**An Analysis of Ethical Approver Website**

**Abstract**

This document contains a review of the Ethical Approver website, the Ethical Approver website is a website design to digitize the process of receiving ethical approval for experiment undertaken by students.

The review consists of the following:

* Analysis of current limitations
* Recommended Technologies
* Proposed system architecture
* Scalability Solutions
* Application Security

This review takes in to account the strength and weakness of the current design of the web site, making recommendation to improve the current design taking scalability into account.

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**1.1 Introduction**

The Ethical Approver website is a website design to digitize the process of receiving ethical approval for experiment undertaken by students. The goal is to increase the efficiency of the process by removing the bottleneck caused by manually filling the form offline before converting it and storing it online.

The website consists of three main users namely:

* Students
* Administrators
* Experiment Approval Officers

**1.1.1 Students Features**

* Students should be able to sign up to the system, create an experiment, and then fill in the ethics form attached to this. They should also be able to edit the ethics form of a project.
* Students should be able to upload additional files that supplement their ethical approval form (e.g. consent forms)

**1.1.2 Administrators Features**

* Administrators should be able to assign experiments to EAO’s

**1.1.3 Experiment Approval Officers**

* Experiment Approval Officers should be able to view experiments that have been assigned to them, give comments on an experiment, and finally decide whether to grant ethical approval for a project.
* All experiments should be assigned to 2 different EAO’s for feedback.

**1.2 Analysis of Current Limitations:**

The Ethical Approver website makes use of the multilayered architecture, specifically three-tier architecture. Multilayered architecture, typically consist of a presentation layer, application processing layer and data management.

**1.2.1 Presentation Layer**

The two technologies used in the Ethical Approval website presentation layer were HTML5/CSS3. Where HTML5 handle the basic structure and data of the site and CSS3 handles the presentation of the data across different views. This approach is one of the most basic approaches to web design.

1. **HTML5**

The Ethical Approval website makes use of HTML5 over other versions of HTML, while there are some disadvantages in using HTML5, such as not being supported by old browser and issues with media licensing, these issue have work around solutions and cannot mitigate the benefits of using the newer version HTML5. HTML5 offers many advantages over its predecessor that makes it more suitable for modern web base design.

1. **CSS3**

CSS3 is the latest version of the Cascading Style Sheet, it offer great improvement over the previous versions. CSS3, as the latest version of the Cascading Style sheet, has better feature support, it supports newer technology and design paradigms such features include better responsive design, better animations and 3D transformations and more color schemas.

**1.2.2 Application Processing Layer**

The application processing layer is handled by PHP; PHP is a popular open source, server side scripting language used to handle web application requests. The method employed in the Ethical Approver website is to embed PHP directly into the html code using a structural style approach.

**1.2.3 Scalability**

This website doesn’t implement many of the techniques makes web applications scalable, an example being SoC concept. One of the basic building blocks of coding and development is separation of concerns (SOC), which requires the breaking of programs into distinct modules in such a way that each module addresses a separate concern. The approach currently employed by the Ethical Approver does full employ the SoC concept, making it difficult to scale in the future.

**1.3 Recommended Technologies:**

In the development of the Ethical Approval website, there was no development frameworks used, beyond the basics required for both presentation layer and application layer. Below are frameworks that can be utilized to improve and increase website development, deployment and performance. These frameworks also allow the utilization of advanced design methodologies, to build better scalable websites.

**1.3.1 Client Side Technologies:**

**React.js**

React is not a framework; it’s a library for building reusable user interfaces that offer a great view framework for building reusable and scalable UI components.

Because react is not a framework, it does not implicitly implement scalability into output design, but the flexibility of the library, allows developer to incorporate scalable designs in to their applications. React is great for producing scalable website because of it reusable UI components and flexible design, these features gives the developer the ability to incorporate whatever design paradigm they chose to achieve there desired application rather the being limited by the limitations of the framework.

**1.3.2 Server Side Technologies:**

**Laravel**

Laravel is a PHP based framework that follows the MCV design pattern for developing backend applications. Laravel is stateless, with a distributed storage framework and therefore can scale easily. It allows for multiple deployments on different servers with a load balancer in front. It is a great technology for building scalable websites.

**1.3.3 Database Technologies:**

**PostgreSQL**

MySQL is known to be the world’s most popular database, using in many web application worldwide, but as an RDBMS database, MySQL is not fully SQL compliant and does not have many of the features that PostgreSQL has. This is why PostgreSQL has become a great choice for developers, and its popularity is growing exponentially with each passing day.

While both MySQL and PostgreSQL have replication and clustering capabilities that help in implementing horizontal scaling, PostgreSQL replication is very popular and reliable.

Unlike MySQL, PostgreSQL’s replication is based on WAL files, which makes it more reliable, faster, and easier to manage. Postgres supports master-slave and master-to-multiple-slaves, including cascading replication. Postgres offer both synchronous and asynchronous replication.

Asynchronous replication is the default replication, and slaves can cater to read requests. If the application (like a web application) demands the data snapshot on slaves to be the same as the master, then synchronous replication will help.

In PostgreSQL, table partitions and Indexes can be placed in separate tablespaces on different disk file systems, which can greatly improve table scalability as well.

**1.4 Proposed System Architecture:**

Separation of modules

Horizontal Scaling

Ethical Approver

**1.4.1 Separation of modules**

This step breaks the website into different modules for example the database access module, the Administrator module, the Student module and the Experimental Approval Officer module are broken up and put on separate severs. The idea is loosely couple the different module such that if one server gets overloaded, the whole web app wouldn’t be affected.

**1.4.2 Horizontal Scaling**

In this step, the load of the web app is distributed between several servers. Each distributed server running a copy of the web app and can be enabled or disable based on the current load. The setup is managed by a load balancer; load balancers control the enabling and disabling of server as well as monitor the health of the server. When the load is more than what the currently running server can handle, the load balancer enables more servers and redistributes the load between them and when the load reduces, it disables un-need servers.

**1.5 Scalability Solutions:**

**1.5.1 Service-Oriented Architecture (SOA)**

SOA allows users to distribute applications to multiple locations, sometime between departments within a corporation. Plus, it permits reuse of existing code within an organization and, more importantly, collaboration among different business units. SOA architecture based applications are inherently scalable, easily growing across multiple servers and/or datacenters. However, SOA applications deal with data, and if not properly managed, data access can become the scalability bottleneck.

Applying SOA to the Ethical Approver website would mean a redesign of the site to accommodate the new architecture.

**1.6 Application Security:**

There are many and varied method of increase a web application’s security, some of which are listed below.

* Query parameterization
* Multi factor authentication
* Implement HTTPS and redirect all HTTP traffic to HTTPS.
* Prevent cross site scripting attacks by implementing the x-xss-protection security header.
* Implement a content security policy.
* Help prevent man in the middle attacks by enabling public key pins.
* Apply subresource integrity to your resource’s <script> or <link> elements
* Use an updated version of TLS.
* Using **strong passwords** that employ a combination of lowercase and uppercase letters, numbers, special symbols, etc.

**References**

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