

# Effectiveness of the use of frameworks in the development of information systems

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## Abstract

This article presents information on the importance of implementing the Yii Framework version 2.0 (Yii2) in the development of web applications; this Framework has been used worldwide by 6.7% of programmers in general; according to the neoguides page published on June 4, 2020 by Eduardo Lázaro, who prefers to work with it, because it covers the needs of users, since it has different tools and functions that benefit agile development. At present, with this Framework a variety of information systems have been developed, because it has the ability to create large systems which are implemented in organizations to solve the needs of their work plans.

For all the advantages they present, it is recommended to create an information system with the Yii2 Framework because of its work structure, which will speed up the development of web applications and the generation of a quality product. The importance of knowing each of its benefits is substantial for each developer, such as the support of the installation guides (created by its work team), tutorials and documentation (which was created by the Yii2 community) and being able to start with a basic layout of any project. By conducting this research, we can understand the benefits it brings to development, such as: security, flexibility and compatibility with multiple database systems, among others, making it a highly recommended framework.

## Resumen

Este artículo presenta información de la importancia de implementar el Marco de Trabajo Framework Yii versión 2.0 (Yii2) en el desarrollo de aplicaciones web; dicho Marco de Trabajo se ha destacado por ser utilizado a nivel mundial por el 6.7% de los programadores en general; de acuerdo con la página de neoguías publicado el 4 de junio, 2020 por el Ing. Eduardo Lázaro, los cuales prefieren trabajar con él, debido a que este cubre las necesidades de los usuarios, ya que cuenta con distintas herramientas y funciones que benefician el desarrollo ágil. En la actualidad, con este Framework se han desarrollado variedad de sistemas de información, porque posee la capacidad de crear grandes sistemas los cuales se implementan en las organizaciones para solucionar las necesidades de sus planes de trabajo.

Por todas las ventajas que presentan, se recomienda realizar un sistema de información con el Framework Yii2 por la estructura de trabajo que posee, lo que agilizará el desarrollo de aplicaciones web y la generación del producto de calidad. La importancia de conocer cada uno de sus beneficios es sustancioso para cada desarrollador, como lo son es el apoyo de las guías de instalación (creadas por su equipo de trabajo), tutoriales y documentación (la cual fue creada por la comunidad Yii2) y el poder iniciar con una maquetación básica de todo proyecto. Al realizar esta investigación podremos comprender los beneficios que aporta al desarrollo, como lo es: seguridad, flexibilidad y compatibilidad con múltiples sistemas de base de datos, entre otros; siendo así un Marco de Trabajo altamente recomendable.

**Keywords:** Yii2, Frameworks, Information Systems.

**Palabras Clave:** Yii2, Marcos de Trabajo, Sistemas de Información.

## 1. INTRODUCTION

In web programming, there are several components or elements which are essential to identify for its development such as: Programming language, frontend tool, database manager, the framework, etc. Precisely the Framework is a tool that provides a basic layout for the development of web systems by supporting the development of multiple tools and functions, allowing to improve productivity and reducing work time; it is for this reason that in this article we will emphasize the effectiveness of the Yii2 Framework.

Yii2 is a PHP-based framework that uses the MVC model (Model, View, Controller) and Object Oriented Programming (OOP) for the development of high-flow web systems. This framework has multiple tools that facilitate development, and also provides support from the Yii community by developing external tools that can be implemented in projects.

Therefore, it is important to show the effectiveness of using this Framework, as well as the advantages and guidelines to consider why it is an effective tool to develop information systems and even any web system.

## 2. FRAMEWORK

It is a framework that helps the development of web applications, currently most programmers prefer to use this type of tool that has multiple components that facilitate coding, avoiding repetitive code, using templates as a starting point with a cleaner and more consistent code being effective and minimizing the time of work according to the various opinions found in research on Frameworks.

### Advantages of the Framework

- Reduces work time during development, since it has a previously structured skeleton.
- Facilitates collaborative developments by allowing programming standards.
- Facilitates the navigation of module tools and usage information.
- Manages greater security in the development of applications.

### Features

The main features of the Framework that help or benefit the Framework in the development of web applications.

- Adaptations of the controllers in the projects.
- Facilitates in the configuration of the language allowing the integration of development languages.
- It allows the easy handling of the .txt, .xml format of the interfaces that generate the database.
- The Framework allows to control and manage URLs and sessions.
- It implements security with the use of roles and permissions to users.

Well, after having understood the fundamental concepts about the Framework, its components, characteristics, advantages that they have for the development of information systems in web environment, we must analyze some of them that allow us to identify their advantages, disadvantages, architecture among others, but mainly the optimization of processes, efficiency, available tools, support communities to mention a few. For this reason, the following are taken into consideration for this research because they contain similarities.

### 3. RUBY (RUBY ON RAILS)

This Framework is used for web applications, works with Model-View-Controller (MVC), can be installed for free. It is a Framework used in worldwide known websites such as GitHub or Twitch. Ruby is one of the web applications that uses applicable objects within development.

It has been considered a flexible language helping developers freely. Users who use Ruby can work without restrictions in the development of the information system, as well as they can remove and redefine the essential parts at the time of coding, since Ruby does not restrict code access to the developer.

This Framework is based on agile development, and has been very popular until today, since it allows the development of commercial and corporate apps, sales systems, etc.

#### Features

- It is a general purpose language, because all kinds of different applications can be developed: web service applications, email clients, backend data processing, network applications, etc.
- It is an interpreted language, because it is not compiled, it is only necessary that the Ruby interpreter evaluates the code and translates it into machine language understandable by a computer, but there is no previous compilation process as in C or Java.
- It is dynamic and flexible. With strategies such as metaprogramming (writing programs that write or manipulate other programs). You can even use the Ruby language itself to alter the code at runtime.
- It is high-level, meaning it is far from machine language and very close to English, sometimes it will seem like you are simply writing in English.
- It is Open Source and cross-platform, you can download it totally free from the official website and run it on different operating systems.

#### Advantages

The main advantages of using Ruby in web programming are the following:

- It is a free code that can be used without paying licenses, users can download it for free, as well as use, copy, modify and distribute.
- It allows you to use instance variables and classes, set methods for any online project you can think of, no matter if you use numbers and other primitive types; it has the flexibility to modify them without restricting the use of the system, since it allows you to remove or redefine any part of Ruby's essential code.
- It offers blocks for you to add clauses to any method within the programming code. For many developers, both novice and experienced, this is a feature that provides flexibility. It also allows you to naturally describe how each related language fragment should act. Moreover, the latter are inspired by functional languages such as Lisp or Perl.
- It uses simple conventions for determining and mentioning variables, which improves its readability compared to other languages.

## Disadvantages

- It does not have communities and customer support as extensive as other programming languages.
- "Interpreted" can mean "slow", since there is an intermediate step between code execution and interpretation by the computer.
- High memory usage.
- Does not support parallelism.
- Less flexibility.

According to author Diego Pacheco in the Post The 10 Most Requested Web Development Frameworks in 2021, the popularity of the Ruby on Rails Framework has decreased being is a disadvantage (Pacheco, 2021). (Pacheco, 2021).

### Ruby on Rails popularity graph.

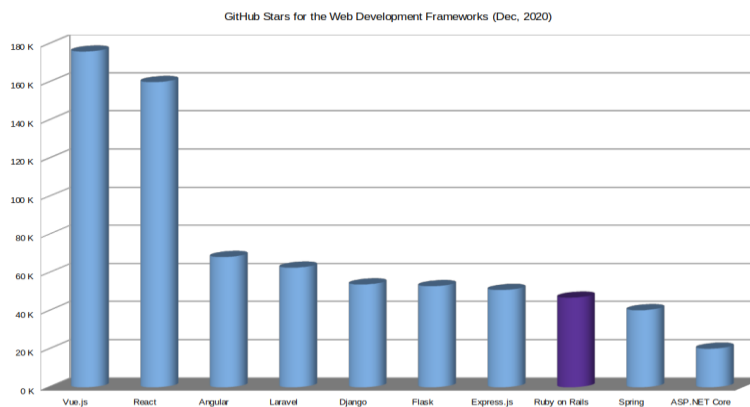


Figure 1. Ruby on Rails popularity graph in terms of GitHub stars.

## 4. DJANGO

It is a framework that helps to develop websites more easily and quickly because it is for web applications and open source written in Python. It also has the need for similar components that handle user authentication such as: register, log in, log out; having the administration for the website because it has forms and file uploads. Django was developed due to the needs of programmers, since they were facing problems when building websites, that is why the Framework was created with the necessary components to use and develop as fast as possible when building a new site. Django has a thriving and active community as well as free and paid support.

This language offers the variety to build any website from content management, wikis, to social networking and news sites. Developers or clients have the facility to return content in any format (including HTML, RSS feeds, JSON, XML, etc.).

This framework helps developers avoid common security errors because it is designed to protect websites automatically.

Django does not have a definitive and immediately available popularity. It has the time for "perfectionist with tight deadline", its **advantages** are:

- Perfect operation.
- Easy documentation of practical cases.
- Powerful database access components.
- Advanced Django application design idea.
- Own admin table administration.
- Easy to find code errors.
- Difficult to get hosting.

### Disadvantages

- Its implementation in production is somewhat complicated, but when it works well, it is really stable and fast, as well as efficient.
- If you come programming in PHP with clean code, the MVC philosophy complicates the development.
- The select and multi select handling is complicated to handle.
- Post\_save.connect makes it difficult to send additional parameters.
- South sometimes generates problems with foreign keys.
- All the official documentation of <https://code.djangoproject.com> is extremely good, but sometimes the English language makes it difficult to understand for Spanish speakers, but it has the community in Google and DuckDuckGo where you can find very good references.

## 5. ZEND FRAMEWORK

Zend is a framework that uses 100% object-oriented code to develop web applications and PHP web services. The Framework offers Model-View-Controller (MVC) implementation as well as database abstraction, form components that implements HTML rendering, validation and filtering for developers, as it can consolidate all operations using simple object-oriented interfaces.

It also has components for development, meeting the needs of the application, as the Framework provides information within the Zend community reducing development time, organizations that develop have contributed with important components or features within the framework.

It is very difficult to make websites with this Framework, because it is a complicated language in the development of web applications where developers can make different patterns and styles. This is why the Framework becomes difficult to maintain because of the slowness that is generated as the development grows throughout the process, users have to develop from scratch and this can cause security problems.

### Advantages

- Zend Framework is totally object oriented.
- It allows the use of any of its libraries instead of using it completely.
- Zend Framework contains a variety of components.
- Community and Documentation.
- Guarantees continuity of the Framework.

## Disadvantages

- Difficult installation.
- Complexity of use and programming.
- Extensive learning.

## 6. Yii2 FRAMEWORK

Yii is a Framework based on object oriented programming and PHP, it is free license and allows the development of large scale web applications, allowing rapid development, currently in its version 2 and version 3 is being developed with compatibility with PHP version 8, the name Yii (pronounced /i:/) is for easy, efficient and extensible (Xue, 2008) (Xue, 2008). Yii2 features.

**MVC:** Yii uses the Model-View-Controller design pattern which is one of the most widely used patterns for web development. This allows code reuse and element separation.

**Gii Generator:** Gii allows to quickly generate models, forms, modules all corresponding to CRUDS.

**Developed based on PRADO Framework:** It was thought to create Yii improving the errors of PRADO, we can say that Yii was developed by experts and improves its features compared to other Frameworks.

**Cache:** Yii allows the implementation of cache extensions that store the cache in different ways. Whether file-based or database-based, it is compatible with Memcache, EAccelerator, Zend and others.

**Lazy Load:** Yii improves performance by loading libraries only when necessary. This avoids loading unnecessary resources that slow down the application.

### Some features of Yii

- Model-View-Controller(MVC) design pattern.
- Data base Access Objects(DAO), query builder, Active Record and database migration.
- Integration with jQuery.
- Form inputs and validation.
- Ajax widgets, such as autocomplete text fields and more.
- Built-in authentication support. In addition, it supports authorization via hierarchical Role-Based Access Control (RBAC).
- Customization of skins and themes.
- Complex WSDL generation, specification and management of Web Service requests.
- Internationalization and localization (I18N and L10N). Supports translations, date and time formatting, number formatting, and view localization.
- Layered caching scheme. Supports data cache, page cache, fragment cache and dynamic content. Cache storage media can be changed.
- Error handling and logging. Errors are handled and customized, and message logs can be categorized, filtered and moved to different destinations.

- Security measures include Cross-site scripting (XSS) prevention, Cross-site request forgery (CSRF) prevention, cookie tampering prevention, etc.
- Unit and functional testing tools based on PHPUnit and Selenium.
- Automatic code generation for application skeleton, CRUD applications, etc.
- Code generation by Yii components and command line tool compliant with XHTML standards.
- Carefully designed to work well with third-party code. For example, it is possible to use PHP or Zend Framework code in a Yii application.

## 7. OPTIMIZATION OF DEVELOPMENT PROCESSES WITH THE YII2 FRAMEWORK

The Yii2 Framework is an efficient tool that through its features helps developers in the process of creating an information system, streamlining the process safely, as it provides us with a basic model and we do not need to start from scratch with the desired project.

The main version of PHP has a byte code cache storage; this is used for the analysis of the time that are included in the PHP scripts every time you get each incoming request.

By taking into account these settings provided in PHP, it helps in maximum performance every time you need to develop web applications.

### Steps for optimizing the PHP environment

- Use the stable version of PHP. It helps to improve PHP performance.
- Enable byte code caching with Opcache (PHP 5.5 or later) or APC (PHP 5.4). This is used to analyze the timing when including PHP scripts for the incoming request.
- `djust realpath()` cache.

Also it is counted on the performance of the consultations of the data bases, the saving of the time of preparation in the analysis of the consultation, facilitates the connection with the data base like SQLite, MySQL, PostgreSQL, MSSQL or Oracle when counting on a user and password, it is very feasible to make a migration in less time, since you count on the necessary configurations; and it provides us some recommendations of code not to exhaust the memory assigned to PHP.

### Yii2 User's Guide

One of the prerequisites when developing a system is to select and use efficient tools that facilitate learning. The Yii2 Framework offers a user's guide developed by the team of creators of this tool and is fed by the community that creates solutions to possible problems that you may face when developing with Yii2.

This guide is extremely useful, as it provides technical support for learning how to use the framework, and offers efficient solutions to possible problems that the developer may encounter in his arduous task in the process of developing a system.

## Gii Tool

The Gii tool is a code generator, which allows you to efficiently create code based on your database tables, using object-oriented programming and Model-View-Controller (MVC). This tool facilitates coding, performing the basic work of the programmer, this is done automatically, and in a short period of time.

The main use of Gii is the creation of CRUDs, which not only creates the code with the necessary functions to interact with the database, but also creates basic templates of the interfaces and forms for the visualization and introduction of data to the system, this tool of the Framework definitely facilitates the developer's work so as not to start from scratch.

## User-created tools

Yii2 not only has the Framework's original tools, but thanks to the community of developers who use the Framework, there are functions that can be easily implemented in our projects.

### Kartik:

It is a library that contains several extensions and enhancements used for the Yii2 Framework, mostly have additional client functionality through jQuery plugins created by the author Krajee, which consists of different elements such as widgets, modules, extensions and more, all these elements have specific documentation, in order to implement them and attach them to the projects.

These elements facilitate the work, since there is a record that they are functional, effective and facilitate the creation of a function within our system; these external tools to Yii2 allow us to make an increasingly robust system in a faster and more efficient way, facilitating the development process.

### Webvmarkt:

A user management module created for Yii2, this tool allows the creation and management of roles and permissions for users, as well as functions for the administration and sending of emails in the system.

As mentioned above, this tool makes it easy for the developer to create a secure method for managing their users, allowing them to easily implement this module with all its functions, including the tables corresponding to the database.

As well as the examples mentioned above, there are several easily accessible tools for developers using the Yii2 Framework allowing them to work in a fast, efficient and safe way to develop our system and not start from a blank canvas, but already have a solid foundation for adaptation to our needs.

## Work Time Optimization

Emphasizing, Yii2 is a framework that streamlines the process of creating a system, since it facilitates with its tools the arduous work involved in this activity; It allows us to considerably reduce the time of creating systems from scratch, according to the skills and knowledge of each programmer, facilitates its implementation by the



amount of documentation, guides, tools, and tutorials that are found of it, talking about the technical aspect of coding, and allows the user to focus on adapting the base skeleton provided, to their needs and have existing tools with functions that are adapted to work hand in hand with Yii2, this allows us to obtain a system, safe, efficient, robust and in a short time with the reliability that there is proven documentation of this framework.

**Table 1.** Framework Comparison Chart Ruby, Django, Zend, and Yii2

	Ruby	Django	Zend	Yii2.o
<b>Working mode</b>	Object-oriented dynamic language.	Object-relational mapping.	It is an object-oriented language with PHP web services.	It is a PHP-based object-oriented framework with code generator.
<b>Implementation</b>	<ul style="list-style-type: none"> <li>• Web service applications.</li> <li>• E-mail clients.</li> <li>• Backend data processing.</li> <li>• Web applications.</li> </ul>	<ul style="list-style-type: none"> <li>• Content manager.</li> <li>• Wikis.</li> <li>• Social networks.</li> <li>• News sites.</li> </ul>	Websites.	Large-scale web applications.
<b>Architecture</b>	<ul style="list-style-type: none"> <li>• Model-View-Controller (MVC).</li> <li>• Object-oriented programming.</li> </ul>	<ul style="list-style-type: none"> <li>• Model-view-template (MVT) architecture.</li> </ul>	<ul style="list-style-type: none"> <li>• Model-View-Controller (MVC).</li> </ul>	<ul style="list-style-type: none"> <li>• Model-View-Controller (MVC).</li> </ul>
<b>Syntax</b>	Python code	Python code	Python code	Python code
<b>Performance art</b>	Slow, interpreted language and high memory usage.	Slow, due to difficulty with host servers.	High performance and robust implementation.	Great performance, with a guide with tips for optimization.
<b>Year of Launch</b>	2005	2005	2007	2014

## 8. CONCLUSION

After having analyzed these frameworks for the development of applications, where characteristics, advantages, disadvantages and some tools to facilitate the work of developers were identified; but above all in the sense of identifying the impact generated by the frameworks in the development of information systems as development optimization, time reduction, error prevention, streamlining and automation of processes, etc.

In summary, to carry out the arduous task of developing an information system, we define the following points to consider for the selection of our framework:

- That it is quick to learn or that it has support material for quick solutions.
- That it facilitates the connection with the database.
- That it speeds up the coding.
- That the product obtained is safe and efficient.

According to the study conducted by Libardo Pantoja and Cesar Pardo in the article evaluating the Ease of Learning MVC Frameworks (Evaluating the Ease of Learning of MVC Frameworks) in Web Application Development (2015) referred to Yii as one of the best Frameworks in application development.

**Table 2.** Global Frameworks Evaluation Table.  
Global Frameworks Evaluation Table according to the article Evaluating the Ease of Learning MVC Frameworks in Web Application Development.

No.	Framework	Overall evaluation of the Framework
1	Yii	100%
2	Web2Py	100%
3	Asp.NetMVC	100%
4	JSF	95%
5	Kumbia	93%
6	BubyOnRails	90%
7	Zan	90%
8	CodeIgniter	90%
9	Symfony2	90%
10	Phalcon	85%
11	Cake	81%
12	Laravel	80%
13	Grails	80%
14	Spring	80%
15	Kohana	80%
16	Pyramid	75%
17	Zend	70%
18	Sails.js	70%
19	Slim	60%
20	Tapestry	60%
21	Nette	60%

Therefore, the Yii2 Framework was identified as the ideal candidate, since it has the points mentioned above, this framework provides guides and tools that facilitate learning and with a community that provides fast and efficient solutions, favors the connection with various database managers and provides a code generator that definitely facilitates the work of the developer, it also provides our final product robustness, security and efficiency, this tool is growing which gives us the notion that improvements will be implemented by the creators and the community.

When comparing other frameworks, it was found that some of them are currently in an intermediate range in efficiency for development, not counting on their popularity but on their impact on the development of systems, which causes them to be discarded.

According to the Benchmark performed by user Kenji on the Github platform in which he evaluates data overhead and minimum startup cost of the various PHP Frameworks in the real world, the results of the Yii2 Framework are shown.

**Table 3.** Comparative table of PHP Frameworks.  
Comparative table of PHP Frameworks according to the requests per second responses and memory usage.

FRAMEWORK PHP	REQUEST RESPONSE PER SECOND	RELATIVE	MEMORY USE	RELATIVE
Siler-0.6	2,069.69	20.3	0.25	1
Kumbia-1.0-dev	1,753.60	17.2	0.29	1.2
Staticphp-0.9	1,665.28	16.3	0.27	1.1
phalcon-2.0	1,618.39	15.9	0.26	1.1
tipsy-0.10	1,376.97	13.5	0.32	1.3
fatfree-35	965.16	9.5	0.41	1.7
codeigniter-3.0	753.09	7.4	0.42	1.7
nofuss-12	667.24	6.5	0.4	1.6
slim-3.0	550.43	5.4	0.61	2.5
bear-1.0	502.52	4.9	0.73	3
lumen-5.1	415.57	4.1	0.85	3.5
yii-2.0	410.08	4.0	1.32	5.4
zend-espressive-1.0	403.34	4.0	0.75	2.9
phpixie-3.2	267.24	2.6	1.25	5.1
aura-2.0	233.54	2.3	0.88	3.6
cake-3.2	174.91	1.7	1.95	7.9
Zend framework-3.0	133.87	1.3	2.24	9.1
symfony-3.0	131.5	1.3	2.18	8.9
laravel-5.3	101.94	1	2.83	11.5

Technological advances favor the performance of the new frameworks as ideal tools for the development and implementation of information systems, some deficiencies were identified at present such as: slowness of the system due to information overload, little or no community to provide support to new developers, and popularity based on the time of existence of the framework, some of the frameworks compared are between 13 and 14 years old within the community of systems developers.

Therefore, Yii2 is one of the least known frameworks in the market, we could say that it is young in web application development, with a growing community and the development of new versions that improve the framework, which leads us to the conclusion that it is one of the tools that currently meets the characteristics that favor the development of a system.

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