

PHP Frameworks Usability in Web Application Development

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Abstract- A framework defined as a structure that supports the development of dynamic websites, web applications, and services. Framework code and design are often reusable to assist customization, resource service, and API-related tasks. This study discussed current practice to help a developer understand PHP frameworks adoption for web application development. Three approaches were selected to understand the features suitability of the PHP frameworks: the systematic approach, score criteria evaluation, and PHP framework technical factors. A comparison of 23 different frameworks features also has been studied that involves features such as ORM, Code Generator, Template Engine, and CRUD Generator. Besides PHP framework features, understanding the basic core PHP to build web application would help a lot in learning PHP frameworks. Moreover, new developers should not limit themselves to a particular PHP framework only but also allow themselves to explore various PHP frameworks in the development of web application projects.

Index Terms- User Experience, Usability

I. INTRODUCTION

PHP was initially developed by Rasmus Lerdoff in 1994 to watch over his online resume and related personal information in which PHP initially named as "Personal Home Page". However, two programmers Zeev Suraski and Andi Gutmans rebuilt, updated and released the PHP core in 1997 and changed the acronym PHP to "Hypertext Processor" [9]. Through time PHP has evolved and PHP has been used as a language for the World Wide Web (WWW) or so called Internet in which developers find PHP is a language that easy to learn, community friendly, freely available as an open source software and easily to deployed. The current PHP environment requires developers to create interfaces components of the system, link to database and user authentication. The usage of framework could overcome the problems during development life cycle environment by reuse of code which could save times and costs to design, developing codes and tests [13]. This study discussed on the current practice to understand PHP language and PHP frameworks in building web application.

Any developer who wished to adopt the PHP framework to build web applications should understand on the basic concept related to PHP framework and grab the necessary knowledge and skill required to become a competent web application developer. The significance of this study will provide an insight for developers who wished to develop web application using PHP frameworks. Developers would have better knowledge on which PHP frameworks that are suitable to be

implemented in their web application development environment.

II. PHP FRAMEWORKS CONCEPT

A framework is defined as the skeleton for an application with a built in collection of related objects, factored into classes in which the framework code or design are reusable [8]. In other words, a framework is a collection of source codes organized into an architecture that supports the development of dynamic websites, web applications and services [26]. Frameworks also assist for customization, resource service and API-related tasks [21]. 1) The concept of a PHP framework is related to Object Oriented Programming (OOP) and Model View Controller (MVC). MVC is a design pattern that applies the concept of software development and originally designed to provide multiple views of the same data virtually for modern inter- active applications [18]. The MVC pattern allows the interaction of data and methods in multiple classes and offers possible solutions to problems which could arise in the application development [4]. MVC pattern has three separate application components as follows [26]: Model —represent data structure relationship and dependencies which provides an interface to manipulate all classes corresponding to the logical object of the application. 2) View —represent screen presentation on different devices in which the application could have multiple views of the data. 3) Controller — represent as an information collector or input for the user and transfers the information to the model. The idea of having MVC in PHP frameworks are the code presentation and layout

will be simpler and well separated that will make the application more maintainable. In other words, the controller could easily handle the view inside the files and the logic inside the model [1]. Figure 2 shows the interaction flows between each component in MVC pattern [20].

Basically, MVC would improve the PHP processflow by effectively divided the flow into smaller steps and separate them clearly. The motivations in using MVC are as follows [20]:

- Built in libraries, helpers and less codes to developed application functionality.
- Standardize, consistency and predictability and allow software components to be shared and reused.
- Allows easy visualization on how the entire system works.
- Security, interoperability and maintenance.

Besides MVC pattern the OOP concept is also implemented in PHP frameworks. OOP is a programming languages concept which abstract the data, logic and interactions into a set of objects. The areas of Object Oriented (OO) involves the concept such as class, instance, method, message passing, inheritance, abstraction, encapsulation, polymorphism and decoupling [5].

However, this study will not discuss further on the OOP concepts.

III. THE SELECTION OF PHP FRAMEWORKS

Any developers who have the intention to build knowledge and skill regarding PHP frameworks requires to be vigilant on the current trend regarding the development on web application technologies. Currently, there are many PHP frameworks with unique features, thus careful selection should be made to identify which framework is suitable for them. The question aroused how to choose the right PHP frameworks because the choice might depend on which PHP frameworks that have a large user base and community support, useful features, popular, trendy and widely used [4]. This study has identified that there are three approaches could be conducted to identify on the choice on which PHP frameworks should be selected for beginners or anybody who wished to fully understand the concept of PHP frameworks at the initial stage. The approach is a Systematic approach, Score Criteria Evaluation, and PHP framework technical factors. A. Systematic Approach The systematic approach proposed by Parker [22] described the commonly approach used in selecting software tools for the IT curriculum. This study adopted the systematic approach on the selection of the suitable PHP frameworks as follows:

- Compile the PHP frameworks criteria list.
- Weight each of the criteria of the PHP frameworks.
- Determine the PHP frameworks list.
- Rate each of the PHP frameworks.
- Calculate the weighted score for every PHP framework.

The systematic approach requires each of the PHP frameworks to be tested using a few evaluation criteria such as performance, maintenance, suitability, and other software assessment evaluation. Hence, the relevance of the PHP frameworks could be determined through the weight score of each PHP frameworks that have been tested. Another study conducted by Milos and Zurkiewicz [17] suggested that evaluation on PHP frameworks weight age criteria should include these analyses as follows:

- Documentation and technical support—to ensure the source code reliability.
- Tools are supporting web application development—to reduce programmer's workload with generated source codes.
- Programming techniques—to reduce the amount of source code for a reliable application.
- Database technologies—to allow applications to integrate with other elements of the system.
- Caching (Buffering)—to ensure optimum performance application.
- Integration—to ensure compatibility with other elements of IT system.
- Conciseness of source code—to reduce the possibility of making mistakes in improving the reliability of the application.
- Framework efficiency—important to determine the server work load so the resources could be used intensively.
- Therefore, any organization who wished to adopt any PHP frameworks for building their IT system or application should consider the weight criteria as proposed.

Score Criteria Evaluation

Another assessment approach is using score criteria evaluation. The score criteria evaluation is adopted from Chao et al. [4] to identify which PHP framework is relevant to be learned or taught for beginners. Chao studies has makes a few comparison of the PHP frameworks such as Zend, CakePHP, CodeIgniter, Yii, and Symfony. Chao et al. suggested any organization especially Higher Education Institution(HEI) which have planned to adopt PHP frameworks in preparing their students with PHP skills and knowledge should consider these evaluative scores criteria as follows:

- Pedagogical features—students learning curve associated with framework complexity for beginners [12] and ample time to study in at least four months or a semester for in-depth understanding [22].

- Industry penetration—students have marketable skills and the adoption of industry software tools and technologies will expose students with future workplace practices [14].
- Support and Training requirement—resources on various aspects such as availability of documentation, training and support for both Instructors and students [3].
- Software Cost—PHP frameworks usually are open source software.
- Software Characteristics—Most PHP frameworks have similar features and are available on all platforms.
- Course Methodology / Software Paradigm—PHP frameworks usually implement an MVC design pattern.
- Acceptance in Academic Environment—perception about PHP frameworks suitability in IT curriculum.
- Forms —single classes or groups of classes responsible for rendering and validating logic of entry data.
- Modules—separate functionality and ensure the portability of the source code between projects.

Support Technologies and Programming Technique

The support technologies and programming techniques vary based on the framework usefulness for the development of web application project as follows [29],[17]:

- Model-View-Controller (MVC).
- Object Relational Mapping (ORM) - technique for mapping database objects and relationship between programming language classes.
- Code generator - generate resources like views, controllers, routes, migrations and form requests.
- DB objects - support access to databases.
- Templates - support techniques in managing templates (two step view or composite view).
- Cache - technique for storing intermediate results.
- AJAX - frameworks provide classes that increase performance and simplify source code.
- Modules - divide source code into functionality groups which improves management and portability of source code between projects.
- EDP (Event Driven Programming) - source code organization technique.
- Namespace - provide better source code management.

Chao et al study discussed that pedagogical features are the most important in choosing the right PHP frameworks. The weighted score for each criteria elements of the result also suggested that the Yii PHP framework has the highest ratings compared to Code Igniter, Cake PHP, Symfony, and Zend [4]. However, in another study conducted by Prokofyeva and Boltunova,, the CakePHP is identified as the easiest PHP framework to learn compared to Zend which is quite complex, CodeIgniter and Symfony are moderately easy and complex[23]. Therefore, selecting the most appropriate framework for beginners or students in HEI usually requires the academician involves in the course planning should do extensive research and well versed hands-on experience [4].

PHP Framework Technical Factors

Apart from understanding the criteria in learning PHP, the PHP framework technical factors which are related to the PHP framework components suitability [29] are essential to be studied such as the performance of the framework related to the source code, the framework documentation quality and availability of technical support. Other technologies feature that already built in the PHP frameworks are application tools, support technologies and programming technique should also be considered as listed follows: a) Web Application Tools: The frameworks usually distributed together with tools that support the development of the source code elements. The tools could speed up the process of developing the source code of an application, reduce programmer's workload and decrease programming mistake [29]. The tools that support the MVC patterns should have the following elements:

- Models —MVC pattern represent a problem subject to business logic in which models is use for table mapping.
- CRUD — (Create, Read, Update and Delete records) tools enable to perform basic operations on the database record.
- Controller —classes are responsible for the functionality of a controller in MVC pattern.
- Views —MVC pattern elements.

Consequently, the PHP frameworks technologies are to simplify the complexity of the development of web applications. Currently, there are 42 different type of PHP frameworks for web application development [11]. However, this study only compare 21 PHP frameworks features as shown in Table 1. Other framework such as Flight, Meedo, Simple MVC, PHP Mini, Silex (reached its end of life in June 2018), Typo 3 Flow, Guzzle PHP, YAF, Akelos PHP, Qcodo, evoCore, Stratus, Seagull, Maintainable, Limb, Phocoa, AjaxAc, Zoop, BlueShoes, Recess and PHPDevShell that are not listed in Table 1 will not be discussed deeply in this paper because the insufficient information regarding the frameworks. The features that should be considered in the selection of PHP frameworks are ORM, Code Generator, Template Engine and CRUD Generator. Template engine in a framework is useful in separating between application logic and display logic, therefore the back-end developers and front-end developers could collaborate on the same areas of the website and they will not interfere with each other codes. The common template engines are Blade, Mustache, Smarty, Twig and Volt.

PHP Micro-framework

The micro-frameworks are designed specifically to simplify development of small websites. They usually do not have some of the advanced features provided by other frameworks

listed in Table 1. The fewer features and modules make it lightweight and fast. Therefore, integration between the micro- framework and small website will not be affecting its performance and user experience. Each micro-framework offers features to up development ofsmall web application, while reducing

Overheads and simplifying deployment. Listed are the PHP micro-frameworks.

- Laravel - laravel.com
- Symfony - symfony.com
- CodeIgniter - codeigniter.com
- Yii Framework - yiiframework.com
- Phalcon - phalcon.com
- PHPixie - phpixie.com
- Slim - slimframework.com
- POP PHP - popphp.org
- Fat-free - fatfreeframework.com
- Limonade - limonade-php.github.io

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Table 1: PHP Frameworks: Advantages and Disadvantages

No	Advantages	Disadvantages
1	Complete environment for website development, interoperability, security, and maintenance.	Complexity on framework code for certain condition which affects the performance and put burden on the hardware.
2	Standards, consistency and predictability.	Security in the framework could affect the built web application.
3	Standard architecture for easy visualization	Require high learning curve
4	Able to share or reuse the codes in libraries, classes and functions	Strict framework convention that hinder application flexibility and developer’s creativity

IV. DISCUSSION AND CONCLUSION

The decision to use a PHP framework or develop from scratch is crucial and depends on the specific requirements of the web application. PHP frameworks like Laravel or Symfony are ideal for large, complex projects due to their built- in features and support for software engineering practices. However, for smaller or simpler applications, the benefits of frameworks may not justify their use, and developers should carefully

evaluate whether a framework aligns with project needs. Understanding core PHP is essential for developers transitioning to frameworks, as it enhances overall web development skills and flexibility across different frameworks. Ultimately, the choice of PHP framework should be based on project-specific requirements to ensure optimal development outcomes.

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