

# Survey on popular web development frameworks

## Abstract

Web development frameworks have become an essential tool for developers to build efficient web applications. They simplify the development of web applications, ultimately enabling developers to save time and reduce expenses. A web framework provides access to ready-made components, snippets of code, or templates that aid in web development. There are numerous web development frameworks available. Before choosing a framework, we need to have an idea about their benefits, performance and scalability. This paper provides a survey on some of the popular web frameworks, their unique features and the advantages they offer. This analysis would help in taking an informed decision on which framework to choose that best meets a user's requirements.

## Introduction

Web development frameworks help developers to build websites quickly and efficiently without having to start from scratch which saves a lot of time and effort. By leveraging these frameworks, developers can concentrate on integrating distinctive features and ensuring a smooth user experience, rather than repeatedly recreating fundamental components for each project. Also, frameworks promote the use of standardized coding practices which enhance code readability, maintainability, and the overall quality of the product.

With so many web frameworks available, it might seem daunting to choose the best option which suits our project requirement. For doing my Internet and Web system project, I was confused on which framework to use for my front end. This is why I decided to choose this topic so that one could have a clear idea of the different options of web frameworks available and their advantages and disadvantages.

Web development frameworks can broadly be classified into front-end frameworks and backend frameworks. Front-end frameworks primarily concentrate on the client-side development of web applications, offering a suite of tools, libraries, and pre-built components aimed at enhancing the user interface, interactivity, and overall user experience of websites. These frameworks typically use HTML, CSS, and JavaScript, and play a crucial role in rendering content within users' browsers. The advantages of front-end frameworks are code modularity, increased productivity, and compatibility across various browsers.

Back-end frameworks are primarily dedicated to server-side development, managing the underlying logic behind web applications, which includes responsibilities like database management, business logic implementation, and server operations. The advantages of back-end frameworks extend to features like database abstraction, security enhancements, session

management, and the capability to develop APIs. They simplify tasks like routing, authentication, and data manipulation [1].

## **Popular web development frameworks**

### **React**

React is an open-source JavaScript library developed by Facebook. React is used for building user interfaces and is quite popular among web developers. Components are the code building blocks of React. The components can be nested and merged to build complex UI. Also, the components can be reused on other pages which helps with reusability. React uses JSX which stands for JavaScript XML. It allows developers to write HTML like tags and structures directly in their JavaScript code.

React uses a virtual DOM (Document Object Model) to optimize the updating of the actual DOM. When the state of a component changes, react first updates a virtual representation of the DOM and then efficiently updates only the necessary parts of the actual DOM. This approach improves performance by minimizing the number of direct manipulations of the real DOM.

React has strong community support. If someone faces a bug or problem, community support helps to easily find solutions.

### **Angular**

AngularJS is a popular open-source JavaScript framework developed by Google. It helps in building dynamic web applications. One of the main features of Angular is two-way data binding. It allows automatic synchronization between the model and view. When the model changes, the view is automatically updated, and vice versa which helps to keep the UI in sync with the underlying data [1].

AngularJS uses services that provide shared functionality and data across multiple components. Services can be used to handle data fetching, perform API calls, manage application state etc. Angular is a comprehensive framework that provides a complete solution for building applications. Angular even provides support for unit testing and end-to-end testing. Some disadvantages of Angular would be that the framework size is large compared to some other frameworks which impact the initial loading time of applications. Also, developers may end up writing more code to achieve certain tasks compared to other frameworks.

### **Vue**

Vue is an open-source JavaScript framework. It is often used for developing single-page applications. Vue is known for its simplicity and ease of integration. Vue follows component-based architecture like React. Vue automatically tracks JavaScript state changes and efficiently updates the DOM when changes happen.

Main advantages of Vue includes flexibility and versatility. It can be easily integrated into existing projects. It supports both HTML based syntax as well as JSX to define its components.

## **Next.js**

Next.js is a popular open-source React-based framework for building full-stack web applications. Next.js supports Server-side rendering. Next.js offers easy-to-code functionality compared to React. Next.js can help build interactive, dynamic, and fast React applications [3].

Next.js has several essential features. Fast Refresh is a Next.js feature that gives instantaneous feedback on edits made to React components. Next.js comes with a file-based routing system. We can create pages by simply adding components to the "pages" directory, and the routing is handled automatically. This reduces the need for manual configuration. The other important feature is server-side rendering which comes with pre-rendered on the server, making the client-side loading quicker. Typescript support and being able to export static sites are distinct features of Next.js [3]. Personally, when I used Next.js for my project, I felt I was able to build my application with less amount of code.

## **Express.js**

Express.js is a popular and widely used web application framework for Node.js. It provides a simple and minimalist approach to building web servers and APIs. It does not restrict the developers to organize the application in a specific way and hence helps to make decisions based on the project requirements.

One of the key features of Express.js is that it simplifies the process of defining routes for different HTTP methods like GET,POST,DELETE etc. and specify the corresponding handlers to execute when a request matches a route. Also, Express has a powerful middleware system which has functions that can process requests and responses. Middleware functions can perform tasks such as logging, authentication, parsing request bodies [1]. It also provides built-in error handling mechanisms and developers can define custom error handling as well.

## **Django**

Django is a high-level web framework for building web applications using the Python programming language. Django provides a powerful and flexible ORM that allows developers to interact with databases using Python objects, eliminating the need to write raw SQL queries. Django uses a URL routing system that maps URLs to views, allowing for clean and organized URL patterns. Django comes with built-in security features to protect against common web vulnerabilities. Django REST framework is a powerful and flexible toolkit for building Web APIs, making it easy to develop RESTful services. The drawback of Django is that it might not be suitable for projects with high performance requirements. Also, Django ORM is not suitable for complex queries and where large databases are involved [1].

## **Ruby on Rails**

Ruby on Rails is a popular open-source web application framework written in Ruby. It uses the principles of Convention over Configuration (CoC) which promotes the idea that developers need to write less code by adhering to conventions. By following naming conventions for files, classes, and database tables, developers can spend more time on application logic rather than configuration.

Rails is known for its emphasis on developer happiness and productivity. Its conventions and built-in tools contribute to a faster development cycle, making it suitable for projects with tight deadlines. It is a popular choice for developers who appreciate its clean syntax, convention-driven approach, and focus on developer happiness.

## **Laravel**

Laravel is a popular open-source PHP web framework known for its elegant syntax, developer-friendly features, and extensive ecosystem. Laravel's combination of a clean syntax, extensive features, and an active community has contributed to its popularity in the PHP development community. Laravel comes with many built-in features that speed up development, such as authentication, caching, routing, sessions, and more. Laravel's conventions and structure may limit flexibility for highly customized or complex application requirements.

## **Flask**

Flask is a lightweight and flexible web framework for Python, designed to make it easy to build web applications. It is simple and minimal. It provides the basic features required for web development such as routing, request handling and response generation. It can be extended through Flask extensions or third-party libraries. Flask is well-suited for building RESTful APIs, and many developers use it to create backend services for web applications.

## **FastAPI**

FastAPI is a modern, high-performance web framework for building APIs with Python. It is one of the fastest Python frameworks available [2]. It is designed to be easy to use and learn for Python developers. FastAPI automatically generates interactive API documentation, based on the type hints in the code, allowing developers to explore and test the API easily. FastAPI provides automatic request and response validation based on defined models, reducing the need for manual validation. Personally, I had used FastAPI for building backend APIs which I was able to learn quickly because of the detailed documentation available on their site.

## Conclusion

Almost all developers utilize web development frameworks to build websites. There are numerous frameworks available based on different popular programming languages. But because of the wide variety of options available, developers would find it challenging and confusing to decide on which framework to choose. This analysis of different frameworks would help to understand the advantages and disadvantages of each framework and would in turn help to take the right decision depending on the project requirements. In terms of popularity and easiness to learn, react seems to be a good choice for frontend framework and express.js seems to be a good choice for backend framework. Developers should select the framework depending on their specific use-cases like size of the project, developer's comfort with the programming language, community support and tooling available and performance metrics.

## References

- [1] [30 Best Web Development Frameworks for 2023: A Comprehensive Guide - DEV Community](#)
- [2] [FastAPI \(tiangolo.com\)](#)
- [3] [Docs | Next.js \(nextjs.org\)](#)