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## **5.5 Planning for the next problems to solve**

Software development is an iterative process—we're never truly finished. As we complete the development and testing of one feature, we're often trying to understand our users' requirements and needs to design the next set of features in our product.

For iteration 3 we have produced a short report which contains a simplified approach to understanding user problems, developing requirements, and doing some early designs.

## [Requirements] Elicitation

For the elicitation, we found 2 people to interview our TOOHAK app as target users. Target users are people who currently use a tool like Toohak or intend to. We recorded their names and email addresses and developed a series of questions to ask them to understand what problems they might have with quiz tools that Toohak currently unsolves. We have also come up with potential ways to solve the target users' problems.

### Target users:

**Name:** Dhruv Sharma

**Email:** [meetdhruv.23@gmail.com](mailto:meetdhruv.23@gmail.com)

**Name:** Ved Khanolkar

**Email:** [vedkhanolkar@gmail.com](mailto:vedkhanolkar@gmail.com)

1. **Question:** What impact do quiz tools have on learning and teaching in your school or university?
  - a. **Dhruv's Answer:** Quiz tools are highly effective tools for learning and assessment. However, I've noticed a significant drawback: the ease with which students can engage in dishonest practices. The use of personal devices in the classroom setting opens up opportunities for sharing answers, often leading to several students picking identical answers without truly engaging with the material.
  - b. **Ved's Answer:** As a student, I think that these quiz platforms really enhance my educational experience. They make learning interactive and can be quite engaging. However, there is a lack of a feedback mechanism on these platforms. There are also times when I encounter quizzes that fall short of expectations or could be improved, and I find myself without a direct way to convey my suggestions or criticisms to improve the quiz experience.
2. **Question:** How do the quiz platforms handle diverse learning styles?
  - a. **Dhruv's Answer:** The platforms currently do not well cater to diverse learning styles. They mainly focus on text-based questions and images and neglect audio clips and interactive tasks.
  - b. **Ved's Answer:** As someone who learns best through interaction and practice, I find the quizzes somewhat lacking. They don't often include interactive elements or simulations that could cater to different learning

preferences, making it hard for some students to fully engage with the content.

3. **Question:** What obstacles have you faced when creating or solving quiz questions?

a. **Dhruv's Answer:** Crafting questions as a tutor presents its own set of challenges, especially when aiming to gauge students' comprehension accurately. The lack of a structured difficulty ranking system for the questions leads to concerns about whether they're appropriately challenging or too simplistic.

b. **Ved's Answer:** As a student, I've found that while the intention behind quiz questions is to align with learning objectives, there's often a gap in their execution. Crafting questions that truly capture the essence of the content is crucial, and when I attempt to create quizzes for study groups, it's a significant challenge to balance the breadth and depth of the material. This is mirrored when I'm on the solving end; sometimes, the questions either narrowly focus on less critical details or are so broad that they fail to test the understanding of key concepts.

4. **Question:** How do you work together with a team or within an educational subject to create quizzes?

a. **Dhruv's Answer:** Collaborating as a maths tutor with my colleagues to construct quizzes often involves logistical complexities, notably synchronizing schedules for group discussions on content creation. Aligning our visions to ensure consistency in question style and maintaining a coherent difficulty gradient across the quiz can also be a complex task.

b. **Ved's Answer:** Our current quiz tools lack collaborative functionalities. Working in tandem on quiz creation or attempting real-time collaboration poses its own set of challenges. We sometimes face troubles, like encountering variations of the same quiz that contain differing sets of questions.

## [Requirements] Analysis & Specification- Use Cases

Now that we have elicited this information, it's time to consolidate it. We have taken the responses from the elicitation step, expressed these requirements as user stories, and documented them. For each user story, we have added user acceptance criteria as notes so that we have a clear definition of when a story has been completed. Further, we have generated two use cases that attempt to describe a solution that satisfies some or all of the elicited requirements.

**User Story (Dhruv):** As a tutor for grades 3 and 4 in Math and Science, I would really like to be able to post questions in the form of images, tables, engaging imagery, and sometimes even audio. This would help me engage students more while making the experience fun for them as well.

**User Acceptance Criteria (Dhruv):** Toohak should have ways to add imagery and multiple forms of visuals while the admin user is making the quiz.

**User Story (Ved):** As a student in year 10, I want to be able to give feedback about things such as my opinions on questions, the time allotted to solve these questions, etc.

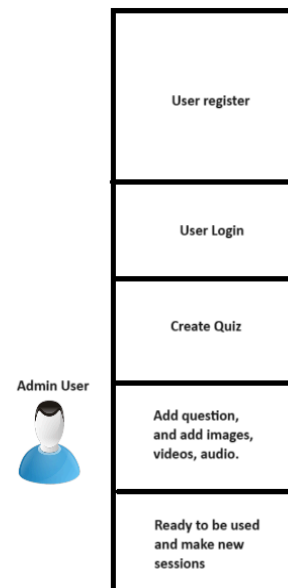
**User Acceptance Criteria (Ved):** Toohak must incorporate a feature that allows students to give feedback on that quiz session and also store it back to the actual 'master' quiz. This can be done just before the "SHOW\_RESULTS" stage to encourage students to give feedback.

**User Story (Dhruv):** As a team of tutors, we aspire to streamline our workflow by collaboratively crafting questions and directly contributing to a single quiz. This requires a system where we can share administrative access, allowing us to seamlessly integrate our individual questions into the quiz without repeatedly seeking approval from a central admin.

**User Acceptance Criteria (Dhruv):** Toohak must incorporate multiple admins for a single quiz, allowing them to modify, add, or delete questions simultaneously.

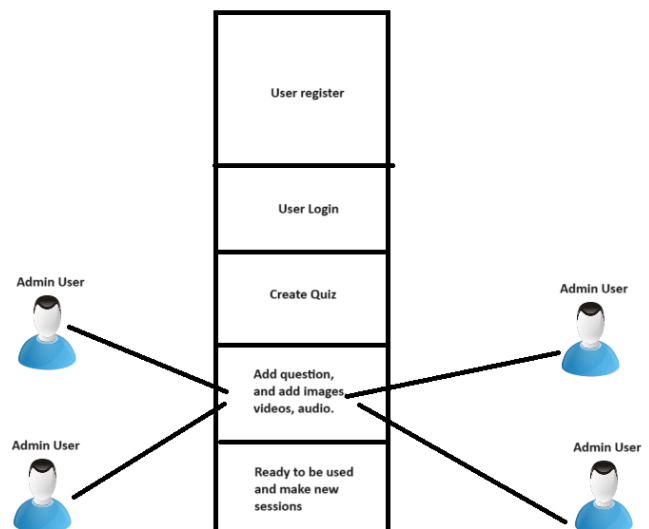
### Use Case 1: Incorporating imagery and visuals

We should make changes to the stage where quiz questions are created to give users more options for adding images and other media. We should add a 'media' field to each 'question' object. This field will be of type 'Media' and will include two properties: 'mediaType' and 'mediaLinkUrl'. 'mediaType' can be any of these options: ['audio', 'table', 'image', 'video'], letting users pick the type of media they want to add. They can also provide a valid URL in 'mediaLinkUrl' for the media. Both the backend and front end need to be updated to handle these URLs and display the media correctly on the question page.



### Use Case 2: Multiple admin users

The Quiz tool can now support multiple admin users for each quiz, allowing them to collaborate on adding, editing, or removing questions. This means we need to change the 'quizOwnerId' field for each quiz to an array, allowing multiple 'authUserId's to collaborate. We'll also need to add a 'collaborators' array to each quiz. This field will determine who gets added as collaborators. Only the main 'quizOwner' will have the authority to add other 'authUserId's as collaborators. We'll also need to tweak some error-checking mechanisms to verify whether an 'authUserId' is a valid owner.



## [Requirements] Validation

With our completed use case work, we then contacted the people we interviewed originally and inquired as to the extent to which these use cases would adequately describe the problem we're trying to solve.

**Ved's answer:** The use case (1) is great. The addition of images, audio, and videos to the quiz makes it even more fun and engaging. This feature is available on each question making it even more customisable and flexible, and the mediaLinkUrl will make it easy to upload any type of media I want without hassle.

**Dhruv's answer:** This is exactly what I was looking for. The diagram really lays it out well, showing how different tutors can contribute to the same quiz. I like the idea of having a 'quizOwner' who can manage who gets to edit. It's a great way to keep things organized while still letting everyone have a say.

## [Requirements] Interface Design

Now that we've established our problem (described as requirements), we have specified these capabilities as HTTP endpoints, similar to what is described in the Swagger docs.

### Updating the create question function:

**HTTP endpoint:** `v2/admin/quiz/{quizid}/question` (unchanged)

We're going to add a new 'Media' object in the 'QuestionBody' when you pass it through. We'll need to tweak the implementation a bit to accommodate this change. The 'Media' object will be stored in 'DataStore.js' so that the front end can access it easily. We'll add a 'Media' member to the 'Question' interface in 'DataStore.js' to store it efficiently. This way, every question can include media elements like images, videos, or audio directly linked through URLs.

### New Body:

```
{
  "questionBody": {
    "question": "Who is the Monarch of England?",
    "duration": 4,
    "points": 5,
    "answers": [
      {
        "answer": "Prince Charles",
        "correct": true
      }
    ],
    "thumbnailUrl": "http://google.com/some/image/path.jpg"

    "media": {
      "mediaType": "image",
      "mediaUrl": "http://google.com/some/image/path.jpg"
    }
  }
}
```

### Description:

This change takes in two new parameters {mediaType?: string, mediaLinkUrl?: string}, which allows users to optionally upload media for a question.

### New Responses:

Code	Return value	Description
400	{error: "mediaType is invalid"}	If mediaType is not of the following types ['audio', 'table', 'image', 'video'].



400	{error: "mediaLinkUrl is invalid"}	If mediaLinkUrl is not a valid URL or does not link to an audio, table, image or video media
400	{error: "mediaLinkUrl or mediaType is an empty string"}	If mediaLinkUrl or mediaType is an empty string

### **Admin Collaborator Access:**

**HTTP endpoint:** v1/admin/quiz/collab/access/{tokenCollaborator}/{quizId}

Pass in the tokenId's of 'quizOwner' and 'Collaborator' to give access to 'Collaborator' to collab and create questions.

Input	Types
quizId	path
tokenCollaborator	path
token	headers

### **Responses:**

<u>Code</u>	<u>Return Value</u>	<u>Description</u>
400	{error: invalid token}	Token is empty or invalid (does not refer to valid logged-in user session)
400	{error: invalid owner}	A valid token is provided, but the user is not an owner of this quiz
400	{error: no collaborator user found}	The collaborator token does not refer to a valid authUserId

## [Requirements] Conceptual Modelling - State Diagrams

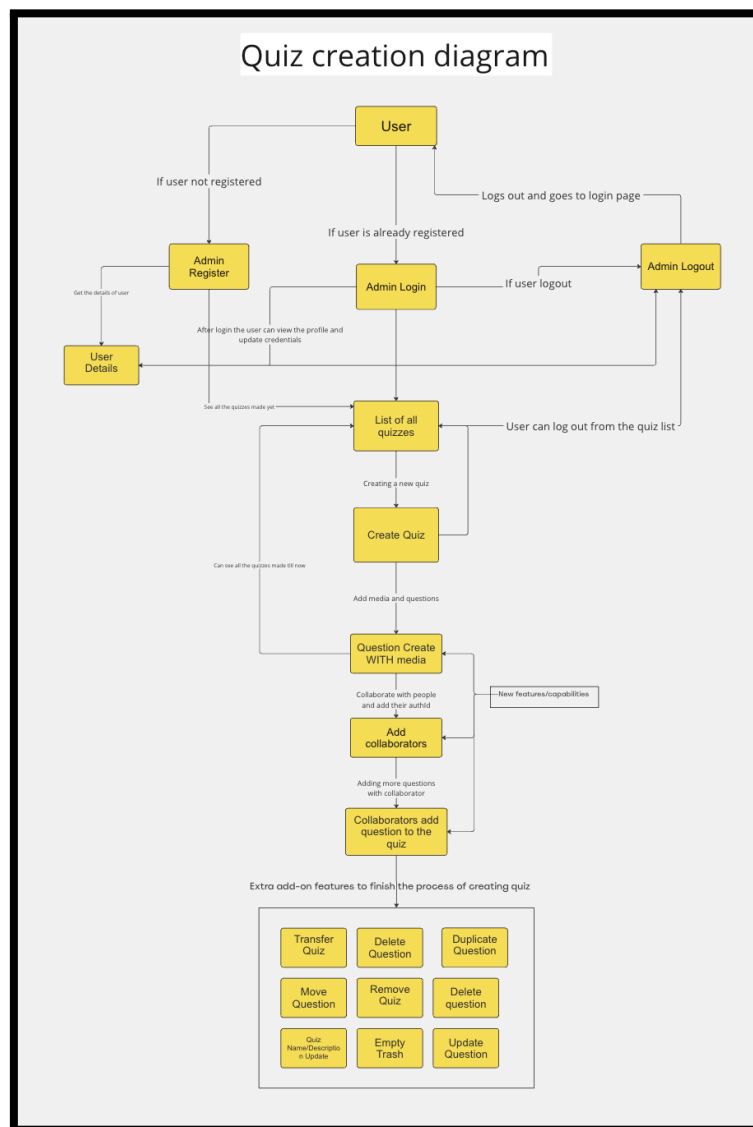
Finally, we have added a state diagram to our PDF to show how the application's state would change based on user actions. This diagram aims to help a developer understand the application's different states.

### Link to state diagram:

[https://miro.com/app/board/uXjVKSXe-iE=/?share\\_link\\_id=445068328655](https://miro.com/app/board/uXjVKSXe-iE=/?share_link_id=445068328655)

### State Diagram:

For Admin (tutors/teachers/collaborators) => (Quiz Making process):



**Player State Diagram:**