

Road to developing an ERP system for MSME's using Laravel MVC Framework

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Abstract: The paper studies the development of an ERP (Enterprise Resource Planning) system using Laravel MVC (Model View Controller) framework by a group of entry level developers. It showcases the way in which group of developers should go about developing the application with entry level technologies and by utilizing the Laravel framework for efficiency and ease of use.

1. Introduction

The paper delves into how a complex software application can be developed by a group of entry level developers using open source technologies. Developing any software application can be a tedious process especially for an entry level developer. Without having a dedicated framework for MVC it can consume lots of time and resources to develop a simple web application. Learning new technologies is not hard but being competent enough to use them to develop a software application for industrial use is a different thing altogether. Thus, designing a web application with a modern MVC framework that utilizes PHP can be used for efficient development process. An organizations presence on the web is essential for its growth. Similarly, the organization also needs software applications to manage its internal day-to-day processes to efficiently utilize its resources. ERP software application are considered to be an enterprise application which is a business management software solution that is often customized or modified to suit the business needs of an organization. This paper will look into the development process required to develop an ERP software application for a MSME (Micro, Small and Medium Enterprise). The MSME in question deals with renting of cranes to other organization along with the supporting inventory.

2. Working of the ERP System

The ERP system being developed is for an organization that deals in renting and repairing of cranes. The system will contain various modules that will satisfy the need of the organization at various levels. The software application will include modules for on-boarding clients, vendors and employee's of the organization. It will also include modules that keep track of transactions of the organization. Another module will keep track of the organizations assets and inventories (Cranes and its parts). Each of the major modules will be further subdivided into sub-modules. [Fig. 1.] is the diagrammatic representation.

a) On-boarding and Management

On-boarding process will ask for users of the application namely Employees, Clients and Vendors to be registered to the system. They will also have to provide relevant data and documents for authentication. Employee attendance tracking and Role management of the system users will also be done in this module. Role Management will include setting of role type and authorization level for each role type for each module.

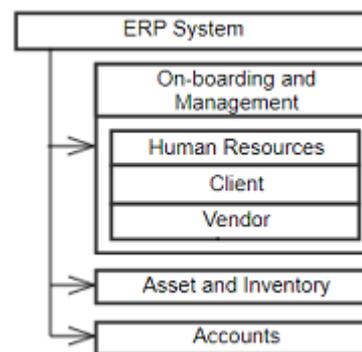


Figure 1: ERP System Overview

b) Asset and Inventory

Management of asset and inventories of the organization can be a tedious task. Hence, there will be a one time process for registering all the assets and inventories of the organization to the ERP system so it can keep track of them. Asset and Inventory module will keep records of all the movement of inventory from within organizations to outside and back. This will keep track of the inventory that will be supplied along with the crane as well as the employees that are assigned to crane that will be rented out to customers.

c) Orders Module

One of the most important module of the entire system is the Order module. Using this module the Crane Company owner or employees can send quotations, receive orders and create the respective PDF documents.

d) Accounts

Accounts module will record the transactions done by the organization and generate necessary documents such as Invoices. This module will also accept certain prerequisite data from Vendor client and Employees to work.

e) Bill and Invoice Generation

It is pertinent that all transactions are accounted for and all the customers of the Crane company receive the bills and invoices for each and every transaction done. This module is tightly linked with Accounts module.

f) Client Facing

This module will essentially display details of past and ongoing business of the client with the Crane company. The client can also ask for quotations form the crane company as well as receive bills and invoices for each transaction.

g) Vendor Facing

This is one of the smaller module. Its main responsibility is

to keep track of all the vendors of the Crane company.

2.1 Development Process

a) Choosing the development methodology

Developing a software application is a time consuming process and there is a need to break this process down into smaller portion and organize them properly. There are various development methodologies present that can be used. Following are some of them.

- Waterfall
- Rapid Application Development (RAD)
- Iterative
- Agile

Agile Development: Agile methodology of software development is one of the better choices that can be followed when creating an ERP software application. As there are multiple requirements and high level of complexity it is easier to break down the entire application into smaller modules and attractively work on them. It emphasizes on individual and team interaction over process and tools, a working software is more important than detailed documentation, there is also high involvement of the customer, and finally agile allows for dynamic changes to requirement. All these points help in better development of the complex software application.

b) Implementing the Agile development methodology

The entire development process can be split into sprints which will contain daily stand-up meetings done by the team leader. This will help keep the development team focused. The sprint duration is fixed at the start. In each sprint a module or part of the module can be developed depending on the complexity. At the end of the sprint the deliverable will include a working piece of software that can be tested by the customer. If the work on the module is no completed it will spill over to next sprint hence the development team needs to meet milestones on time to avoid it,

2.2 Technology Stack

a) HTML and CSS (Bootstrap Framework)

HTML is Hyper Text Markup Language and it is the building block of any web based application and it is assisted by CSS or Cascading Style Sheets. CSS helps to make the user interface more appealing to the user. For an entry level developer this technology is easy to learn and even master. This will help to increase efficiency in development of the user interface.

b) JavaScript, jQuery and AJAX

These technologies help make a web application more dynamic and functional for the end user. AJAX is short for Asynchronous JavaScript and XML. It helps the developer to asynchronously load data from the server. This is done without reloading the entire page. Similar to HTML and CSS JavaScript, jQuery and AJAX are easy to learn and implement thus can be utilized by entry level developer.

c) MySQL Database

MySQL database is open source and it integrates seamlessly with PHP. Being an open source technology there is no licensing fee. This is one of the major reason entry level

developers use this database. It also has more than enough reference materials for the developers.

d) Laravel Framework (PHP)

PHP or PHP:Hypertext Preprocessor is a server side scripting language. In simple words it help to establish communication between frontend and the database. Laravel is a MVC (Model View Controller) framework.

2.3 Laravel Framework

PHP Frameworks can be utilized for developing a web application when time is of constraint and Developers do not possess high skill. Laravel framework handles all the basic repetitive tasks allowing the developer to utilize their time more efficiently. Laravel framework provides a organized structure for a project as a whole thus allowing developers to write clean and clear code while developing as a group. Laravel also has built in security features that help make the application more secure

a) Architecture

Laravel handles repetitive task such as session management, caching, authentication, routing etc. Laravel is also easy to setup as it requires minor changes in php code thus saving developers time in setting up the development environment. When a developer creates a Laravel projects following [Fig. 2.] directory structure is generated.

b) MVC (Model View Controller)

MVC Architecture is an industrial standard. Laravel provides developers with an MVC Architecture thus helping in increased efficiency.

Model: Models are the way by which developers manipulate data stored in MySQL database. It can be considered as the Layer between the data and the application.

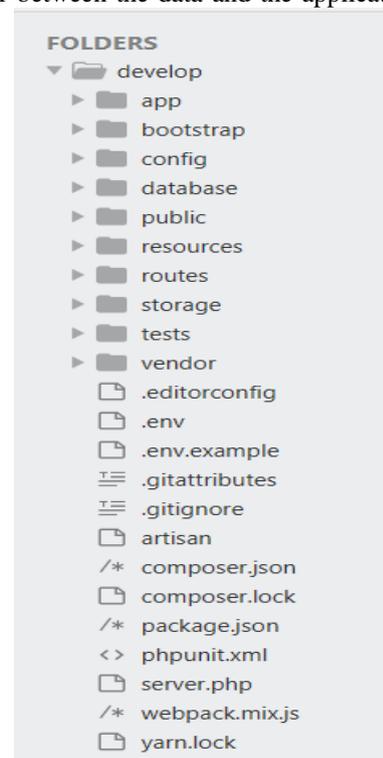


Figure 2: Directory Structure

documented and clients approval taken before the development process began. A simplified version of development process breakdown is displayed in [Fig. 3.].

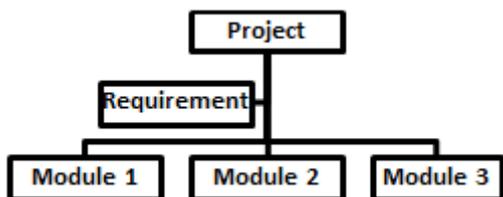


Figure 3: Development Process Breakdown

c) Sprints

As the project used Agile Development process the entire development lifecycle was divided into sprints. Each sprint focused on a module or part of the module. End deliverable of each sprint was a working piece of code that could be shown to the client and can also be tested by the client. Each sprint was of a week and at the end of the week the deliverables were demonstrated to the client and feedback was taken. In case of spillover of sprint the incomplete parts were fixed in the consecutive sprints. Sprint lifecycle is displayed in [Fig. 4.].

- *View:* This can be considered as the presentation layer of the ERP Application. Views generally show the data that the controller receive from model. These views can be constructed using blade template, php or plain HTML. The Laravel engine recognizes blade files through ".blade.php" or simple ".php" extension.
- *Controller:* Primary functionality of the controller is to handle requests and pass data from model to view. The logic can be written in the controller.

3. Workflow of the Development Process

a) Requirement Gathering and Understanding Storyboarding

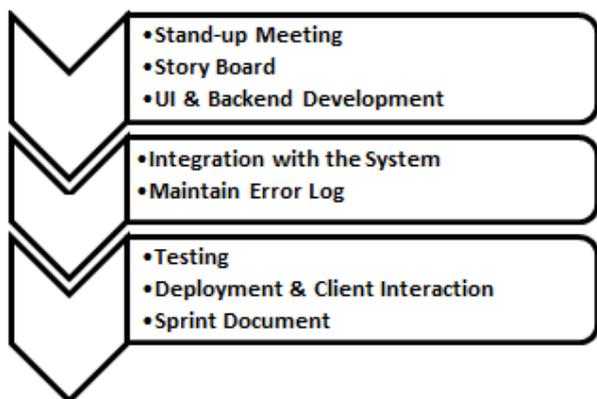


Figure 4: Sprint Lifecycle.

Requirement gathering and understanding can be considered to be one of the most essential step for developing any application. Requirements for the ERP system were gathered from the client by continuous interaction with the client. Proper understanding of the workflow of the clients working helped with gathering proper requirements. This in turn helped the developers to develop modules that were in line with clients requirements. These requirements were also once all the requirements are in place and sprints have been

decided each sprint is assigned a story. This story will define the functionality of the module or part of the module that is to be developed for the sprint. Story boarding should contain all the detailed scenarios that can happen with respect to module that is to be developed. This provides more clarity to the developers and makes developing the module for all functional scenarios possible.

b) Development Flow

Development of a module starts once the requirements are converted to stories. Once the stories are in place the developers start with the actual coding. Work is divided as frontend, backend and database. Developers take responsibility of their role. The Database needs to designed properly before User Interface and backend coding part can begin. Development of the User Interface and backend can start once the database is designed properly. Such complex applications need database with multiple mapping tables thus understanding of joins is once of the essential requirements. Table Mapping is displayed in [Fig. 5.].

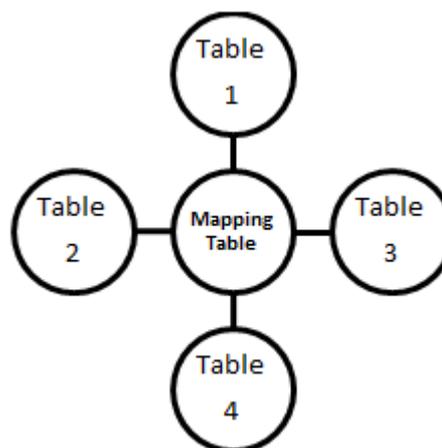


Figure 5: Table Mapping

API's and plugins should be used when necessary for efficiently develop any application. One such example that is utilized in Onboarding Module. One such API helps to retrieve data for Bank details such as Bank Name and Location of the Branch by using Bank's IFS code. This API can be called in the AJAX code. The IFSC is passed to the API and the response received is displayed on the User Interface. Working of the API is displayed in [Fig. 6.].

Plugins can be used to do certain task which would require lot of resources to develop the functionality. Once such plugin that can be utilized along with Laravel Framework is one which helps to generate PDF documents. This plugin uses a basic HTML page which is formatted to show data as per the requirements and convert it into a PDF document.

Validations are another examples where simple jQuery code can be used to validate inputs from the user. This prevents invalid data from being entered to the database. The process flow of how validations are done using jQuery can be seen in [Fig. 7.].

Once a module is developed it is shown to the client and inputs are taken from the client in the form of feedback and suggestions. These feedback and suggestions are then

implemented depending on the feasibility.

4. Conclusions

For an entry level developer developing complex applications such as an ERP system for an MSME can be made

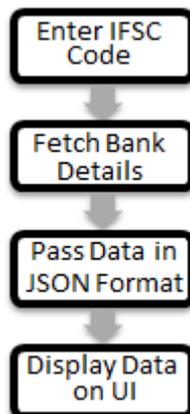


Figure 6: API Working.

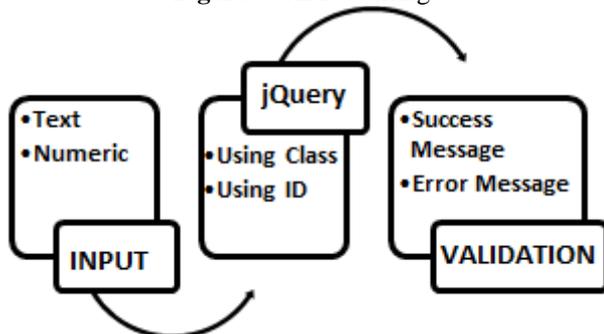


Figure 7: jQuery Validations.

simple using Laravel framework as it provides the user with all the necessary tools to build an application from scratch. Its easy to learn, robust and also provides lots of plugins that the developer can user as per requirement, also majority of these plugins are open source hence integrating these into the application will not be a problem.

5. Acknowledgement

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