

Innovation and Originality

1. Novelty in approach:

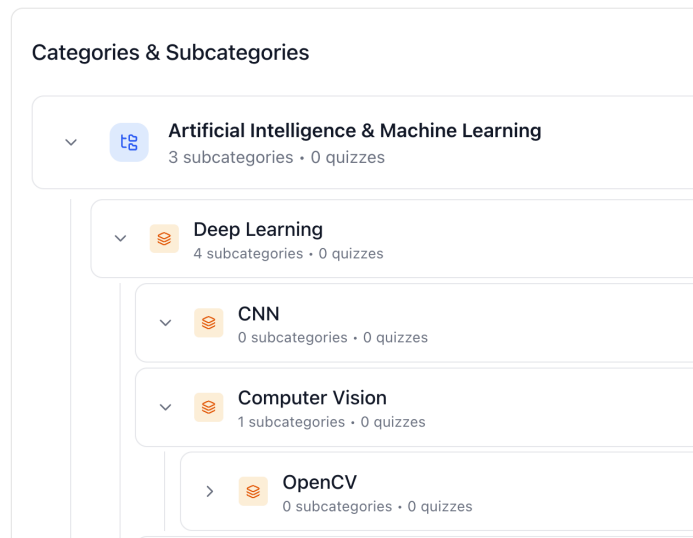
1.1 Containerization:

- To manage all the services using few files using Docker and docker-compose we containerize our whole system managing all the service which are React - Frontend, Node/Express- Backend, socket.io - WebSocket for real time matches, PostgreSQL- Database, Redis - in memory data store to manage data of matches, and monitoring services which we have used Prometheus, Grafana, Adminer, Redis Commander and Opentelemetry
- Now each one of these services need to be managed and run on different ports with different variables Docker makes it easy to manage them all and using just one line. You can start all these things and also docker is used for hosting and CI/CD using Docker and Kubernetes we can easily develop and test environments.
- Installing Prometheus, Grafana, Adminer, Redis Commander require complex setups, but using Docker everything will set-up as docker installs these from cloud, and docker can run and manage in a single separate container which is really easy.
- And Docker solves the problem of running these things on different machines with different configurations. It can be run on any OS (Mac, Windows, Linux etc.) by just using those containers which makes it very easy to implement and use.
- **Comparison with existing solutions:** Platforms like QuizUp 2 and Kahoot! seem not to be implementing these containerization principles similar to our implementation to make things easier and scalable.
- Kahoot! run in containers or use container orchestration stacks (especially since they use GKE, which is built around containers). But there are no such evidences that these platforms have implemented containerization entirely.

References: [Kahoot!](#)

1.2 Hierarchical category structure:

- **Innovation:** The quizzes are stored in different categories and their respective nested subcategories. For the admin, the data might look cluttered and very difficult to manage. So, to overcome this, tree like structure was implemented which contains categories and their respective subcategories.

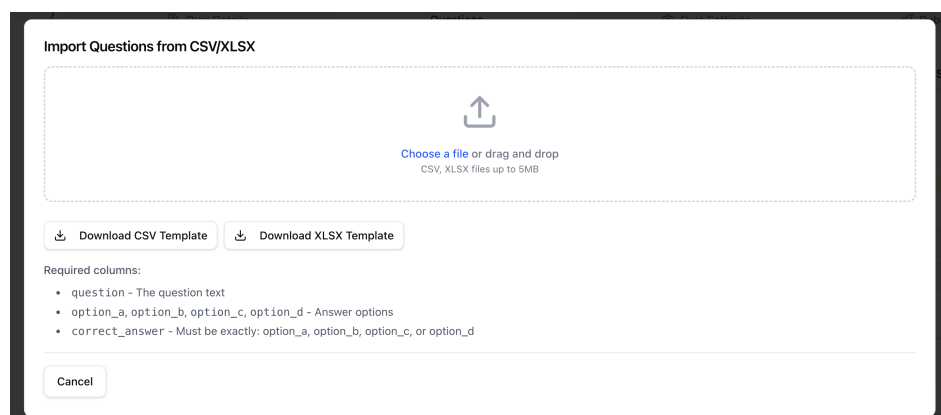


As shown in the image, the visual representation of category and nested subcategory tree looks like this in application.

- **Comparison with existing solutions:** Existing platforms such as Moodle or Google Forms often use flat tagging or shallow categorization, which becomes difficult to scale as question banks grow.

1.3 Bulk import:

- Adding all the questions manually is a very tedious task, in order to fix this, a simple approach by using excel sheets felt reliable.
- **Innovation:** Our application can accept multiple file formats (CSV, XLSX) and uses pattern recognition to automatically map fields like “question”, “option_a”, “correct_answer” etc. It improves accuracy over time by learning from user corrections.
- **Comparison with existing solutions:** One of the main platforms QuizUp 2 seem not to be supporting the bulk upload functionality to add question at a time, while this application proved to be easy and useful to add multiple questions at a time.



The image shows the implementation of bulk upload functionality in our application

1.4 Multiple servers (workers): [Future scope]

- During user testing, we find out that the application can not support more than 11-12 user quiz at a time.
- **Innovation:** In order to fix this, multiple servers (workers) can be implemented. Where new servers will be created using WorkerJS library of Javascript, when the user count exceeds up to a certain limit.
- This will be helpful to handle multiple users easily and without any latencies.
- **Comparison with existing solutions:** Kahoot! and QuizUp2 do use the techniques to accommodate more users.

2. Contribution to field:

2.1 Relevance of ICT domain:

With respect to ICT domain, there are a few considerations.

- **Cloud developing:** Docker and concepts of containerization play a major role in cloud developing course which has been added in ICT curriculum.
- **CPSI:** Creativity, problem solving and innovation allows us to think in a different and other than conventional way to propose a solution which makes the product/application stand out.
- **AWT:** Advanced web technologies course is proven to be helpful when it comes to handle multiple users using multiple servers and bigger architecture.

This is how the curriculum in ICT proves to be helpful to solve these problems and suggest a unique solution which can impact lives of others.

2.2 Impact on stakeholders:

- **Students:** The real time, scalable architecture make sure smooth quiz experiences even during peak usage and reduce latency. Features like hierarchical categorization and bulk question uploads lead to more organized and less tedious quiz creation.
- **Teachers:** Educators benefit from efficient quiz creation and management tools, especially the bulk import and category tree features. This reduces manual effort, assessment workflows and makes things manageable.
- **Institutions:** Schools/colleges gain a reliable, scalable platform for conducting large scale assessments and competitions. The system's containerized deployment model supports easy setup, deployment across varied infrastructure, and maintainability as well.

2.3 Impact on broader ICT field:

- Features like bulk question uploads with smart field mapping and a clear category tree show how small features can make a difference. This can inspire other developers to focus more on usability and practical solutions.
- This application is an example of applying concepts from ICT courses like cloud development, digital logic design and advanced web technologies. It connects classroom learning with real world problems where faculties can assess the students on the go.
- Also, by using multiple worker servers allows to accommodate more users and concept of containerization makes sure that application runs without any dependencies. This shows that better system design could be helpful to run application smoothly.