



Design and Implementation of a Simplified CodeIgniter Framework for Commercial Vehicles Ticket Reservation System

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Authors' contributions

This work was carried out in collaboration between both authors. Author AAK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author AOA managed the analyses of the study and the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

With traditional strategies to design websites comes with many obstacles, many limitations, time-consuming and other relative errors. Subject to this reason, new technology like MVC pattern frameworks was discovered through some organizations to address such problems. The task of manual schedule and verification of travellers' booked tickets is laborious, time-consuming and the accuracy of the manual booking system is in question. Therefore, it was a mind set of computerizing these activities. These studies present the design and implementation of a website using CodeIgniter Framework for Commercial Vehicle Ticket Reservation System. The load test functional behavior and measurement of performance was determined. The final result proved that the development was standardized and the non-commercial enterprise logic relationship of the e-transport system was automatically processed. These include Commuter companies, travellers, Human resources management activities and booking activities, thus helping transporters to efficiently handle their road transport business and other related activities.

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1. INTRODUCTION

The technology behind Model–View–Controller MVC Architecture goes beyond A comparative study between CodeIgniter Framework and other PHP Framework with the wide range use of Web technology, many companies and private owners have target requirements to deploy their own Web solutions to improve and sustain business systems in a more productive and efficient manner [1]. However, a good-quality application relies on the support of a clearance structure of system design. The unique approaches to deployed technology focus on the design and implementation of a stable, scalable, reliable, and reusable structural web application system and this poses a great challenge with the trend of technology. In general perspectives, the traditional framework design method is very simple, takes many limitations, large execution time frame and other issues [2]. This research paper presents a dynamic method for the design and implementation for web-based on online bus reservation systems using CodeIgniter Framework. The CodeIgniter development process is highly standardized which entails automatic processes of some non-business logic relationships. This gives room for programmers to target the implementation of business logic [3,4]. The researcher designs and implements a simple CodeIgniter model, which accurately achieved the systemic processing part of the web design. The experimental and simulation presented in this paper shown, a website design using CodeIgniter Framework, which features is more reliable, scalable and robust for prototype system development with high efficiency [5].

2. THE WEB DESIGN BASED ON CODEIGNITER FRAMEWORK WORKING PRINCIPLE

CodeIgniter is a PHP MVC framework which provides out of the box libraries for connecting to the database. In order to work presented [6,7] the CodeIgniter as a framework with the capacity of performing various operations like sending emails, uploading files, managing sessions and many more. CodeIgniter with average around less than 50ms to load which make this framework much easier since it deals with core processes on Model-View-Controller basics, routing basics, form validation, performing basic database queries alongside with CodeIgniter's "Query Builder" Therefore, CodeIgniter in its full

strength will integrate information from different sources and present in different formats together into a hybrid interface to the client browser. Let take an instance of records on database, if a user wants to retrieve information on a registered user with the id= 3, the controller will receive a user request, then prompt or request the CodeIgniter models to retrieve the stored record with the id of 3. Therefore, the CodeIgniter models will return the record to the controller and the controller then forwards or renders the result to the view and this will be formatted into a human-readable format as shown in Fig. 1. This case result is present to the user in the browser as a returned query.

CodeIgniter released four versions in one decade; the first version was released in 2006, three years after Express Engine 2.0 was released. Ever since Columbia Institute of Technology took over in 2014 so therefore, CodeIgniter officially launched a new version on February 24, 2020. The total volumes of the new release close 20 MB which is much more efficient to work independently without relying on other components of the framework. This framework is well documented with full support from the forum being an open source application.

This research work aimed to deploy applications and take observations from other existing systems to effectively design the transport system solution. Many existing project prototype applications in the global market were implemented and deployed on web based platforms and this pose significant limitations. This work is going to be a solution for bus-tax transport service and its presentation is more user friendly on both Smart phones and laptops of varying size. This application has carefully emerged global menus, attractive icons with good layout. In order to achieve this, a Bootstrap framework was used for the frontend design purposely to enhance the rendering effect to the user browser.

2.1 Implementation of Back-end Method for MVC-Based PHP Framework Design

In general perspective, PHP is an open source framework that provides that accelerates the process of developing a website [8]. With the trend of technology today, there are several (OOP) Object-Oriented Programming technology

as frameworks, its feature uses full-stack model for MVC (Model View Controller) design. The application for these aforementioned designs for MVC framework provides ease and fast completion in web application development. Nowadays, writing the code is becoming more systematic and reusable across programming segments. In addition, this framework is greatly used to help programmers in the development of large-scale applications in collaboration with a large set of peoples in the business. With the PHP framework, the code is well structured and well organized in such a way to be easily understood by other programmers.

2.2 Implementation of CodeIgniter Framework in Web-Based Temperature and Humidity Monitoring System

CodeIgniter is one of the frameworks suitable for web application development with expressive and elegant toolkits [9]. The programmers can create full-featured concentric large web projects. CodeIgniter has a number of helpful functions that are globally defined, like a helper function and performs specific tasks such as authentication controller, application Logic, reverse routing, class auto loading, defines the

flash message *method* which sets the flash data and many more. Implementation of CodeIgniter Framework in line with researchers' objectives explicitly declared that the web technology is not trending unlike non Php framework. The narration of CodeIgniter Framework in this work only covers the implementation of MVC concept, creation of a Secured RESTful API with CodeIgniter, JSON Web Tokens, JWT Helper and create an authentication Filter.

2.3 Design and Implementation of a Web-based using CodeIgniter Framework

The Development of efficient and adaptive Web applications using CodeIgniter Framework is deeply compared to traditional Web design method, these traditional frameworks for designing web applications, throw significant challenges with constraint limits. An example of this narration proves that it's timeless from the beginning of development to final CodeIgniter, on the other way round, presents a well-standardized in the development process [10]. This actually processing some non-business logic relationship is a systemic order. The Web design based using CodeIgniter Framework featured a high level of scalability for drastic improvement and development efficiency.

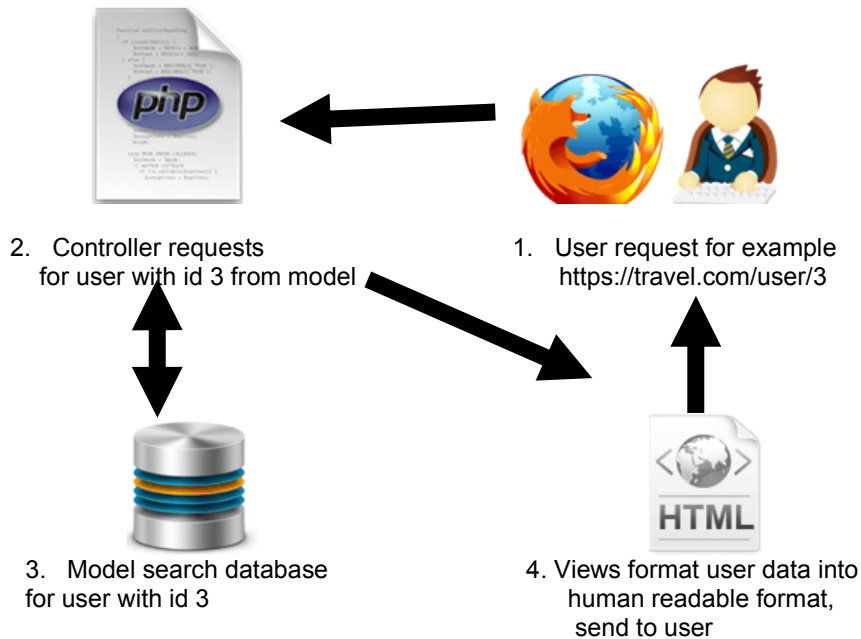


Fig. 1. CodeIgniter framework communication model

2.4 Facilitating Transport Service Process through Commuters Companies Business Initiatives

The transportation business and fleet schedule process is one of the most tedious tasks [11], where travel agents and commuters companies are prioritized. The travel schedule relies on the availability of vehicles at a particular time and the selection scheduling is breaking into categories. This paper focuses mainly on the schedules, this implies that the travellers have to do fleet booking through web form application and print out tickets or store on devices like laptop or mobile Smartphone. This action is performed with respect to choice of service. This schedule is very important because service requests must be approved by the Transport Company running the business. Once the seat reservation is full for a particular travelling section, travellers would not be able to book tickets. Many transportation companies face a lot of problems performing scheduled travelling service, especially when their businesses are not migrating on web or mobile applications.

To develop a more efficient way in running e-transportation service and accept e-booking from travellers from different geographical zones, a web based applications to intermediate e-transportation system is required for booking during the scheduled periods. Intermediate e-transportation system consists of three main components; enrolment form, booking processes and inquires form. This actually speeds up the booking process by filtering out paid travellers, unpaid travellers and allows a better facilitation for quick booking and seat reservation. This provides travellers with guidelines and precise information about services. The booking form is completed online and submitted through the user browser. Therefore, managerial cost and time for auditing seats and accounting can be saved on cloud storage and there will be less paperwork in this regard.

2.5 A Secured Restful API with CodeIgniter and JSON Web Tokens

The fact remains that web-development powerful framework written in PHP CodeIgniter Framework. This framework has been designed to improve the quality and efficiency of software by subsidizing both the cost of initial development and ongoing maintenance costs. This allows developers to build full-scale web applications and the growing use and applications for cloud services and necessitates

a more efficient and adaptive architectural style rather than the Simple Object Access Protocol (SOAP). Using REST for this development is more resourceful, since its (Representational State Transfer) allows for a light-weight, stateless communication between clients and the Application Programming Interface (API).

Therefore, in designing a secured website for this paper, then considering the reasons for its stateless communication, the access control for Restful APIs is based on tokens which carry enough information to determine whether or not the client is authorized to perform the requested action on the resource [12,13]. This path is set to improve the user experience of engaging with applications by providing clear syntax and call for functionality that will save developers hours of implementation time. CodeIgniter is one of the few PHP frameworks that offer true code modularity.

This is achieved through a combination of drivers, modules, AIP(s) and its helper system. The Drivers allow developers to easily change or modify and extend caching, session, and database and authentication functionality. Data analytic solution for heterogeneous transportation management network system [14], This was implemented with CodeIgniter Framework but was study on concentric collaboration of transporters using My SQL for data migration for the productive server.

CodeIgniter deals with cutting-edge toolkits for interacting with databases. The uses of database migrations enable programmers to easily design and modify a database in a platform-independent way. So programmers won't have any compatibility issues. CodeIgniter's Active record implementation is called CodeIgniter Eloquent Model Relationship Class Model. Interacting with a database in an object-oriented way is the modern standard. With Eloquent Mode, developers can create, retrieve, update, and delete the database records without needing to write a single line of SQL. Eloquent Mode provides a powerful relationship Class Model and it can even handle pagination automatically during development.

3. E-TRANSPORTATION SYSTEM ARCHITECTURE AND THE OUTLINE OF SYSTEM

3.1 Passenger (Traveller)

The passenger or traveller will have all current fleet schedules published on websites

by commuters. If the traveller satisfied schedule criteria then can book a ticket online. Once travellers make a booking for a travel schedule then they have to pay for a ticket offline or online through payment processor. The result returns a message on its success.

3.2 System Admin

The admin can access staff, drivers and agents, traveller record details, fleet schedules then can set fleet facilities and manage the web-application. The activities include create, delete, update records regards to commuters services. In collaboration with commuters can shortlist buses and taxes for daily business, set alert systems for collaborators i.e the drivers, vehicles, and passengers' tickets. This is done by input required information that will be useful when travellers navigate through the website.

3.3 Fleet Details

This is one of the required information to render to the traveller browser, categories of vehicles information i.e reserved seats, travel schedule, routes line, vehicle registration number and many more. Travellers with intent to book for fleet tickets will get required information creditable before making choice of service from transporter companies.

3.4 Travel Schedules

Each commuter will register a vehicle first and set registered bus-tax to active for business of the day. For instance, a bus leaving from one destination i.e Ilorin to Offa, the routes must be set to active, add transport fees, number of vacant seats, and take off time and destination arrival time.

3.5 Travellers Booking

Once the vehicle is set active and the schedule is approved by commuters or agents. It is required for passengers to have access to vehicle information. This will grant passengers access to book tickets after sign up on the website. The ticket booking takes two options, it provides an online payment option for seat reservations and also enable passengers or agent to make seat reservation without online payment. The use of booking option without digital payment is tentative and this is only accepted by the

commuters if presented before the seat reservation schedule expires.

4. RESEARCH METHODOLOGY

4.1 System Model View Controller (MVC) in PHP

The general perspective trends of software development in industries into account. The model view controller pattern is an adaptable pattern for today's world web applications. The model class is used in the study purposely to manage the data, stores/save and retrieves entities used by an application, consecutively from a database. This also contains the logic implemented by the application and the aspect of view model class (presentation/rendering) is solely a key factor used to display the data provided by the model class in a specific format. This has a similar usage with the template modules adopted in some popular web applications like Magento, word press, joomla etc and this view is presented in Fig. 2. Therefore, the controller handles the model and view layers to work together in its operations. This shows that the controller receives a request from the client, then invokes the model to perform the requested operations and sends the data to the View class in a rendering format. At the end, view formats for the data is presented to the user, in a web application as an html output.

5. RESULTS AND DISCUSSION

5.1 The Reasons for Selecting CodeIgniter Framework

Observations and results obtained from the general perspective of CodeIgniter frame-work contain inbuilt mechanisms which are responding to the changes occurring in businesses solutions and their web applications. The model, view, and controller framework varies in terms of properties and the tool kits for developers to utilize for the building of web applications in a short time frame was emphasized in section one. This has a small footprint and offers a straightforward programming practice which was adapted to attain the desired outcome of an e-transport system. This was based on graphics user interface effect and user experience. Therefore six reasons were adopted for full integration of the CodeIgniter Framework.

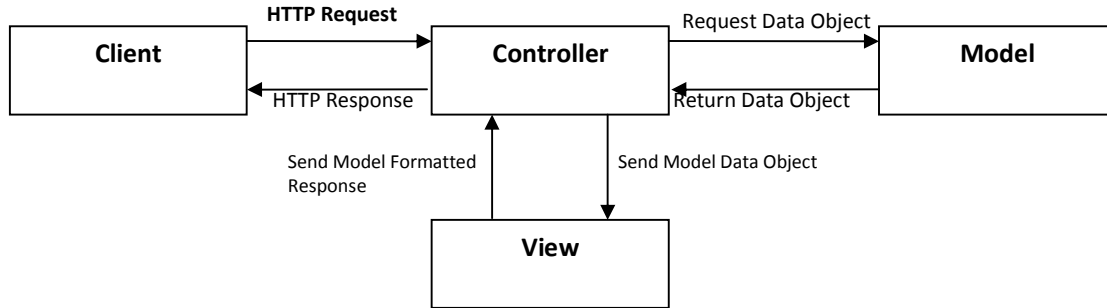


Fig. 2. The MVC collaboration block diagram

These reasons are based on its secure framework which is a prime factor for every company businesses. It offers rich security on the bases of diverse inbuilt functionalities for the input and output filtering. The use of encryption and decryption processes to manage data turnout to be a great advantage since CodeIgniter comes with simple configuration. So, based on its linear arrangement and free reusable or usable folder set-up, CodeIgniter aids streamlining code syntax when utilizing PHP framework. This poses no constraints even for a code beginning to execute some syntax. CodeIgniter is easy to use, based on its model view controller framework; this has a modest interface that requirements do match development purposes.

The use of the framework in this design produces more output with little code and its popularity in the community development for app development framework today motivated the research aims. Its libraries were taken into account since it discourages third party libraries and this paves way for fast and rapid app development with robust functions. CodeIgniter features growth with Superior Testing Facilities, taking the newly released in 2020 as an integral part in app development. This shows significant improvement compared with other PHP frameworks, given the benefits procedural step by step testing characteristics results to a great benefit with high level performance level functions. Furthermore,

A well remarkable document was fully utilized and this aids in preserving the crucial documentation for fully developed programming codes in a simpler manner and improves the system efficiency. The result greatly reduced the development time frame for incorporating alterations with the varying requirements.

5.2 CodeIgniter Framework Implementation Features and Benefits

In order to understand more about website development using CodeIgniter, The CodeIgniter features provide a great advantage to the development of an e-transport system of ticket reservation. Start with vibrant functionalities and a responsive platform (GUI). This is done to improve the user experience at the final result. To allow the business solution to migrate from one server to another, database migration and upgrade support was considered as the most preferred option and this was achieved quickly without any interruption. For a traveller to navigate the entire website CodeIgniter core components have an internal engine to boost the website ranking and improve the accessibility of the website and this is considered as a major benefit to improve search engine option of the website.

Therefore, the entire website layout is easily optimised and the results post significant advantages on business solutions. After completing the website, it required a test driven development, the outcome of this development was fully unitised using step by step testing method at the development stages. Some aspects are required for every business solution, these include web security used to protect users trying to fetch or save data to the cloud server. To maximum security, it's required to protect users, the encryption and a decryption characteristic was used to give the website more reliable security. Choosing a CodeIgniter Framework to invoke this syntax, really complements the designs of e-transportation systems that just have security measures.

The trend of PHP framework is more holistically, the Fig. 3 shows a processed survey conducted

by MATRA LAB for the most popular framework dated 2014-2019. In these views, some frameworks like CodeIgnitor, Cake PHP, Phalcon and Aura, Laravel sticks top among selected server PHP and this trends toward year 2020.

Therefore the presentation in the plot area revealed popular trends of dynamic web-development in the PHP developer community, 78.9% of the websites and app development developers use PHP frameworks and Cloud.

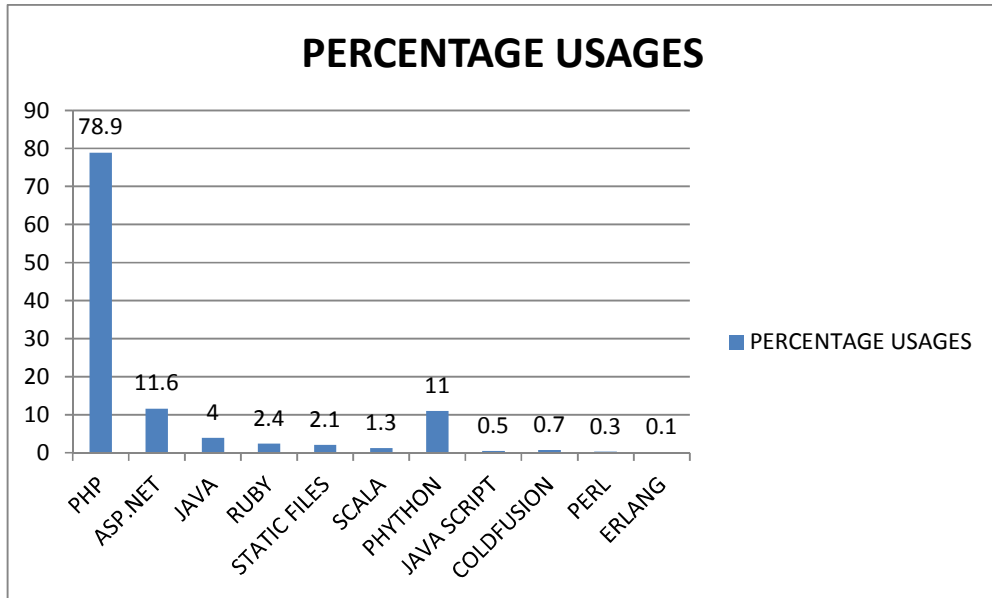


Fig. 3. Percentage of selected eleven websites using various server-side programming languages

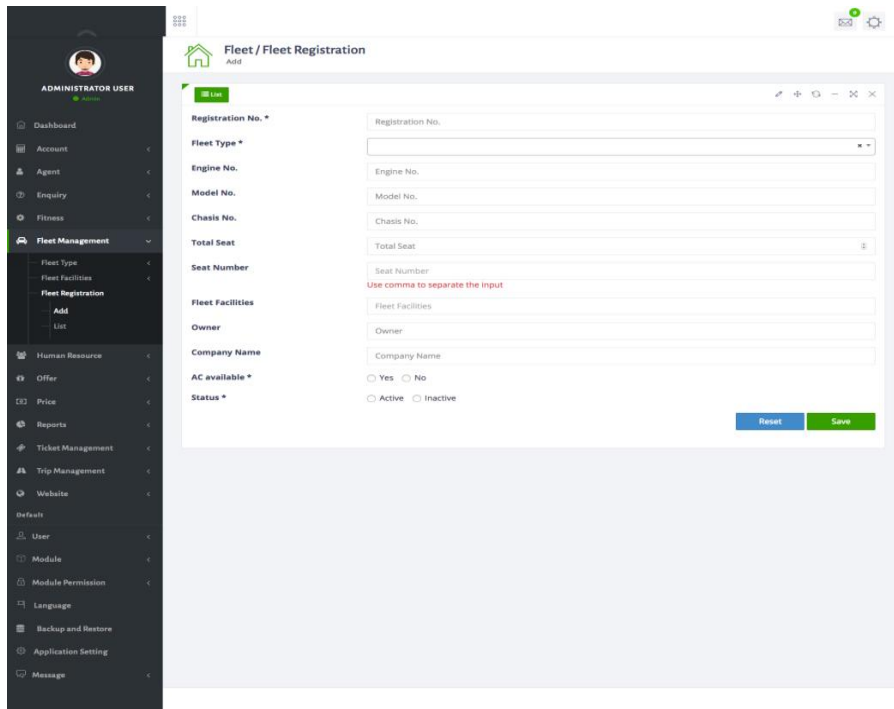


Fig 4a. Fleet registration where to add vehicles information and save to cloud

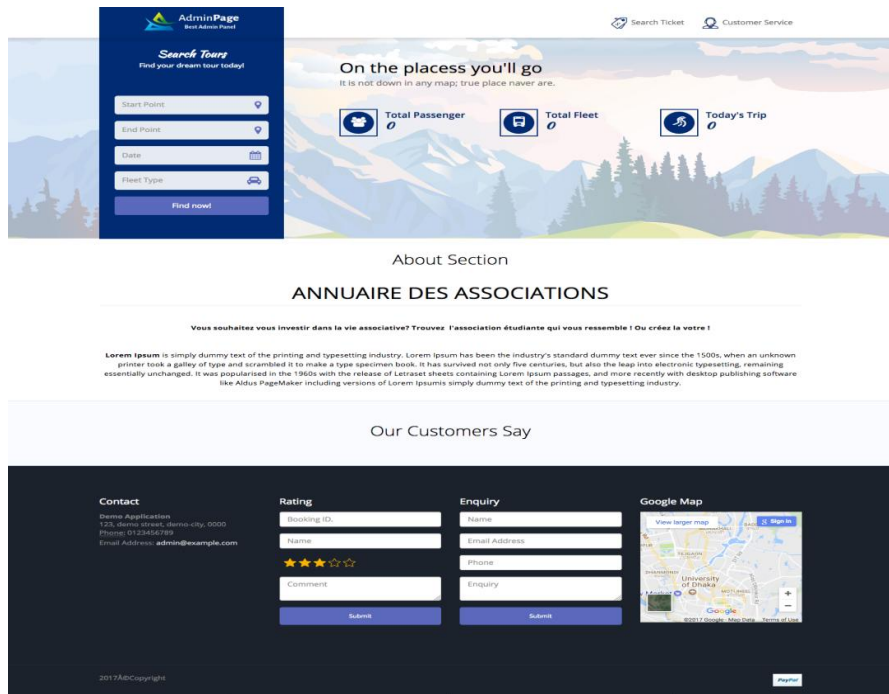


Fig. 4b. Index website where installed the e-transport system for bus-tax reservation system

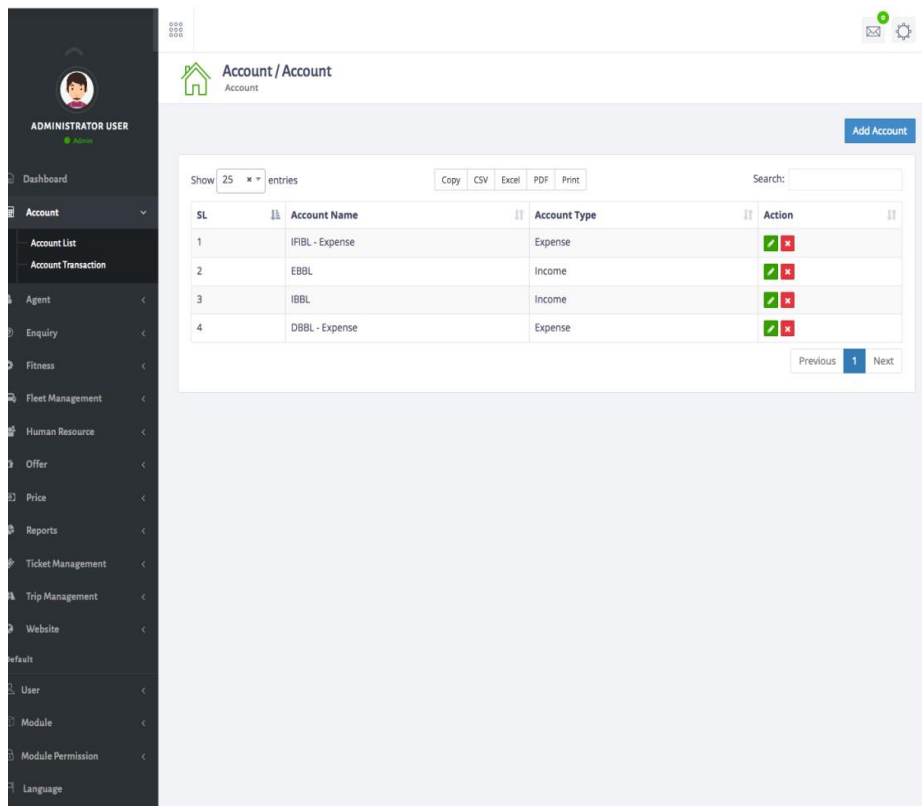


Fig. 4c. Dashboard to add account and manage account option

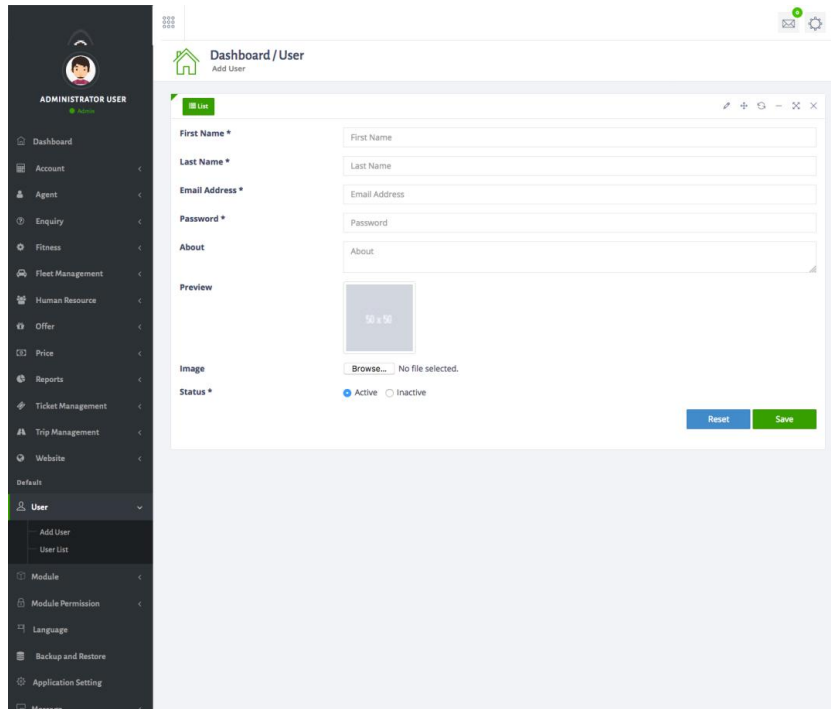


Fig. 4d. Shown where to add users and display user list

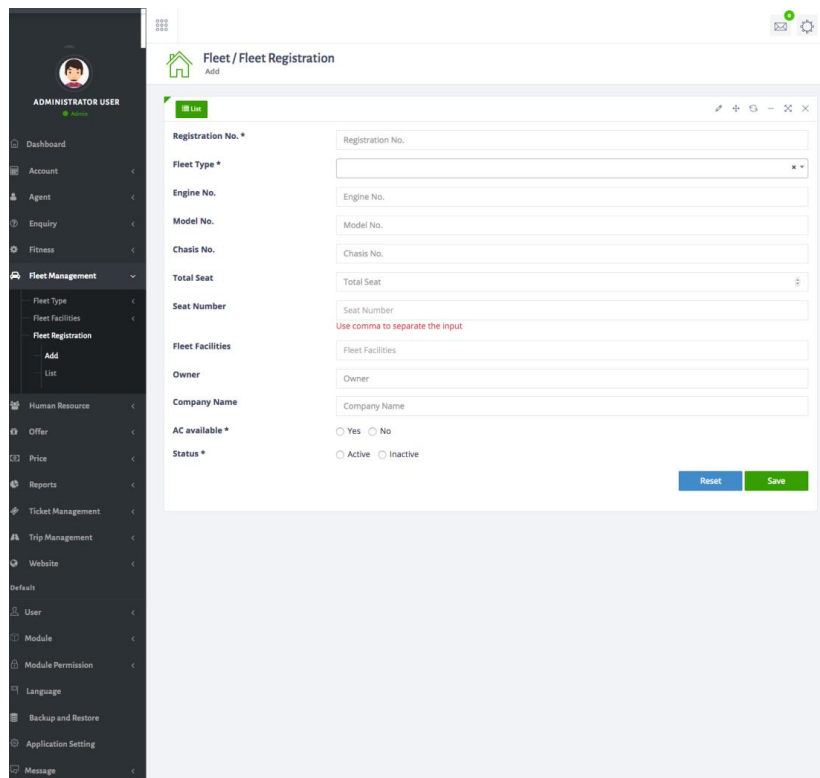


Fig. 4e. Dashboard that displays fleet registration. For commuters or admin to add vehicles information and then save on cloud

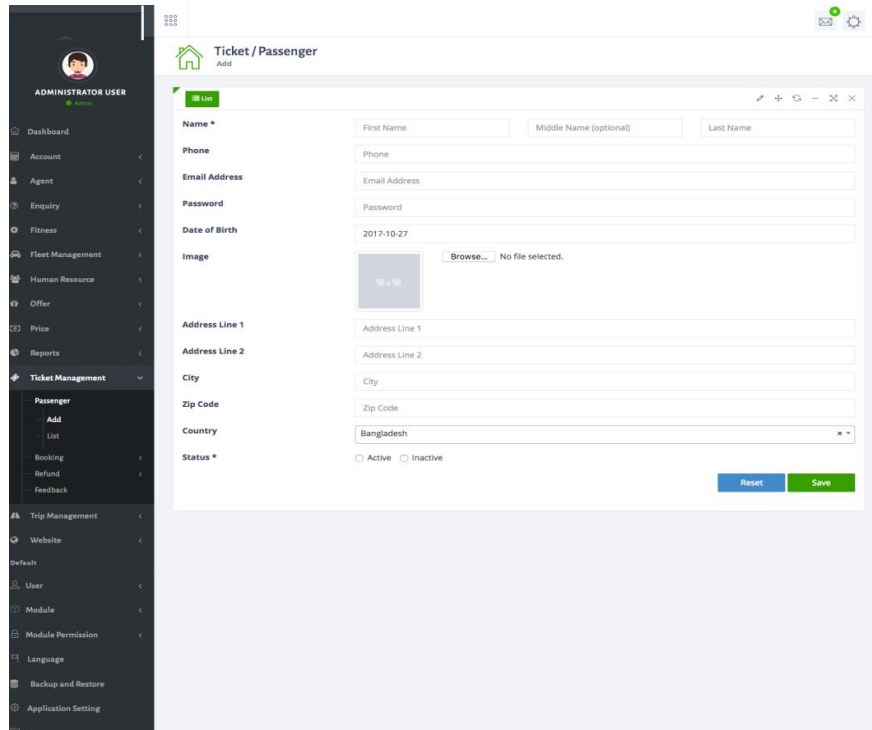


Fig. 4f. Dashboard to add new passenger where agent or commuters can fill up form and manage the passengers

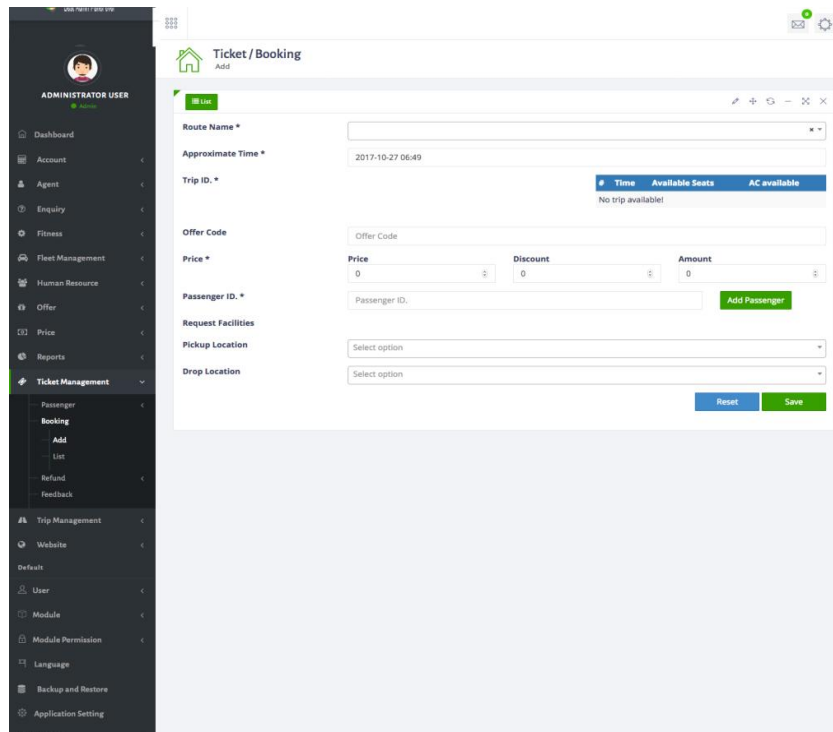


Fig. 4g. Ticket booking features for ticket enrolment

The outcome of this design provides an efficient means for travellers to make reservations after sign up online. User authentication is presented in Fig. 4a and b. Passengers / travellers with privilege to update profile after login. The visitor or passenger can search for a reservation from the index page as shown in Fig. 4b and the result will present search results for available taxis or buses on the user browser as shown in 4c & d. This indicates that the user can check travelling details published by commuters with respect to travel schedules. The login also gives room for system administrators, agents and commuters to register passengers, book tickets for one-half of passengers and initiate transport service to passengers. This allows passengers to adequately make seat reservations as shown in Fig. 4e,f and g. The use of record keeping is assigned to administrators and commuters purposely managing business records such as ticket management, vehicle registration and schedules travels based on available vehicles available for transport service per section. In these Figs. 4a,b,c,d,e,f,g presented below, were the summarised web-based user UI for intermediate browser for rendering Commercial vehicles Ticket Reservation System.

5. CONCLUSION

Thus, in the research work, an overview of this prototype web application was fully developed and tested to justify the research objectives. The implementation e-transportation system justified the needfulness for passengers or travellers to make travelling ticket reservations. The adoption of CodeIgniter Framework clearly showed that how deeper programming coding can be easily complete a web-based applications within a short time frame and functional and non functional required for commercial vehicles ticket reservation system was tested on local hosting servers. The website functionalities are automatic, productive and its benefits can offset manual booking modalities. The end result obtained could make participants make a concentric booking process with respect to geographical locations. The functionalities like travel schedules, booking process, vehicle activation, and booking enquiries will increase the utilization of e-transportation systems and this will definitely improve the service of transport service business in a low income area. The cost of deploying a web is now cheap with the advantage of CodeIgniter PHP. Its advantage provides security from different nature of external

attacks. It also helps for business solutions and sustainability of road transport service in general.

DISCLAIMER

The products used for this research are commonly and predominantly used in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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