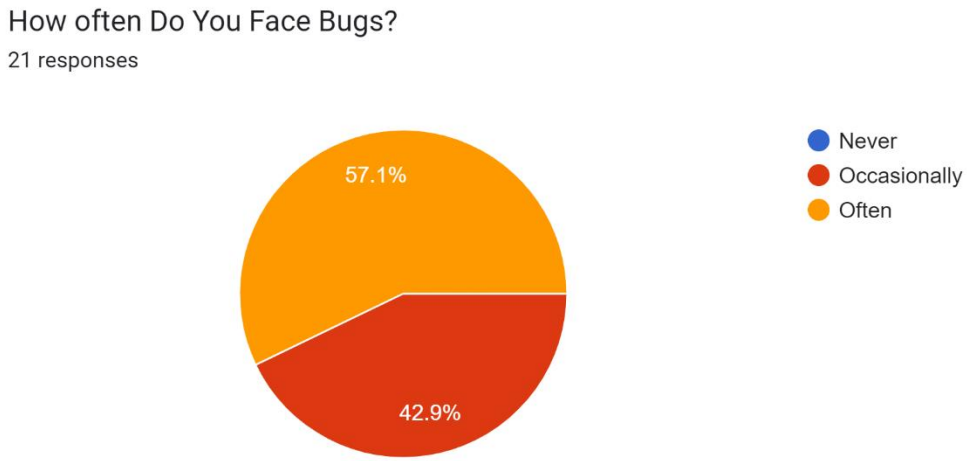

Figure 6 How Often Do You Face Bugs

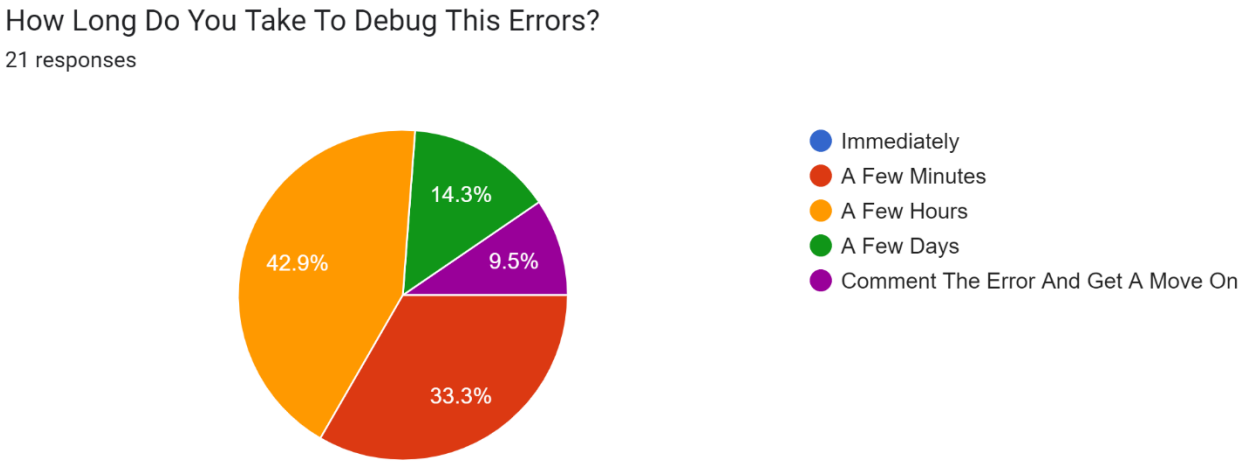

Figure 7 How Long Do You Take To Debug This Errors

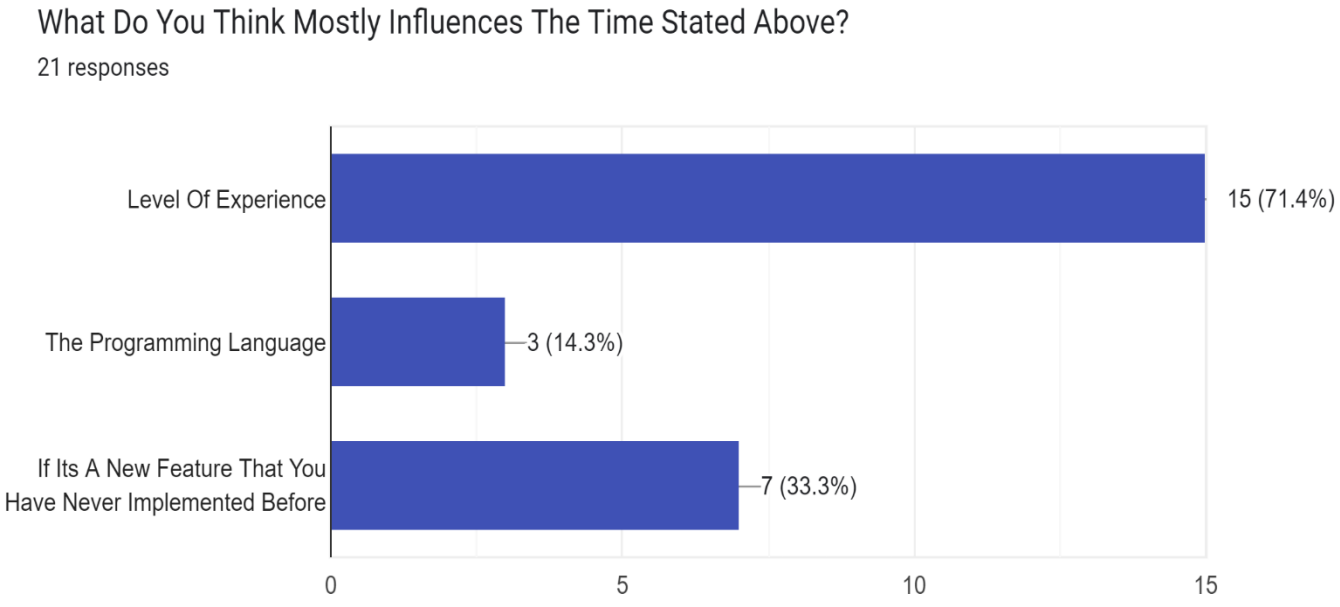

Figure 8 What Do You Think Mostly Influence The Time Stated Above

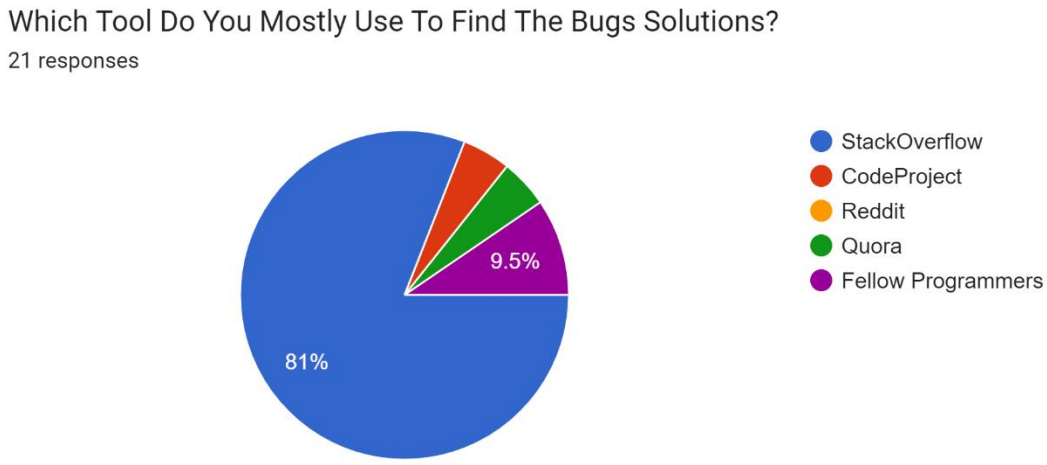

Figure 9 Which Tool Do You Use To Find The Bugs Solutions

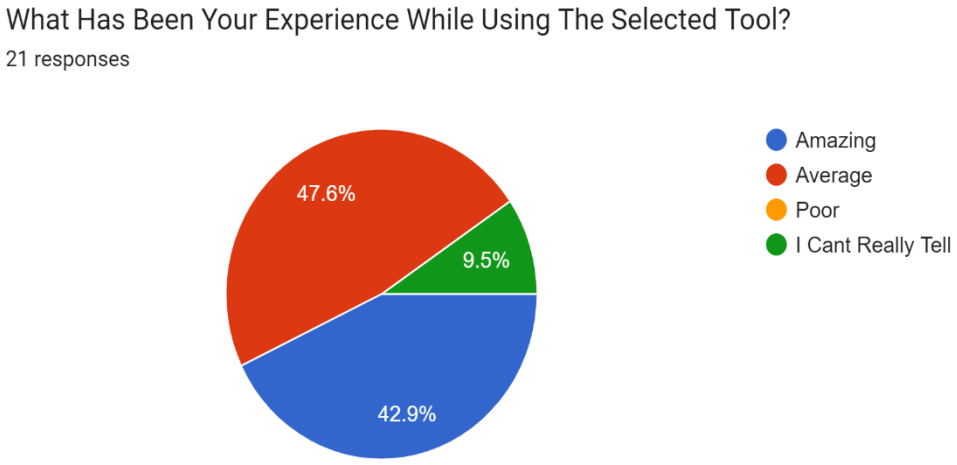

Figure 10 What Has Been Your Experience While Using The Selected Tool

4.4 System Analysis

System analysis can be defined as a deep analysis of a part of the structure of a module that has been designed before(Pedamkar, n.d.-b). It is conducted to study a system or its parts to identify its objectives. Also is a problem-solving technique that improves the system and ensures that all the components of the system work efficiently to accomplish their purpose.

4.4.1 Use Case Analysis

Use case analysis, in simple terms, represents the various ways a software would react based upon the input that it receives(*Use Case Analysis: Tutorial & Examples | Study.Com*, n.d.). Consider the example of a person interacting with a social networking site. The various ways in which he or she interacts, and the results derived from that interaction could be captured in the form of a use case analysis(*Use Case Analysis: Tutorial & Examples | Study.Com*, n.d.).

Figure 11 Use Case Diagram

4.4.2 Class Diagram

The class diagram is one of the types of UML diagrams that are used to represent the static diagram by mapping the structure of the systems using classes, attributes, relations, and operations between the various objects(Pedamkar, n.d.-a).

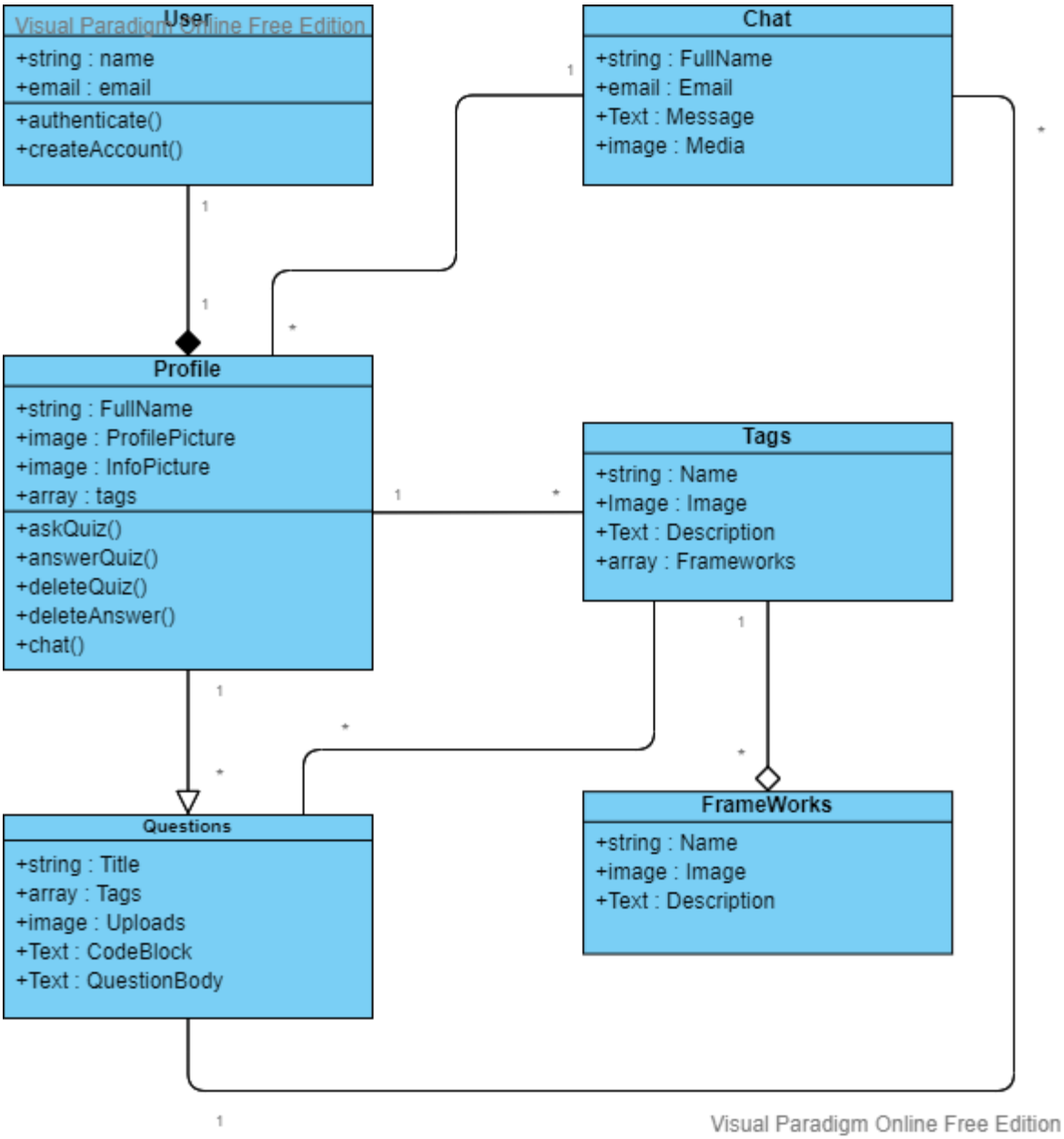

Figure 12 Class Diagram

4.4.3 Data Flow Diagram

A data flow diagram (DFD) maps out the flow of information for any process or system(*What Is a Data Flow Diagram | Lucidchart*, n.d.). It uses defined symbols like rectangles, circles, and arrows, plus short text labels, to show data inputs, outputs, storage points, and the routes between each destination(*What Is a Data Flow Diagram | Lucidchart*, n.d.).#

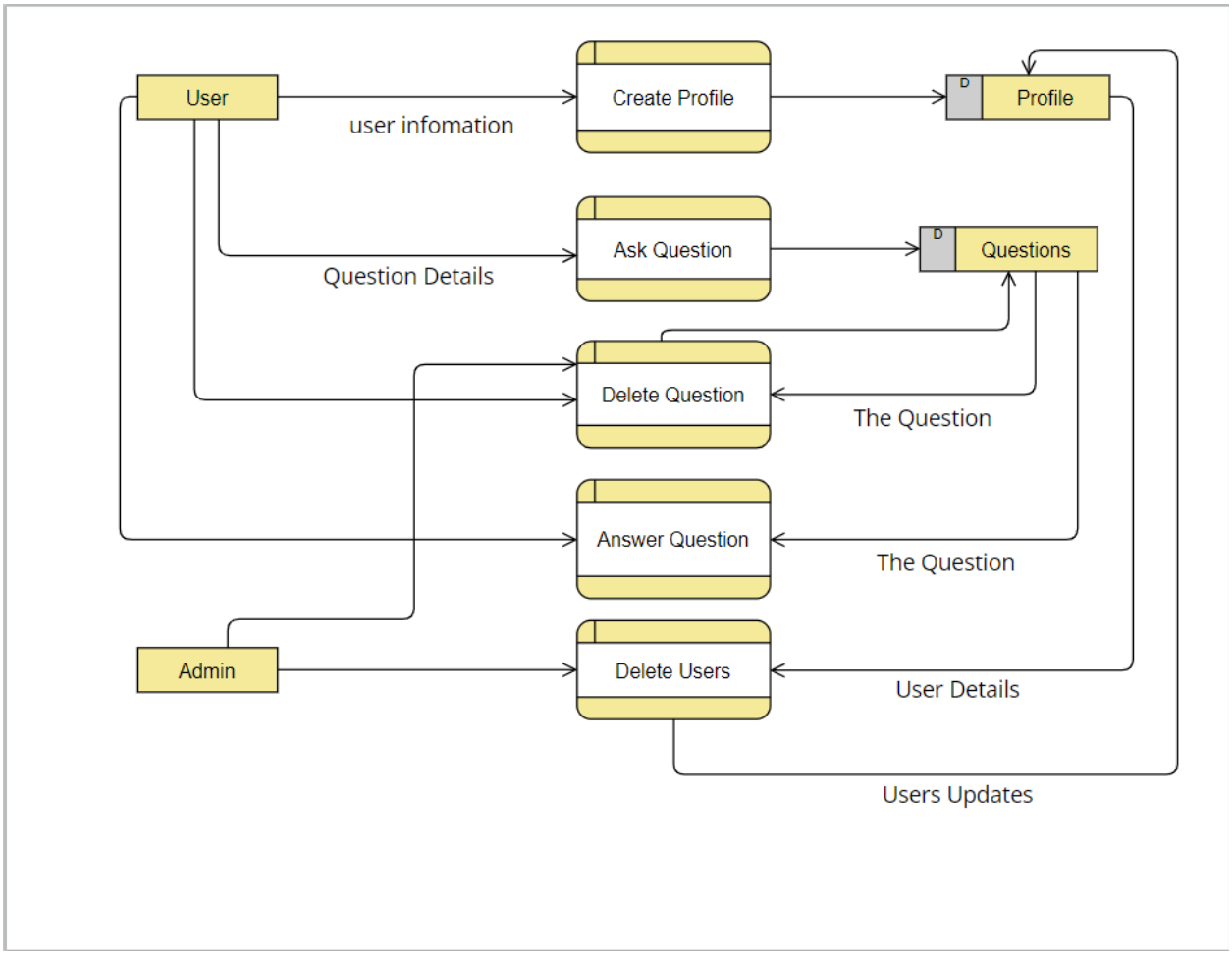

Figure 13 DFD Diagram

4.4.4 Context Diagram

A context diagram is a visual representation of the relationship between data and business processes(Opinaldo Norlyn, n.d.). This diagram has 3 main components which include external entities, system processes, and data flows. It provides the factors and events you need to consider when developing a system(Opinaldo Norlyn, n.d.).

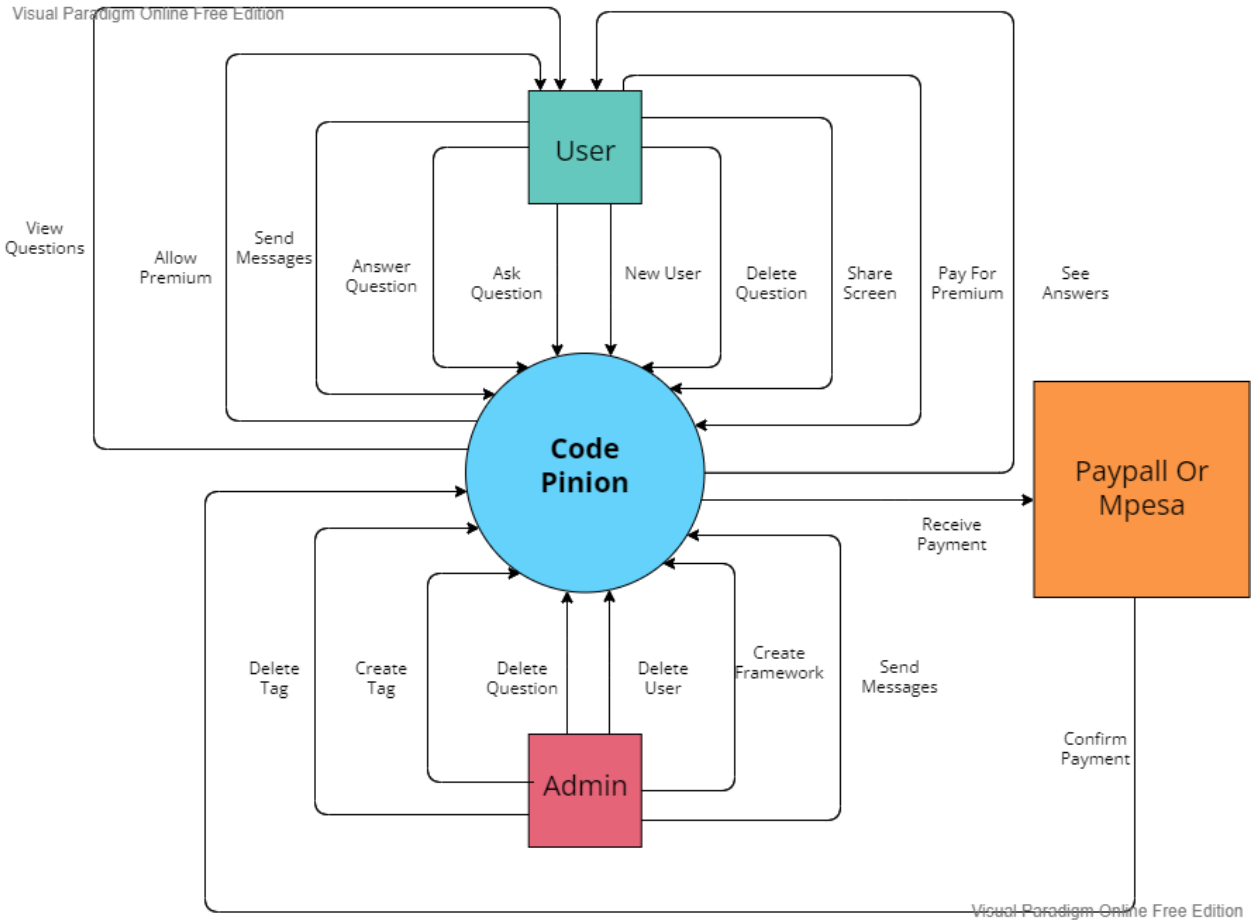

Figure 14 Context Diagram

4.4.5 Sequence Diagram

Sequence diagrams describe interactions among classes in terms of an exchange of messages over time(Sequence Diagrams - What Is a Sequence Diagram? n.d.). They're also called *event diagrams*. A sequence diagram is a good way to visualize and validate various runtime scenarios. These can help to predict how a system will behave and to discover responsibilities a class may

need to have in the process of modeling a new system(Sequence Diagrams - What Is a Sequence Diagram? n.d.).

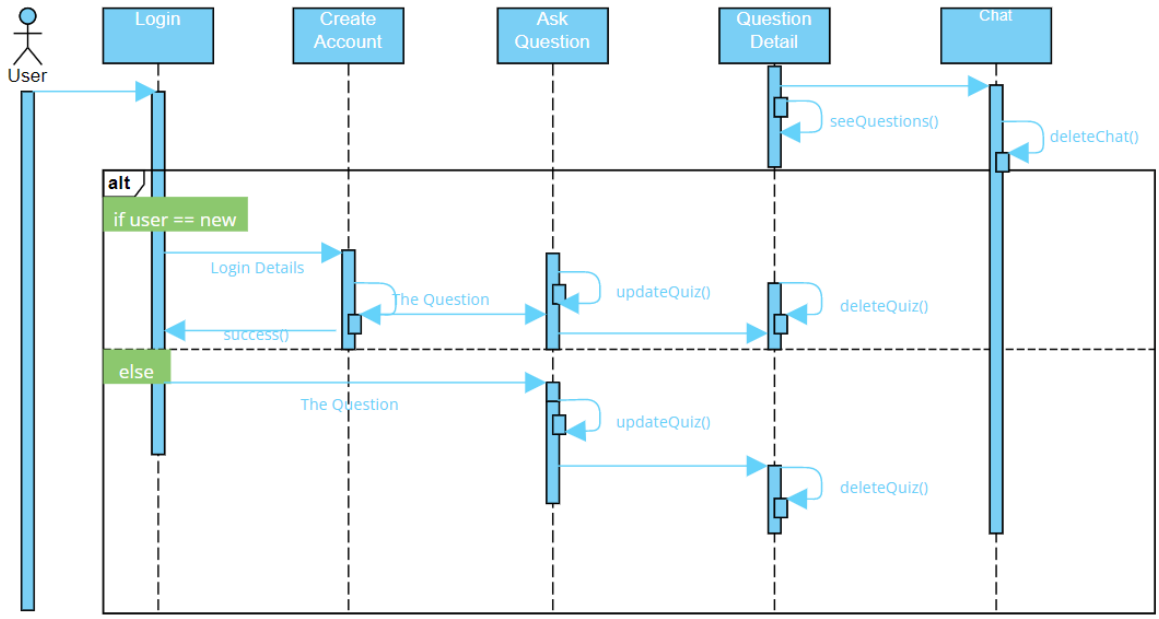

Figure 15 Sequence Diagram

4.4.6 System Flow Chat

A flowchart is a visual representation of the sequence of steps and decisions needed to perform a process(*Flowchart - Process Flow Charts, Templates, How To, and More*, n.d.). Each step in the sequence is noted within a diagram shape. Steps are linked by connecting lines and directional arrows. This allows anyone to view the flowchart and logically follow the process from beginning to end(*Flowchart - Process Flow Charts, Templates, How To, and More*, n.d.).

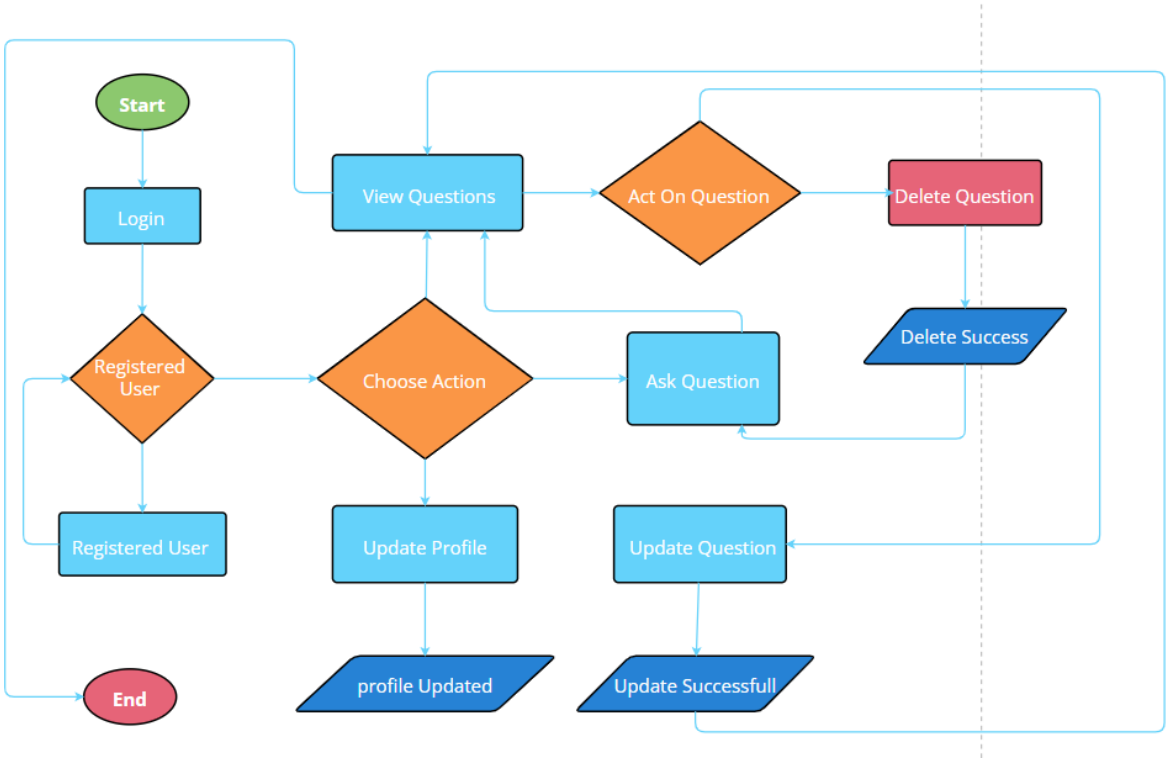

Figure 16 System Flow Chat

4.4.7 Entity Relationship Diagram

An entity relationship diagram is a type of flowchart that enables you to illustrate how entities (people, objects, or concepts) relate to each other inside a system(Roxanna Evan, 2022). To capture an intuitive picture of a system, ER diagrams use a set of symbols such as triangles, rectangles, diamonds, ovals, and lines that display the relationships between entities(Roxanna Evan, 2022). A typical entity diagram mirrors grammatical structure: entities are expressed as nouns, and relationships are portrayed as verbs(Roxanna Evan, 2022).

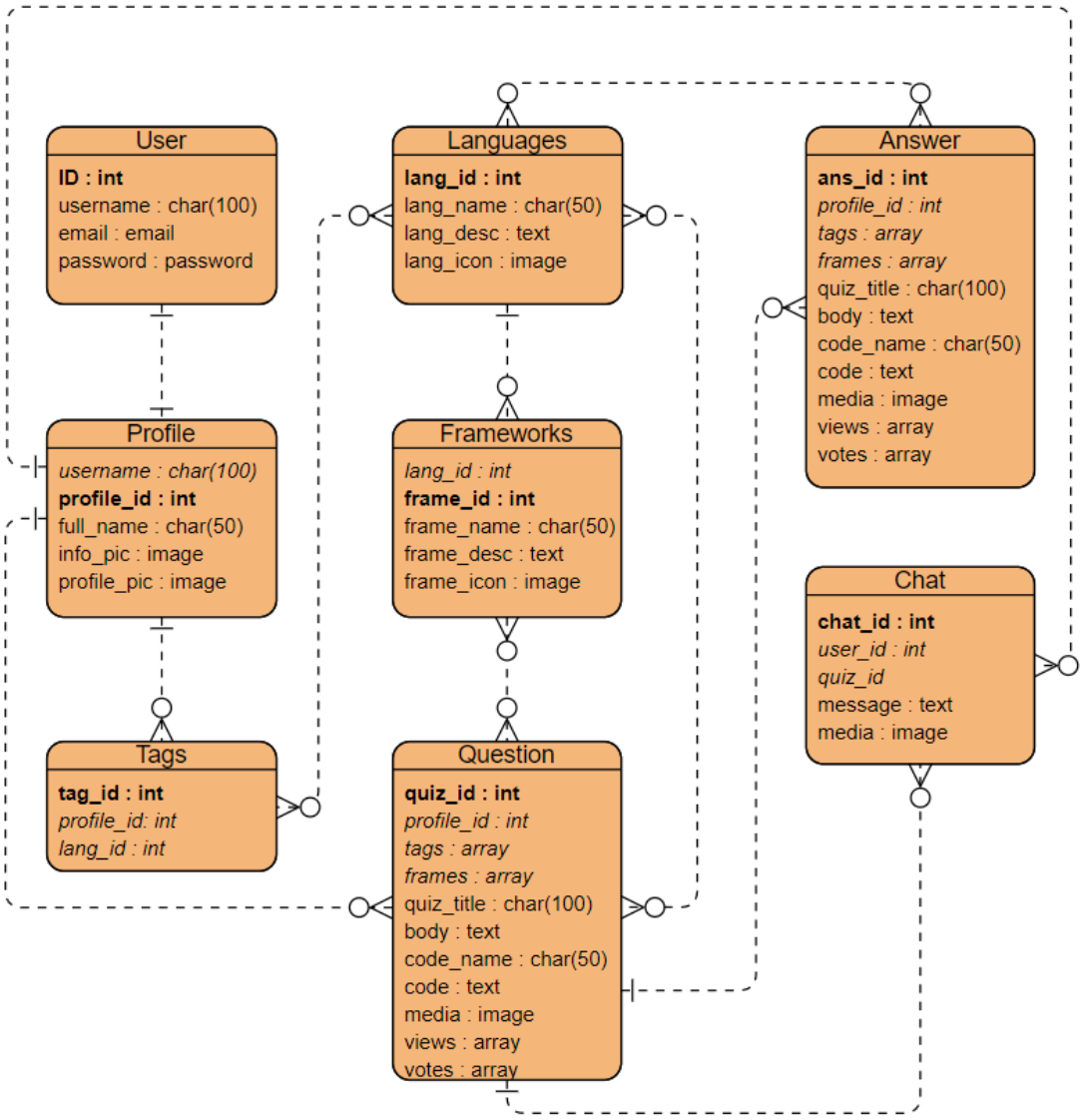

Figure 17 Entity Relationship Diagram

4.4.8 Data Dictionaries

Data Dictionary is the major component in the structured analysis model of the system(*Data Dictionaries in Software Engineering - GeeksforGeeks*, n.d.). It lists all the data items appearing in DFD. A data dictionary in Software Engineering means a file or a set of files that includes a database's metadata (holds records about other objects in the database), like data ownership, relationships of the data to another object, and some other data(*Data Dictionaries in Software Engineering - GeeksforGeeks*, n.d.).

4.4.8.1 Data Dictionary Users Table

Field Name	Field Size	Data Type	Data Format	Description	Example
user_id	---	int	---	The user id	1001
username	50	char	---	The username of a user	TheMeta
email	50	text	---	The email of the user	alex@gmail.com
superuser	---	boolean	---	If the user has admin rights	yes
staff	---	boolean	---	If the user is a staff or not	no
groups	---	array	---	Which roles the user has	admin
permissions	---	array	---	What the user is allowed to do	Delete users

4.4.8.2 Data Dictionary Profile Table

Field Name	Field Size	Data Type	Data Format	Description	Example
profile_id	---	int	---	The id of the profile owed by a specific user	123
full_name	50	char	---	The full name of the user owning the profile	Alex Meta
profile_pic	---	image	---	The profile image	---

info_pic	---	image	---	Image to illustrate more about the user	---
create	---	date	dd/mm/yyyy	The date the profile was created	01/09/2022
update	---	data	dd/mm/yyyy	Any date the profile is updated	01/09/2022

4.4.8.3 Data Dictionary Language Table

Field Name	**Field Size**	**Data Type**	**Data Format**	**Description**	**Example**
lang_id	---	int	---	The id of the language	12
lang_name	50	char	---	The name of the language	Python
lang_icon	---	image	---	The icon of the language	---
lang_desc	---	text	---	Short description of the language	It is an oop language
create	---	date	dd/mm/yyyy	The date the language was added to the database	01/09/2022
update	---	date	dd/mm/yyyy	The date any changes were made to the language	01/09/2022

4.4.8.4 Data Dictionary Frameworks table

Field Name	Field Size	Data Type	Data Format	Description	Example
language	50	char	---	The language the framework is built on	Python
frame_id	---	int	---	The id of the framework	12
frame_name	50	char	---	The name of the framework	Django
frame_icon	---	image	---	The icon of the framework	---
frame_desc	---	text	---	Short description of the framework	It is for website development
create	---	date	dd/mm/yyyy	The date the framework was added to the database	01/09/2022
update	---	date	dd/mm/yyyy	The date any changes were made to the framework	01/09/2022

4.4.8.5 Data Dictionary Tags Table

Field Name	Field Size	Data Type	Data Format	Description	Example
tag_id	---	int	---	The id of the tag	23
user	50	char	---	The user owning the tag	TheMeta

tags	---	array	---	The languages that the user will ask questions about	Python, C++

4.4.8.6 Data Dictionary Questions Table

Field Name	Field Size	Data Type	Data Format	Description	Example
quiz_id	---	int	---	The id of the question	12
profile	50	char	---	The profile asking the question	TheMehta
tags	---	array	---	The languages that the question involves	Python, HTML
frameworks	---	array	---	The frameworks the question is about	Django
quiz_title	100	char	---	The title of the question	How to write a function in python.
Body	---	text	---	The details of the questions	---
code_1	50	char	---	The language the code block is about.	Python
codeBlock_1	---	text	---	The actual lines of code	print(“hello”)

quiz_views	---	array/int	---	All the profiles that have viewed the question	40
quiz_votes	---	array/int	---	The number of votes the question got	50
created	---	date	dd/mm/yyyy	The date the question was posted	09/09/2022
update	---	date	dd/mm/yyyy	The date the question was altered	09/09/2022

4.4.8.7 Data Dictionary Gallery Table

Field Name	Field Size	Data Type	Data Format	Description	Example
gallery_id	---	int	---	The id of the gallery of a question	109
question_id	---	int	---	The id of the question owning the gallery	23
body_media	---	image	---	The images involved in asking a particular question	---
update	---	date	dd/mm/yyyy	The date the question was posted	09/09/2022

update	---	date	dd/mm/yyyy	The date the question was altered	09/09/2022

4.5 System Design

System design is the process of defining the elements of a system such as the architecture, modules, and components, the different interfaces of those components, and the data that goes through that system(*What Is System Design? - Definition from Techopedia*, 2014). It is meant to satisfy the specific needs and requirements of a business or organization through the engineering of a coherent and well-running system(*What Is System Design? - Definition from Techopedia*, 2014).

4.5.1 Favicon

A favicon is a small square image that represents your website in web browsers(*What Is a Favicon and Why Does Your Website Needs One? | Upwork*, 2021). Favicons can be composed of a company's logo, initials, or other identifying imagery(*What Is a Favicon and Why Does Your Website Needs One? | Upwork*, 2021).

Figure 18 Favicon

4.5.2 Navigation

Website navigation is the act of clicking and looking through resources on the internet, such as the various pages that make up a website(*Website Navigation: Definition, Importance, and Tips | Indeed.Com*, 2021). Users navigate websites using a web browser and click on links that transport them to other pages when clicked(*Website Navigation: Definition, Importance and Tips | Indeed.Com*, 2021).

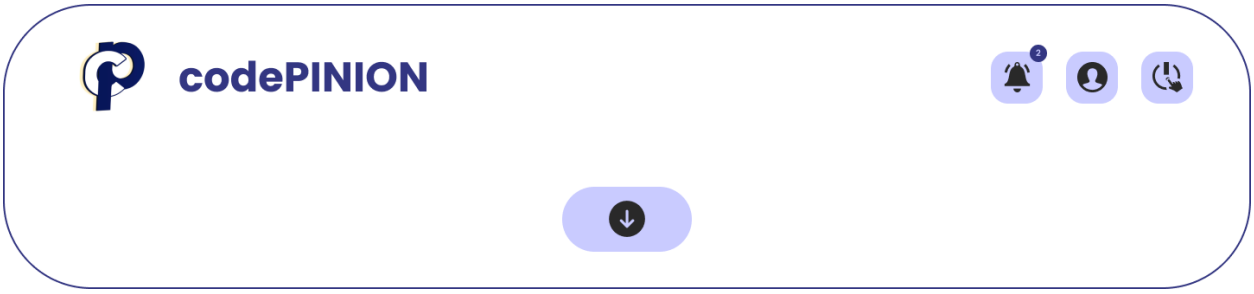

Figure 19 The Navigation

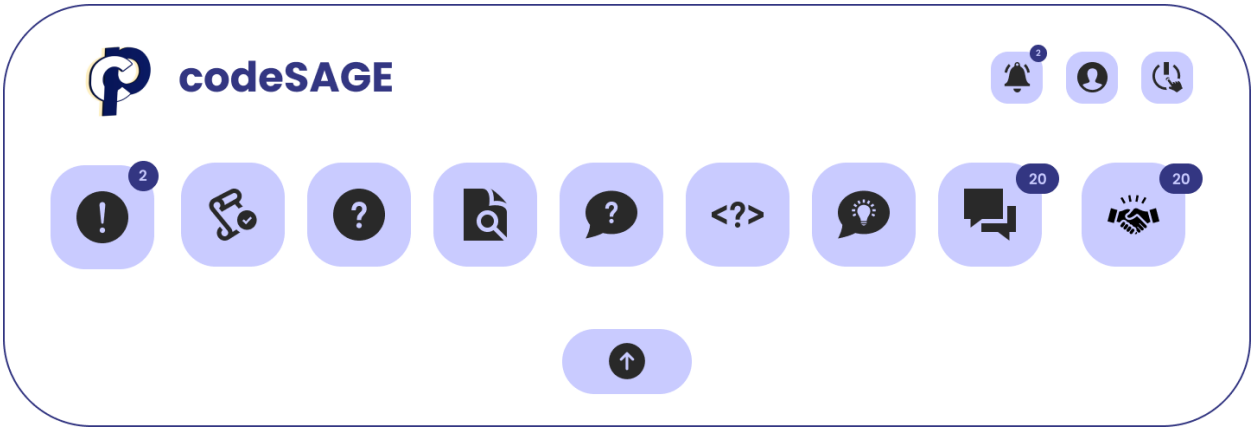

Figure 20 Navigation Dropdown

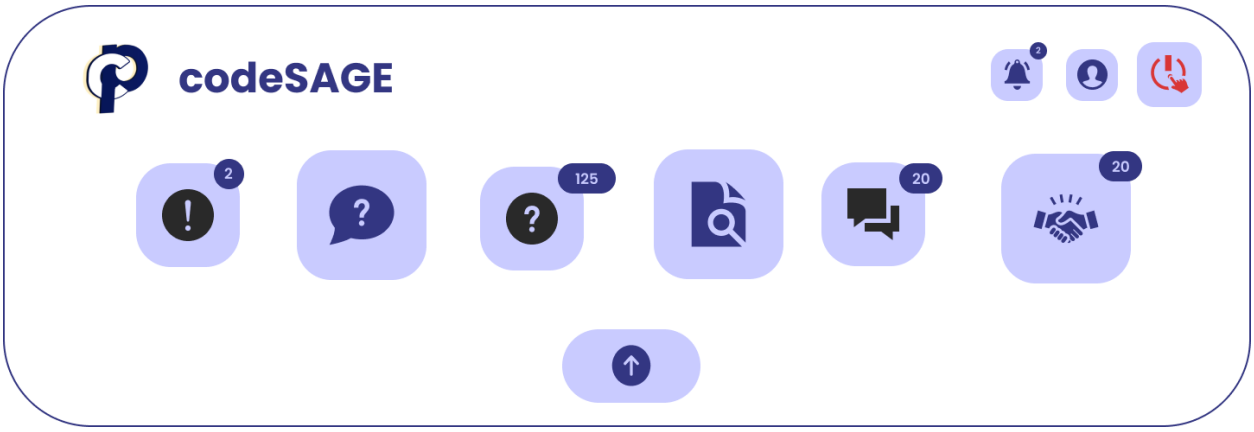

Figure 21 Navigation Active

4.5.3 Authentication

Authentication is the process of recognizing a user's identity(*What Is Authentication? Definition of Authentication, Authentication Meaning - The Economic Times*, 2022). It is the mechanism of associating an incoming request with a set of identifying credentials(*What Is Authentication? Definition of Authentication, Authentication Meaning - The Economic Times*, 2022). The credentials provided are compared to those on a file in a database of the authorized user's information on a local operating system or within an authentication server(*What Is Authentication? Definition of Authentication, Authentication Meaning - The Economic Times*, 2022). Users will either use LinkedIn or GitHub to sign in.

Figure 22 Authentication section

Figure 23 Authentication active

4.5.4 New Questions Page

After a question is posted, it will appear on the new questions page where a user can click on it to view its details and answer it.

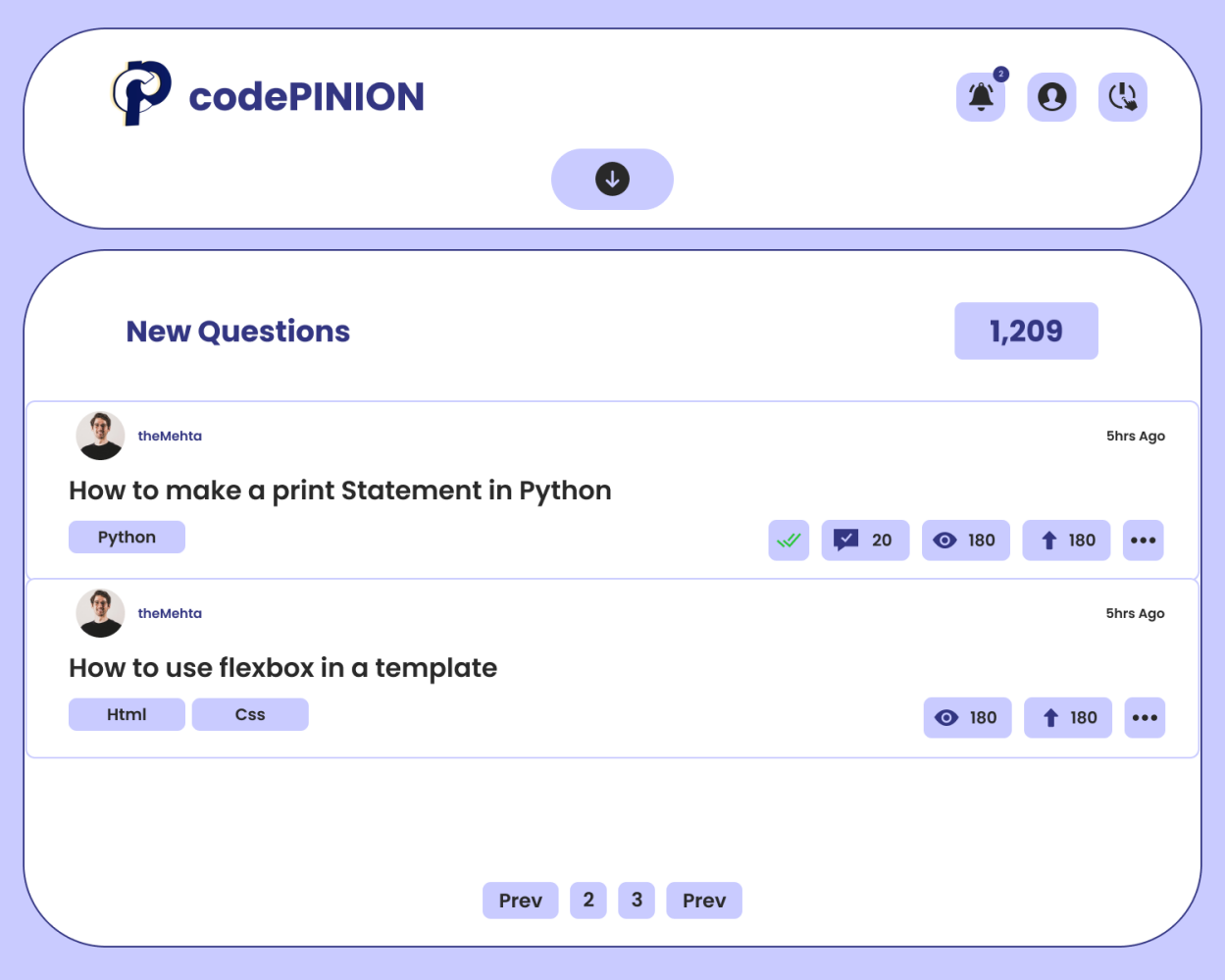

Figure 24 New Questions Page

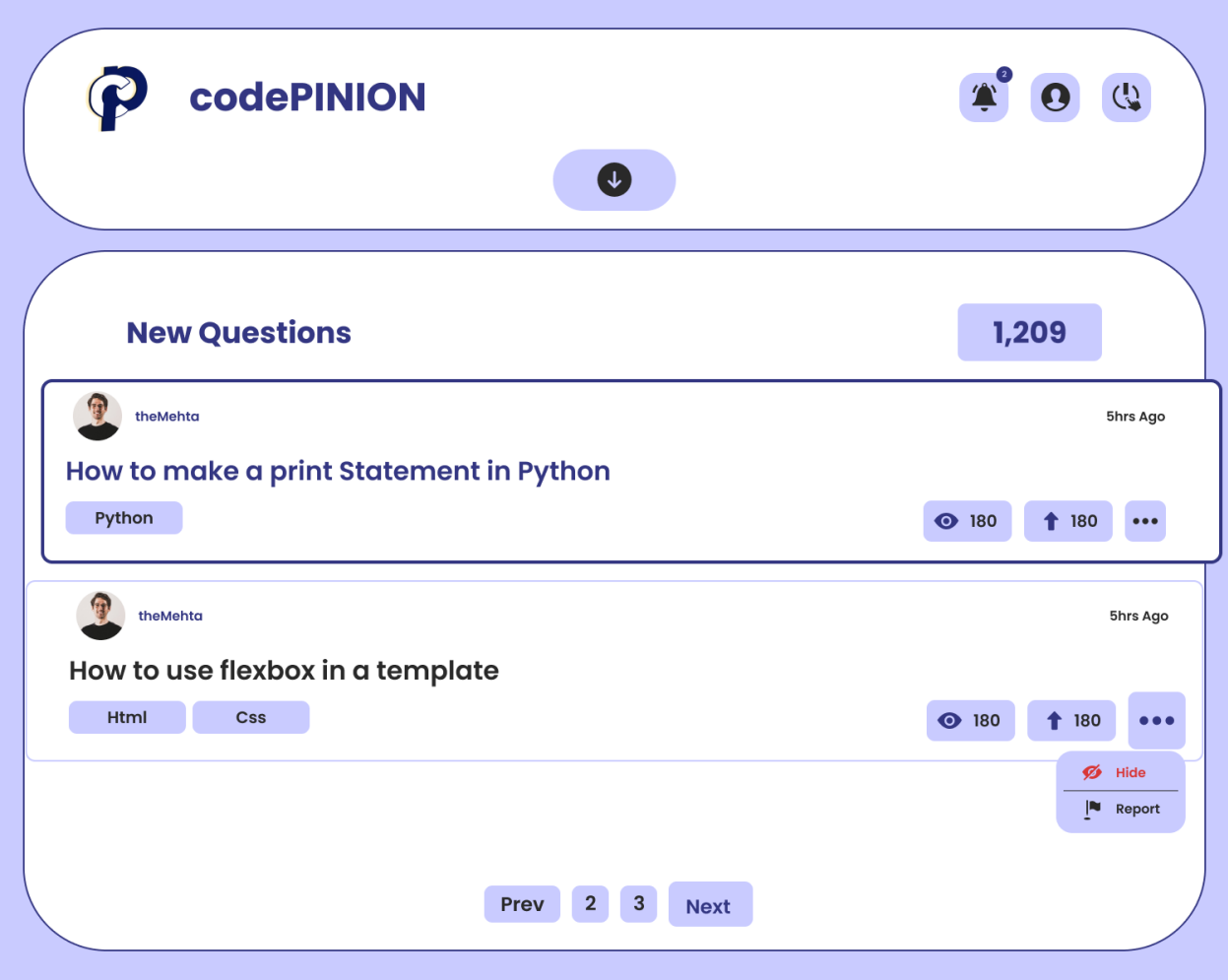

Figure 25 New Questions Page Active

4.5.5 Question Details

After clicking on a random question, the user will be taken to this page to see the full details of the question. Also, they will be able to respond to the questions asked.

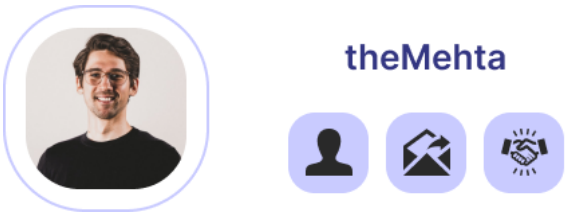

Figure 26 User in the Question Detail Page

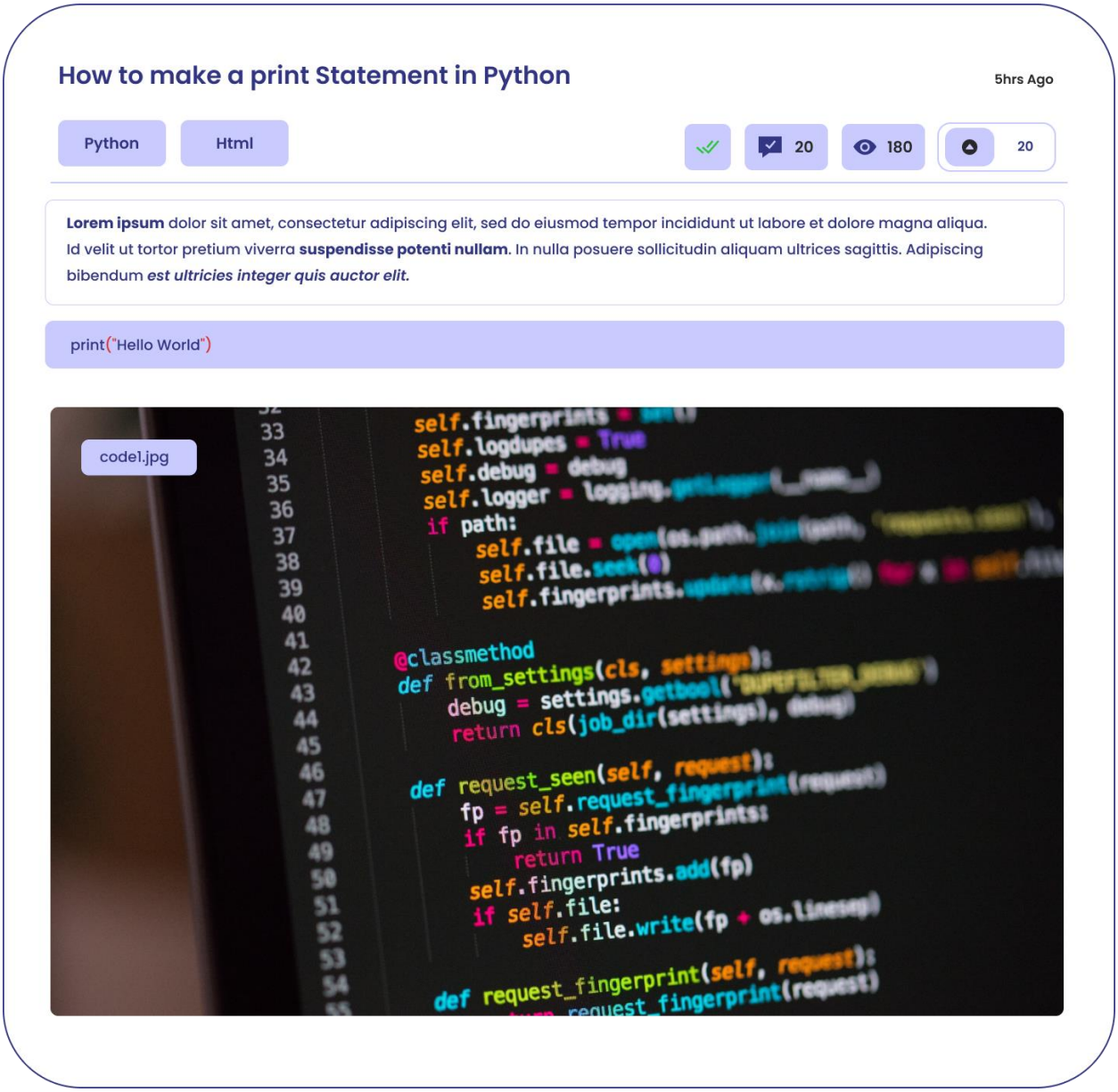

Figure 27 The structure of the question

The current user will respond in the space below.

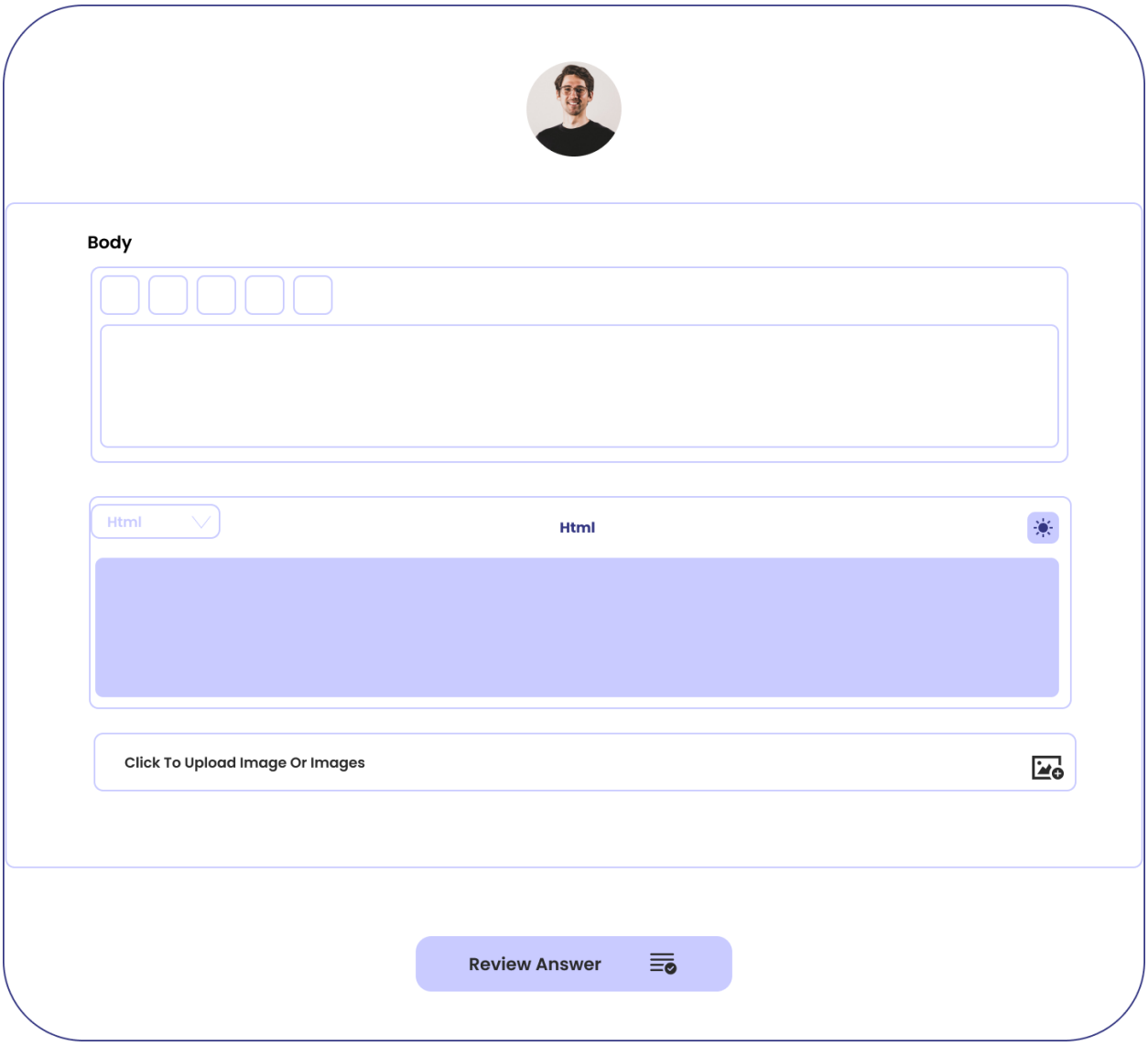

Figure 28 Current user response space

After typing the answer, the user will submit it on this next activity.

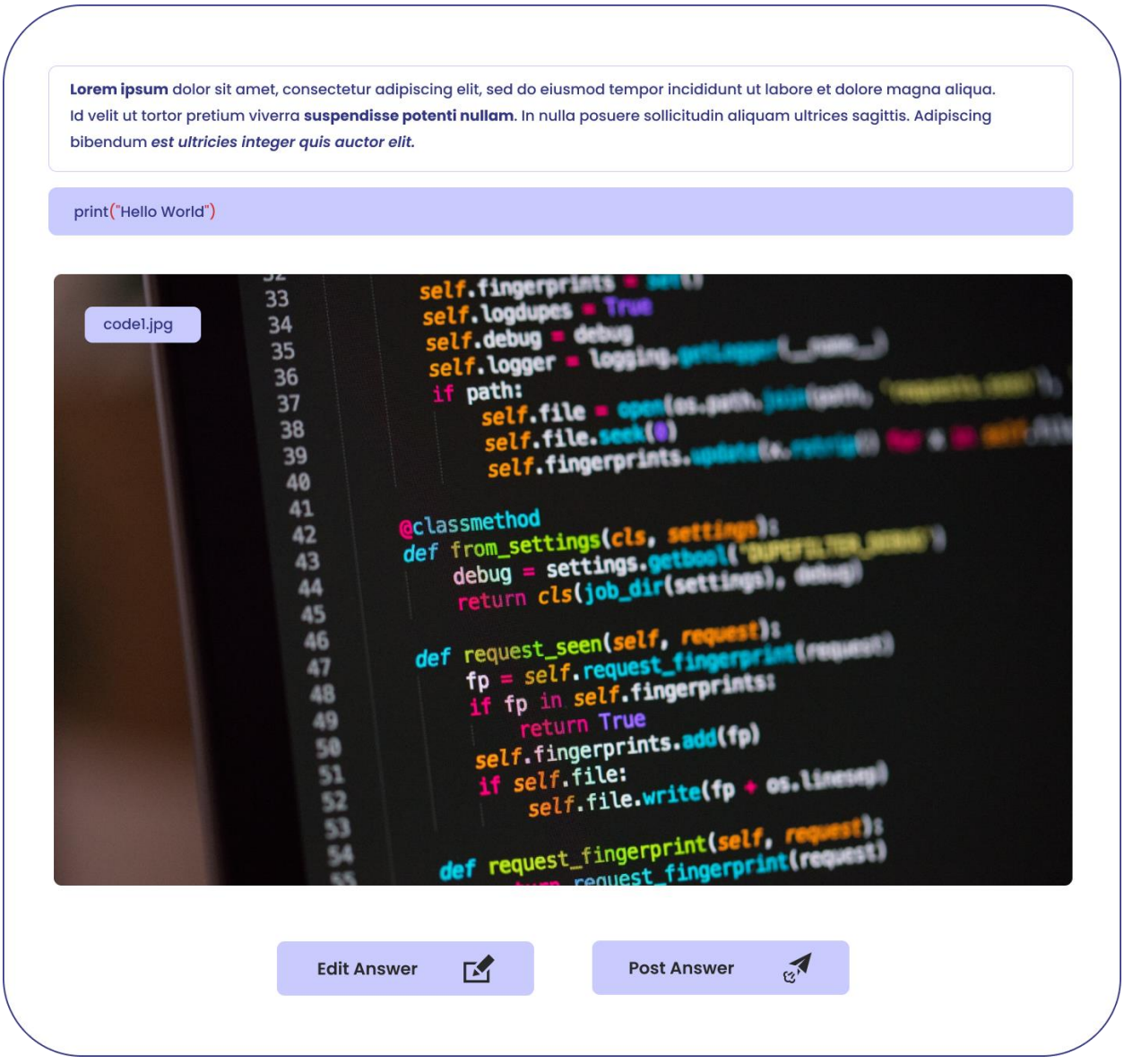

Figure 29 Submit Answer

Below will be how the answers from other users will appear on the website

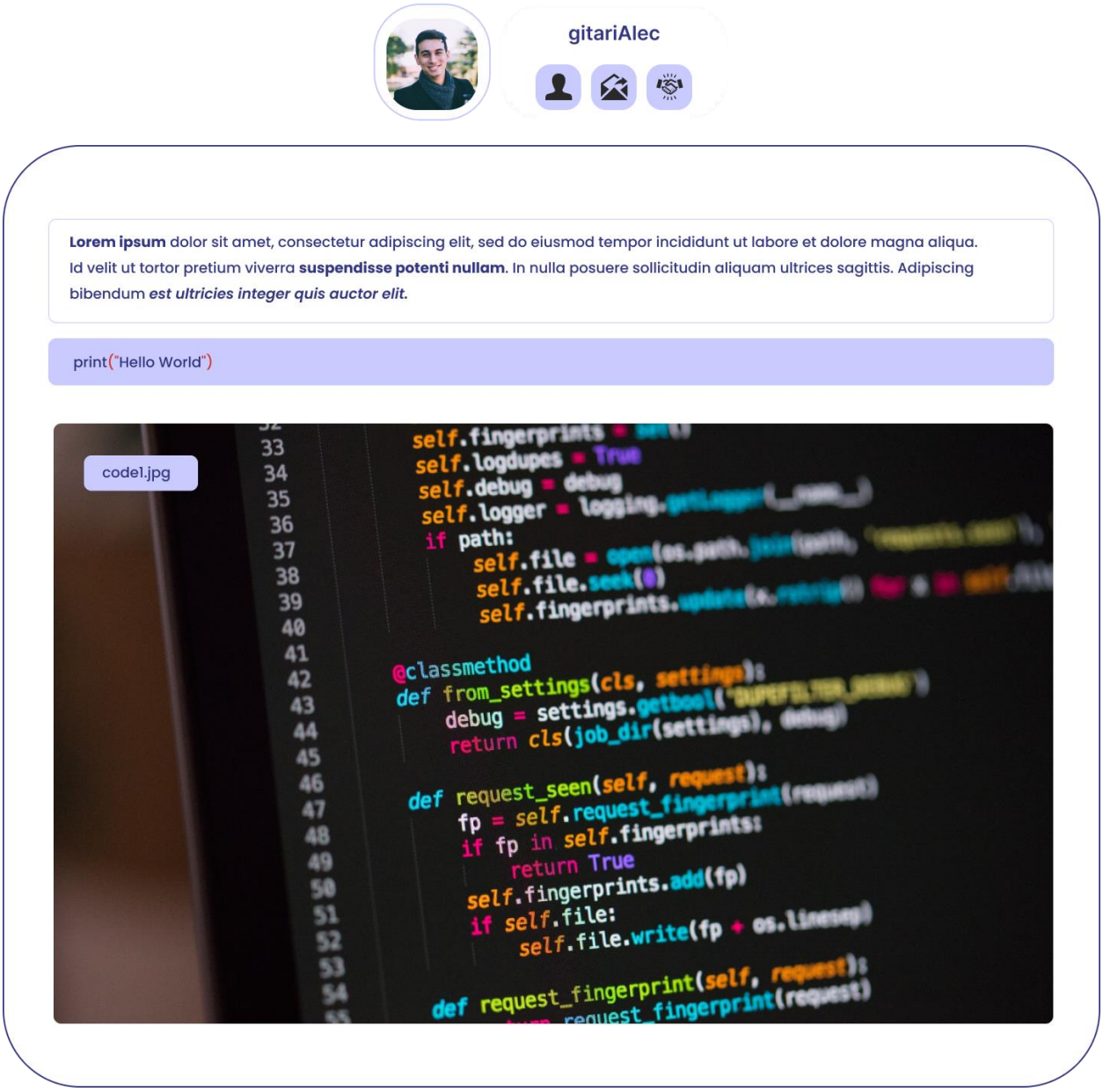

Figure 30 An answer from a random user

4.5.6 Posting A Question

The current user will be able to type their question in the space below.

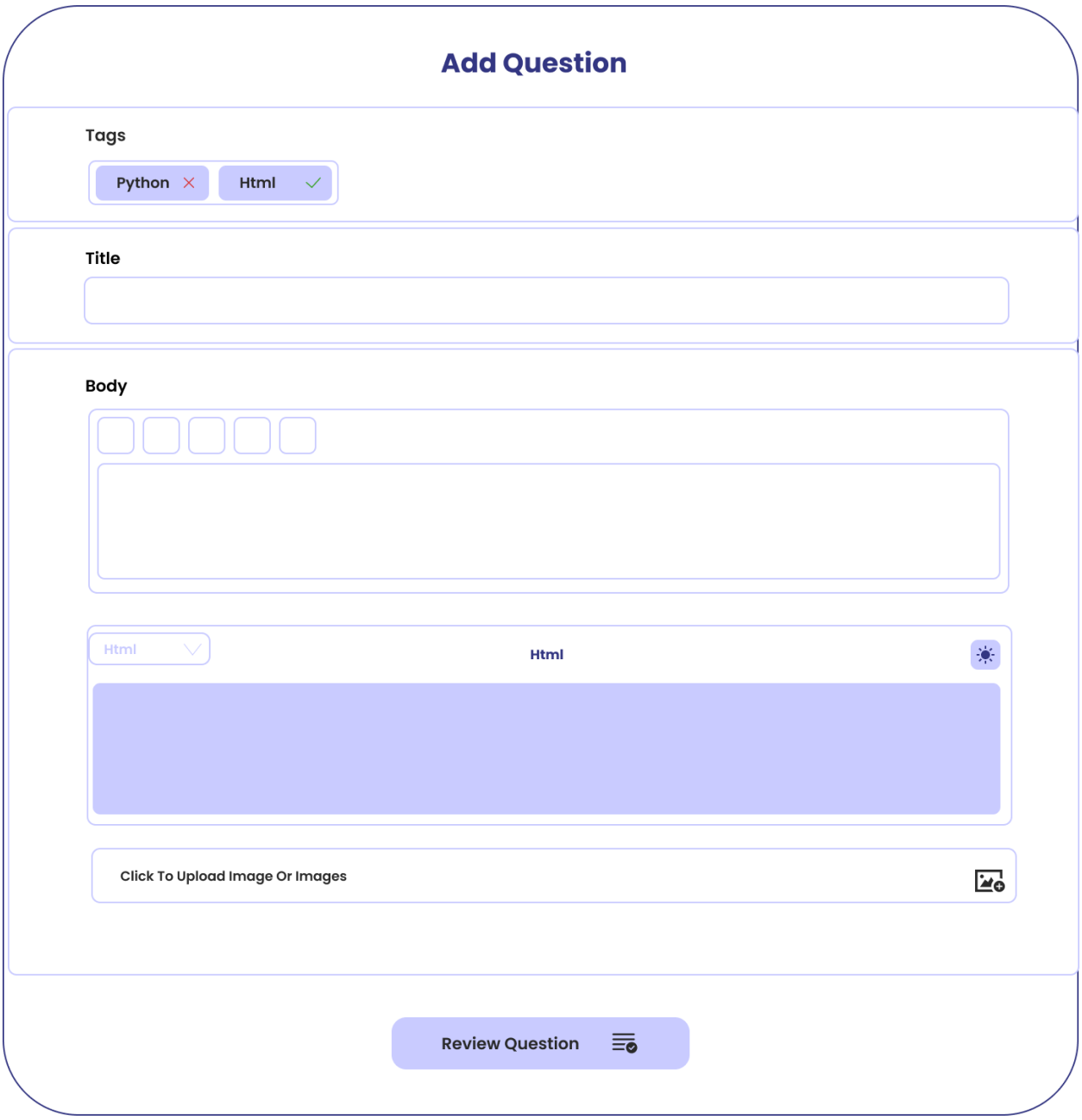

Figure 31 Post A Question

4.5.7 My Questions

A user will be able to see all of the questions they have asked on this platform.

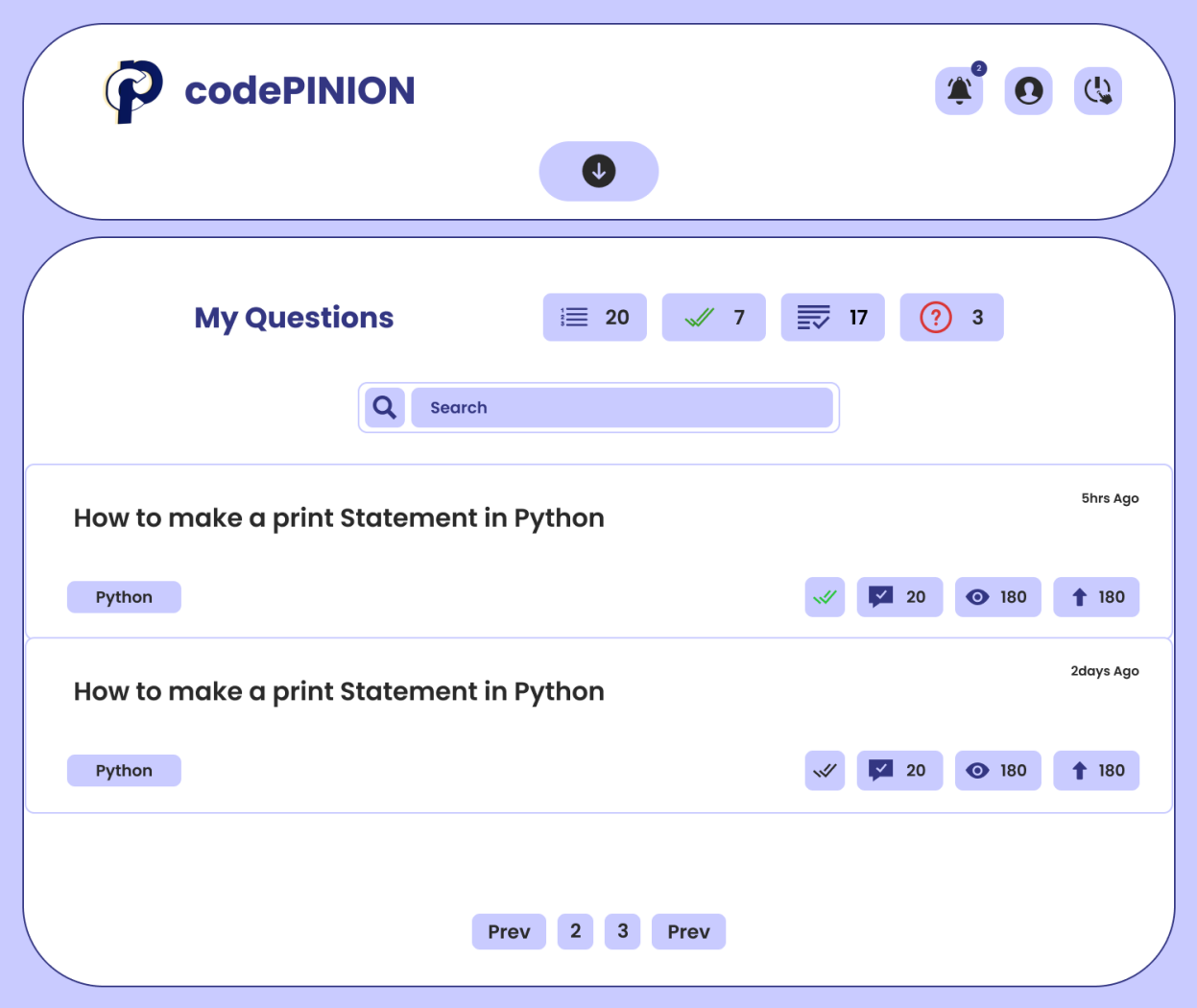

Figure 32 My Questions

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