Design and Implementation of Web Application Based on MVC Laravel Architecture

Thanh Son Huynh, Duc Tung Tran, Quoc Hung Vu, and Luong Anh Tuan Nguyen

***Abstract* — Developing web applications with traditional methods causes large limitations such as a lot of time consuming, number of unexpected errors. A novel approach technology of MVC framework is built by some companies to deal with such issues. This paper presents a design and implementation for web application with Laravel framework. This research makes us find out that the development was standardized and much scalability, so it gives us more efficiency through the implementations.**

***Keywords* — Laravel Framework, MVC, PHP Framework.**

I. Introduction

In modern Information Technology industry, it is essential for web developers to know at least one battle-proven framework. There are several advantages and benefits of using web framework in general and Laravel in particular. Framework is a product of collective intelligence, comprising many robust libraries and convenient tools from other developers. They help to reduce most of the repetitive tasks and complex tasks in simple interface, which means developers can write less and do more with highest quality in a certain amount of time. Therefore, using a reliable framework also help to lower the development cost [1], [2].

Furthermore, using a robust web framework also helps to strengthen the security of the application. It does not require developers have a deep knowledge about security. There are many forms and types of cyber-attacks, fortunately, Laravel as well as most of web frameworks support several features to prevent basic security vulnerabilities such as SQL injection, cross-site request forgery (CRF) and cross-site scripting (XSS) [1], [2].

Moreover, Laravel also provides a well-structured skeleton for building big projects. Basically, Laravel employ the famous MVC architectural pattern, which helps organizing code better. MVC pattern separate the business logic (models), the control coordination (controllers) and the presentation of data (views) into 3 different layers [3].

The main outcome of this paper is to build a journal website which allow users view information, published articles and submit their articles. In order to submit articles, guest must open an account and login to the system. In the backend side, administrators can also create and manage information, papers, and users.

The remainder of the paper is organized as follows. Section II presents the MVC Laravel framework. In section III, the system design and implementations are illustrated. Section IV shows the results of website. Finally, Section V concludes this paper and figures out the future works.

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II. MVC Laravel Framework

The Model-View-Controller pattern nowadays has widely been used by companies and developers [4]. The MVC architecture is shown in Fig. 1.

Model is an abstraction layer, which presents data in an application. In general, it usually corresponds to the records in DBMS database or any type of storage engine such as NoSQL or Microsoft Access. In Laravel 5, a Model usually extends from Eloquent master class and presenting a table in database [5]–[8].

View is the layer that present data in suitable and in desire format for end client, and usually presented as a HTML web page. It is the final visual presentation of data in a web application that Controller has received based on the change from Model. Laravel 5 come along with Blade template language, which allow developers create reusable and maintainable layouts and template components [5]–[8].

Controller is the layer that handles requests and return appropriate responses to the correct View. Therefore, Controller acts as a coordinator between View and Model. In other words, it is the logical layer of the application. For example, controller can receive form submission from the View and perform validation, writing valid data to a database, and redirecting users to other routes [5]–[8].

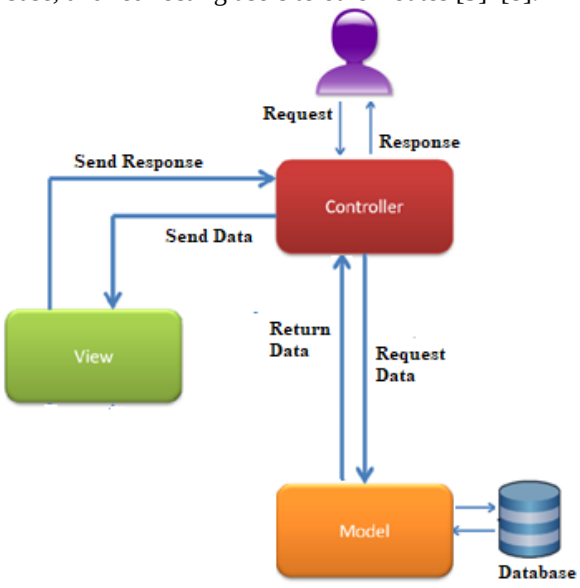

Fig. 1. Model –View - Controller Architecture.

III. The System Design and Implementation

Journal web system design and planning will be presented through Unified Modelling Language (UML). The design part for the application is so important for the quality management [9]. The requirements are being collected by analysts and then converted into diagrams. These diagrams to show the developer how the system is working and how the data are been flowed through the system. We will show some parts such as activity diagram, ER diagram, SQL schema that may be important to be shown.

A. System Architecture

Some processing diagrams are illustrated as follows.

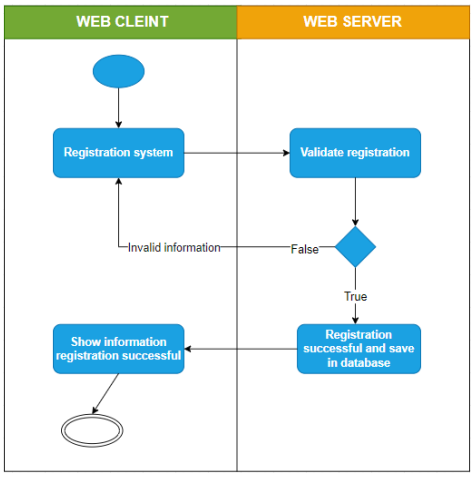

Fig. 2. Registration System Diagram.

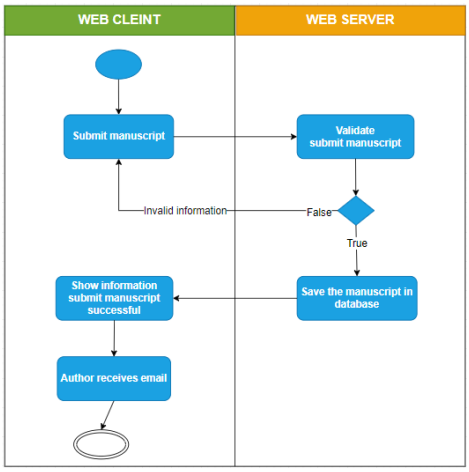

Fig. 3. Submit Manuscript Diagram.

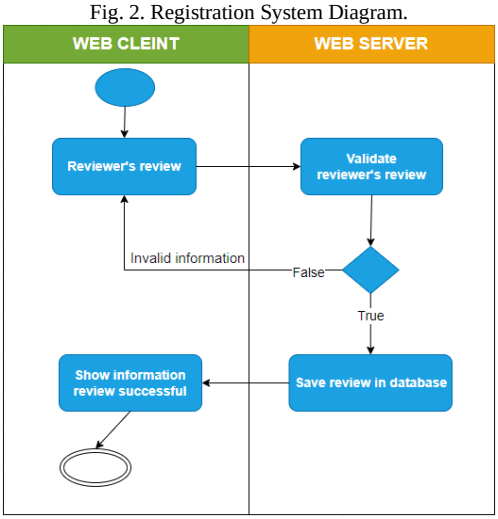

Fig. 4. Reviewer's review Diagram.

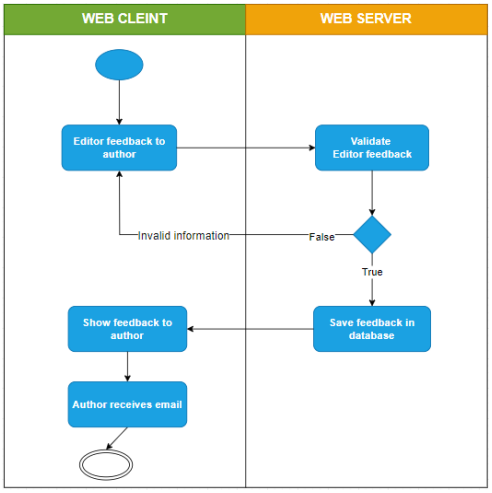

Fig. 5. Editor's feedback Diagram.

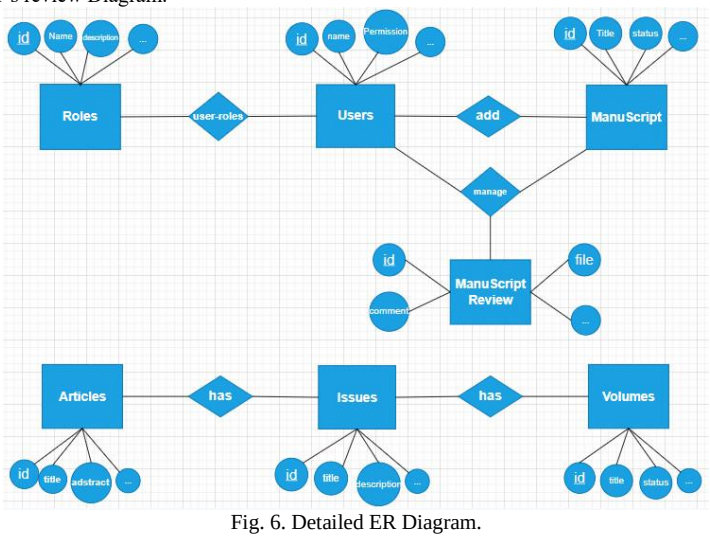

Fig. 6. Detailed ER Diagram.

1) Registration system diagram

Registration system is shown in Fig. 2.

2) Submit manuscript diagram

Submit manuscript diagram is shown in Fig. 3.

3) Reviewer's review diagram

Reviewer's review diagram is shown in Fig. 4.

4) Editor's feedback diagram

Editor's feedback diagram is shown in Fig. 5.

B. Detailed ER diagram

The Detailed ER diagram is shown in Fig. 6.

C. SQL Schema

The SQL schema is shown in Fig. 7.

IV. RESULTS

By the time this paper was written, the journal website was completed and tested. Here are some screenshots of the web pages from Fig. 8 to 17.

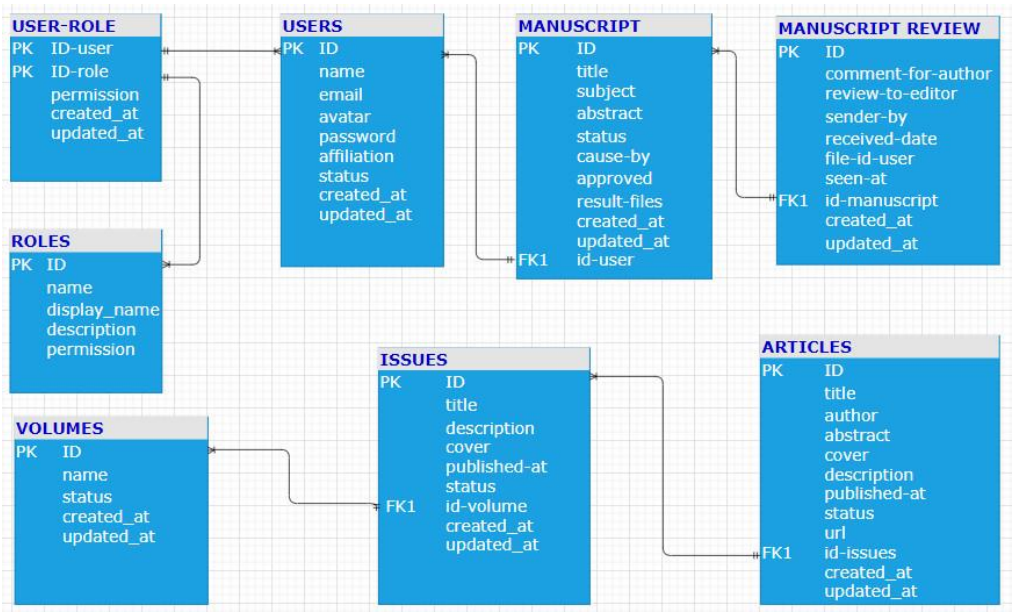

Fig. 7. SQL schema Diagram.

Fig. 8. Home Page.

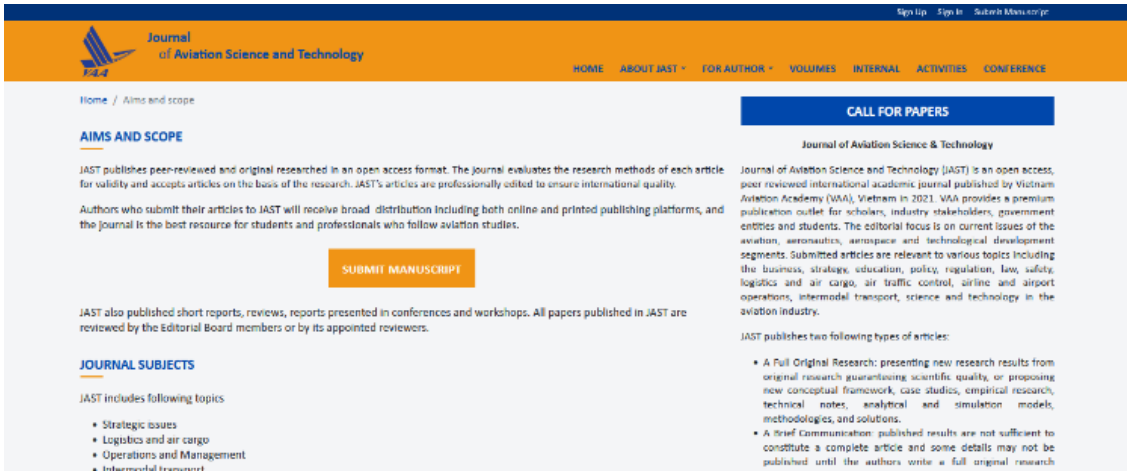

Fig. 9. Aims and Scope Page.

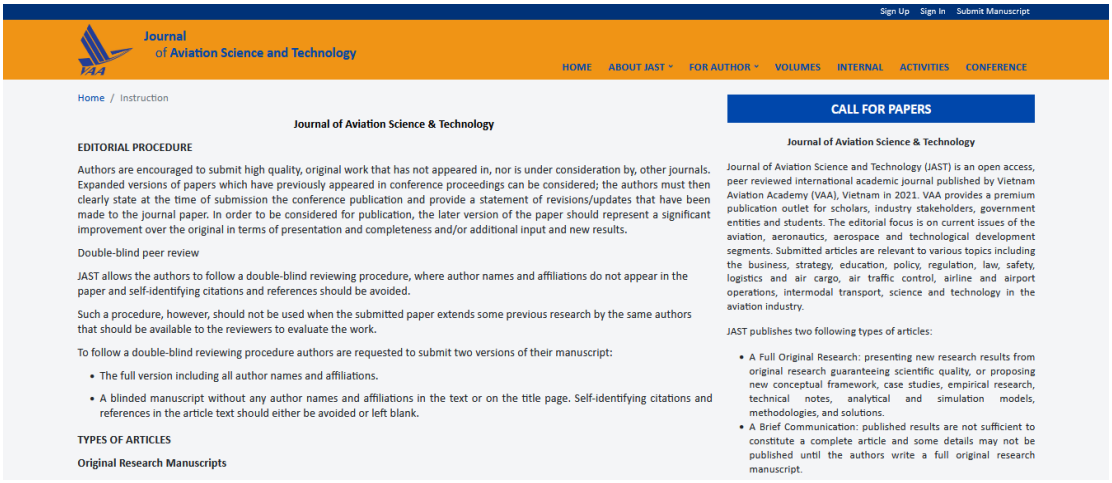

Fig. 10. Instruction Page.

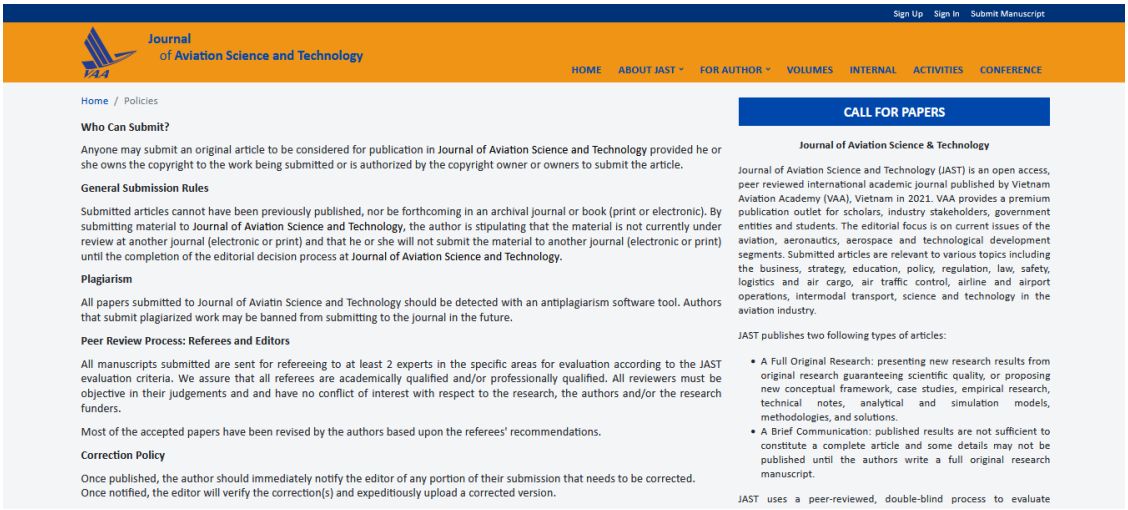

Fig. 11. Policies Page.

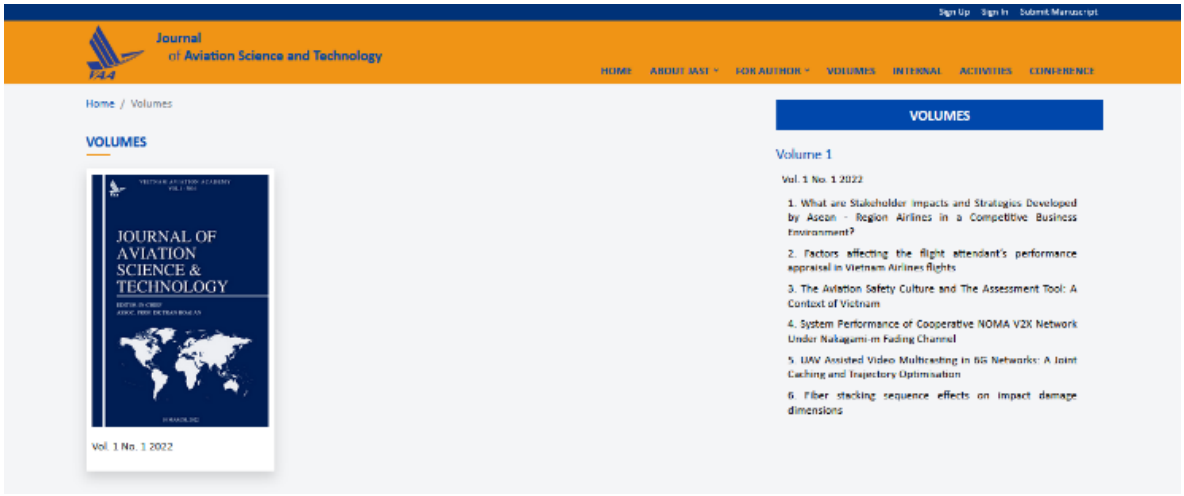

Fig. 12. Volume Page.

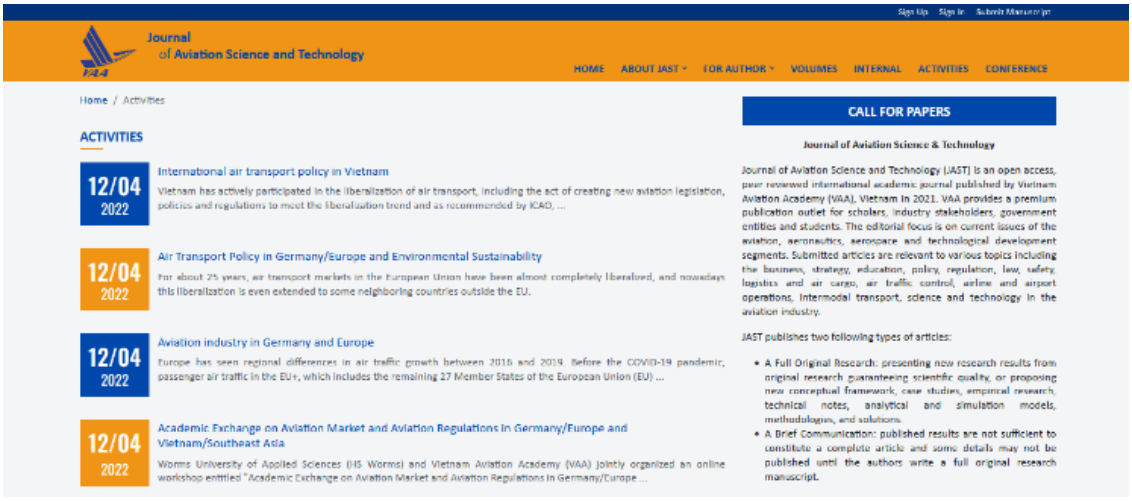

Fig. 13. Activities Page.

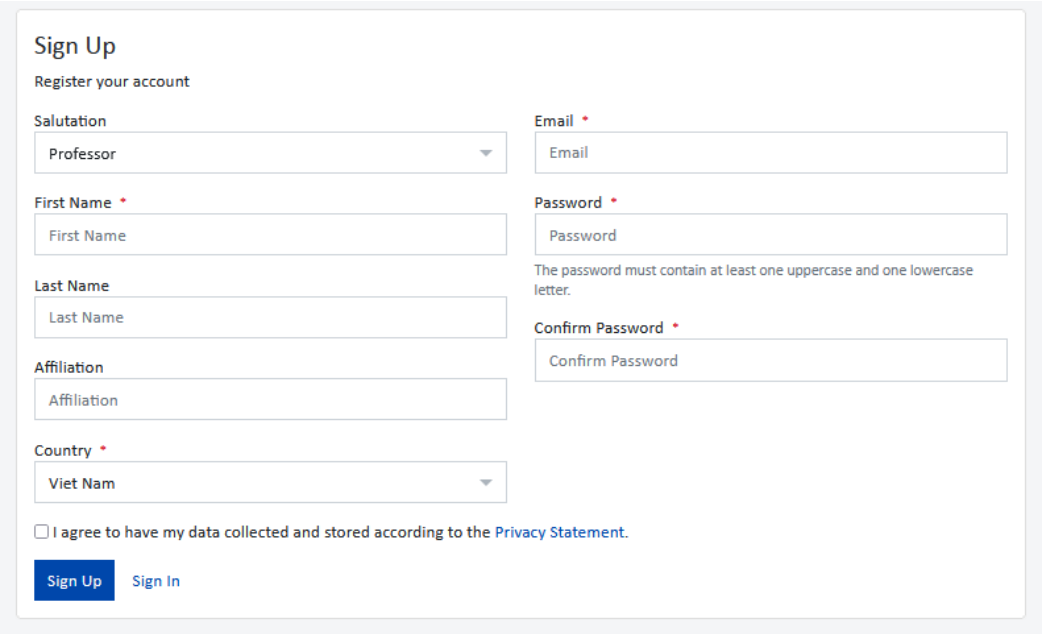

Fig. 12. Sign up Page.

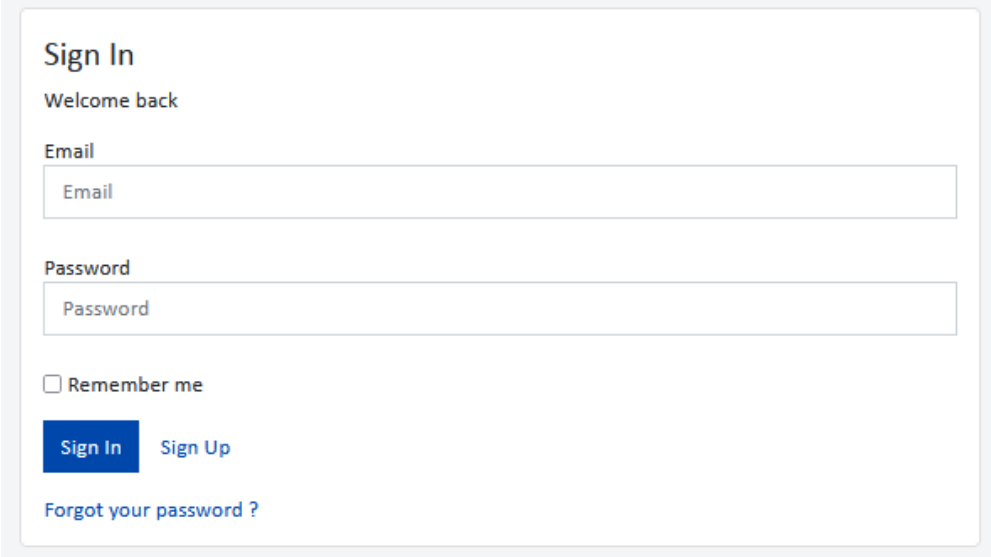

Fig. 13. Sign in Page.

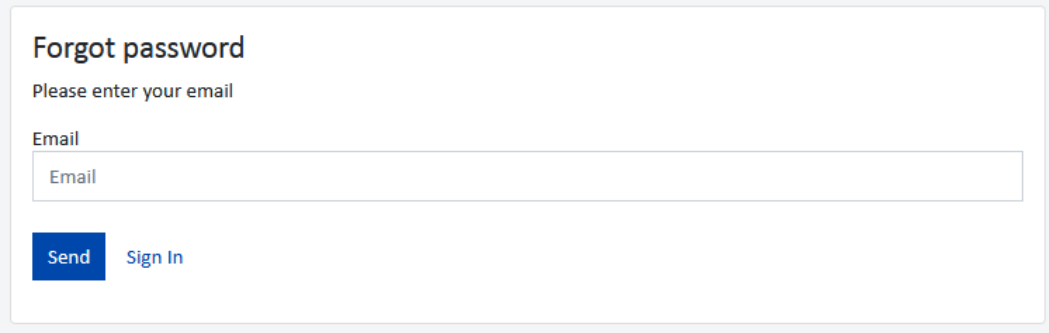

Fig. 14. Forgot Password Page.

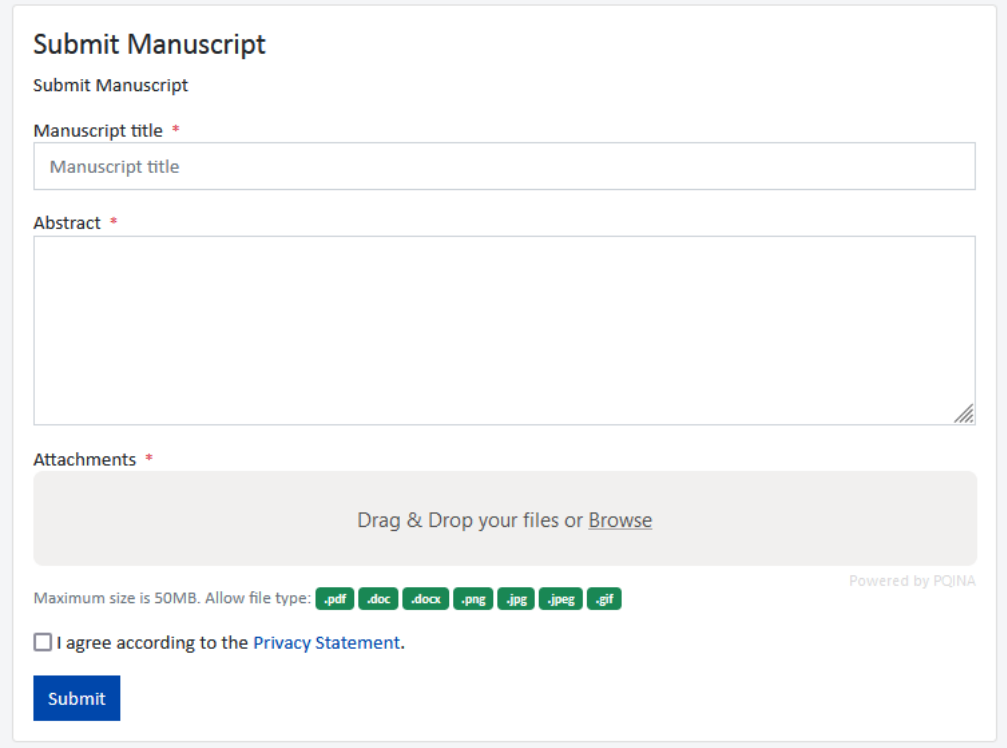

Fig. 15. Submit Manuscript Page.

Fig. 16. Assign Reviewer Page.

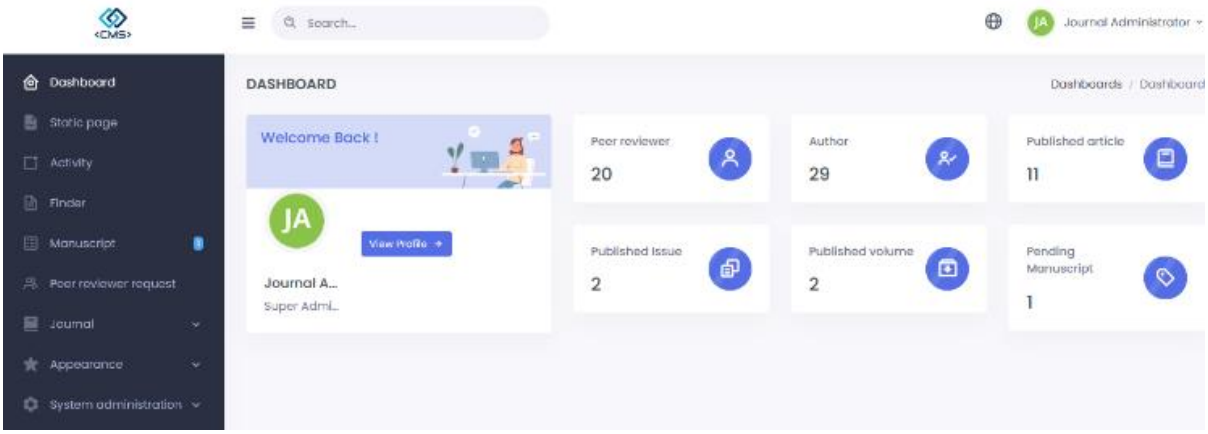

Fig. 17. Administration Page.

V. Conclusion

The paper objectives were to analysis, design and implement a journal website using MVC pattern technology. The Analysis and Design part clear up the website basic features together with initial description of mentioned subcomponents. Additionally, this part presents gathered requirements based on not only user's expectations but also the needs for an application and management requirements.

Through the implementation of the system, we can figure out the following points:

1. The requirements gathering and design help the developers to avoid the flaws and understand the workflow easily.
2. Using the OOP pattern makes the codes more efficient and easier to reuse the functions and that make the development faster.
3. Using the MVC to develop an application is more securable because of the built classes such as authentication, routing, database managing, sending emails Class auto loading.

The first version of the website was successfully deployed. According to feedback, this solution met with success in most aspects. This is motivation so that in the future we will improve the remaining aspects of the system more efficient.

Acknowledgment

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References

[1] Anif, Muhammad, Arya Dentha, and H. W. S. Sindung. Designing internship monitoring system web based with Laravel framework. *2017 IEEE International Conference on Communication, Networks and Satellite* (*Comnetsat*).

[2] The Best PHP Framework for 2015: SitePoint Survey Results, Available: The Best PHP Framework for 2015: SitePoint Survey Results – SitePoint.

[3] Ma, M., Yang, J., Wang, P., Liu, W., & Zhang, J. (2019, June). Light-Weight and Scalable Hierarchical-MVC Architecture for Cloud Web Applications. In *2019 6th IEEE International Conference on Cyber Security and Cloud Computing (CSCloud)/2019 5th IEEE International Conference on Edge Computing and Scalable Cloud (EdgeCom)* (pp. 40-45).

[4] Bean, Martin. Laravel 5 essentials. Packt Publishing Ltd, 2015.

[5] Verma, Archit. "MVC Architecture: A Comparative Study between Ruby on Rails and Laravel." Indian Journal of Computer Science and Engineering (IJCSE) 5.5 (2014): pp. 196-198.

[6] Adam, S. I., & Andolo, S. (2019, August). A New PHP Web Application Development Framework Based on MVC Architectural Pattern and Ajax Technology. In *2019 1st International Conference on Cybernetics and Intelligent System (ICORIS)* (Vol. 1, pp. 45-50). IEEE

[7] Bankov, B. (2019). Software Evaluation of PHP MVC Web Applications. *International Multidisciplinary Scientific GeoConference: SGEM*, *19*(2.1), pp. 603-610.

[8] Cunningham & Cunningham, Inc. Model View Controller History, Available: https://wiki.c2.com/?ModelViewControllerHistory

[9] Sunardi, A. (2019). MVC Architecture: A Comparative Study Between Laravel Framework and Slim Framework in Freelancer Project Monitoring System Web Based. *Procedia Computer Science*, *157*, pp. 134-141.

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