

# Impactful Front-end Architecture in Online Business Development

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## Summary

With the fast expansion of online technology in the recent era, there is a major tendency that HTML5 transforms into a global web consortium and takes charge of front-end innovation, allowing it to take the stage at the beginning of web history. Several front-end programming platforms and libraries are available, including Vue, Angular, and React, to name a few examples. Understanding how to choose a useful model for constructing an e-Business and extend it out to users in order to optimize the consumer experience has become a key activity in the field of web technology. This study begins by providing an outline of the top web frameworks in the area of front-end architecture, followed by an examination of each framework and library's effectiveness in internet services. This article will outline the advantages and disadvantages of each architecture and library according to certain commercial criteria after conducting in-depth research analysis on many topics. Consequently, the article precises the approach and finishes with speculations on the upcoming front-end innovation in online Business tools.

## Keywords:

*Front-End, e-Businesses, React, Angular, Vue*

## 1. Introduction

A broad variety of online economic operations for both items & services are referred towards electronic commerce, also known as e-commerce. It is often connected with online trading activities via the web, as well as executing any financial transaction the transfer of assets or rights to utilize products or services an online system (usually a computer or smart devices). In our opinion, it adds a new depth to the many ways people use the internet, and our goal is to make it fashionable in our region, where digital usage is limited. The development of trust among those involved in a transaction is critical due to the high context culture prevalent in the country. E-commerce in Bangladesh was officially established in the year 1999, with the help of a few non-resident Bangladeshis located in the United States. The aim is to Develop enhanced e-commerce websites by employing an impactful front-end approach, which consumers should widely approve.

The conceptual front-end of endeavors is the stage during which development is scoped, specified, and planned on the client's behalf prior to the employment of the principal contractor. The business development

management (BDM) role, which is a misnomer for sales, is located at the front end of the vendor side of the organization. Ventures are specialized assets, and sales occur prior to production to get a contract. This kind of selling often involves a lengthy period in which BDM is involved with selling prior to a particular project, and then BDM is introduced as the front end after the specific project has been identified.

With the fast advancement of internet technology over the past decade, buyers have increasingly relied on e-Business to perform everyday activities such as buying, purchasing, home loan repayment, and tax return. One of the most important factors contributing to this outcome is the introduction of HTML5 techniques, which can potentially transform the whole internet development ecosphere. Websites worldwide are using the HTML5 technique, known as markup language employed by setting an outline and presenting content [1]. The HTML5 standard, when compared to the prior HTML standard, expands and improves several semantic components, such as the footer and navigation, which serve to describe the web structure accurately, and it aids web developers in creating their websites with a unique structure [2]. Aside from that, HTML5 introduces new components that have acquired access to APIs. For example, the <canvas> element enables the web page to access the canvas part of the smartphone. Web developers may create websites with more complex functionalities by using the strong access characteristics of HTML5 [2].

Even though HTML5 introduces several advances, it obviously has the constraint that any released HTML model is illustrating effectiveness is quite poor, and in certain cases, it performs worse than FLASH. Earlier this year, Google announced the introduction of the Chrome Version, which effectively tackles the problem that has brought JavaScript to the forefront of the web with HTML5 [3]. Prior to the release of Chrome V8, JavaScript's major job on a webpage was to collaborate with CSS to develop a successful user experience and to assume responsibility for certain standard script operations such as form validation, among other things. The debut of Chrome V8 epitomizes JavaScript since the JavaScript in Chrome V8 is so incredibly fast that it is more than 56 times quicker than Internet Explorer in any version [3]. In order to interpret JavaScript, classic internet browsers often require a sophisticated procedure, such as reading

byte-code as well as interpreting the complete web project in order to produce the code, which is then executed from the management information system. As a result, their JavaScript execution time is much greater than that of interpreted code such as Java and C++ [4]. The optimized solution for the V8 engine uses the inline caching technique to boost speed without the need for conventional compilation.

Following the launch of the V8 engine, JavaScript may achieve a running outcome comparable to that of Java or C++. As a result, the V8 JavaScript engine allows online projects to run at a performance equivalent to that of conventional desktop applications. Due to the obvious excellence of the V8 JavaScript engine, several JavaScript platforms built on the V8 engine have developed, ushering in a new era and the beginning of internet development. Node.js was introduced in 2009, and it works in conjunction with the V8 JavaScript engine to provide a programming environment [5].

### 1.1 Front-End Effectiveness for E-Businesses

A variety of dotcoms' misleading economic incentives, like an exponential increase in client numbers, deceptively cheap operating costs, and exaggerated revenues, have caused consternation among both the business world and the general public in recent times. Some businesses went so far as to use questionable accounting procedures to increase sales while simultaneously deflating expenses. These skewed signals have misled many individuals into believing that e-marketplaces have made previous competition laws obsolete, which is not true. Because of this, many businesses have opted to alter their core forms of business away from quality, technological innovation, quality, and profitability and toward a focus on affordable rates and increased revenues as their primary goals. They were unable to succeed due to a lack of long-term earnings.

Organizations will need to develop and execute new strategies that make use of both the advent of the internet as well as the variations in both conventional and digital markets if they are to be successful. Firms that do e-business should maintain close ties with their consumers, vendors, and wholesalers along the supply chain [6]. Aside from that, the supply chain inside e-business organizations is constantly evolving. Businesses must ensure that consumers and suppliers can quickly visit their websites to get critical product information that will aid in decision-making on their products.

Presently, the convenience and speed with which consumers and suppliers can access the internet, as well as e-loyalty and e-trust, are the most significant barriers to their participation in online transactions. Due to the usage of e-commerce innovation continuing to decrease the cost of transferring, e-business organizations must work on e-

loyalty, which involves solid connections and credibility with stakeholders, to strengthen their strategic position and position themselves for growth. B2 B's purchase of direct products necessitates the establishment of a long-term connection with a vendor who is renowned for delivering items of high quality.

When it comes to mission-important purchasing, businesses cannot just purchase from anybody in the e-marketplace. If a supply order is not fulfilled, the unfulfilled items might shut down a manufacturing line or perhaps the whole plant. When it comes to business-to-business procurement of direct products, close collaboration with significant suppliers across the supply chain is vitally important.

## 2. Front End Architectures

Due to the V8 engine's invention, there are a large number of front-end architectures and frameworks that are built on JavaScript. Statisticians use GitHub, the biggest Git-repository storage service globally, to identify the most popular front-end architectures and frameworks that adhere to industry best practices and standards. The use of statistics on GitHub may provide insight into the preferences of front-end programmers throughout the world for various front-end architectures and frameworks.

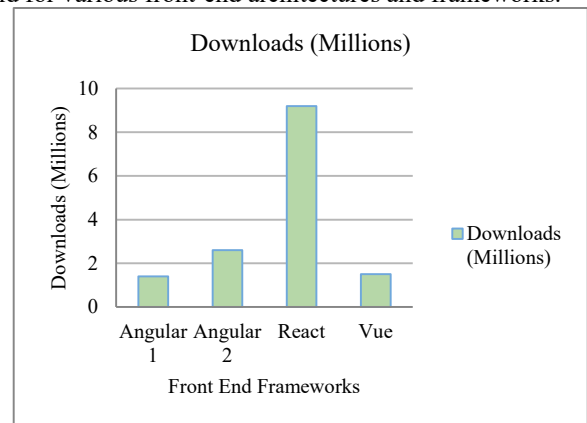


Fig. 1 Front End Framework Download Volume on GitHub

Figure 1 demonstrates that "React" has taken over as the dominant architecture, with Angular 2 as the second framework and Vue taking up the third spot. Consider the fact that Angular has released a new version; the article will integrate technical information from both Angular 1 as well as Angular 2 in one place.

### 2.1 React Native and React JavaScript

Facebook created the React JavaScript framework in order to provide an outstanding user experience on the Facebook and Instagram websites [7]. Given React

tremendous capabilities, in 2013, the social media company Facebook made React available as a free software JavaScript ES6-based framework to worldwide professionals and businesses [7]. In addition, Facebook introduced React Native in 2015, which allows developers to create mobile applications using React on key mobile platforms like IOS as well as Android [8].

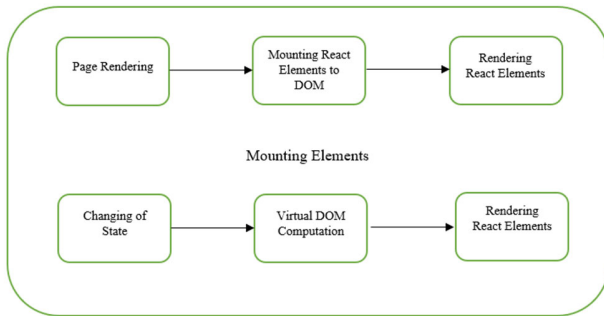


Fig. 2. Mounting and Re-Rendering Elements in React

Figure 2 shows an example of how to load a webpage using React technology. Using React, web content is mounted as a set of elements to Document Object Model (DOM). JavaScript will be used to render the component in the browser. Utilizing Chrome V8 technologies, the JS processing rate would be much faster as compared with the interpreting rate of typical web pages, making it more efficient. Another piece of React basic expertise is the creation of a synthetic DOM [7]. It is customary for conventional HTML webpages to re-render a webpage from scratch whenever a user refreshes the data or navigates to another subpage. The re-rendering procedure consumes additional browser resources and has a negative impact on the website's performance. The old technique utilizes a different approach to handle the problem, while "React" employs a different approach to tackle the problem by creating a virtual DOM based on single data binding. When a user browses a different subpage, "React" first produces an upgraded simulated DOM and in next phase, evaluates the variation among the simulated DOM as well as the real DOM to determine which is greater. The real transformation section will be re-rendered when it has compiled a summary of the differences between elements; however, other uniform elements would not be re-rendered.

The most important benefit of using the virtual DOM website is that it loads rapidly using the React architecture. Additionally, "React" encourages designers to develop the UI following the module-based approach. Just like, 2 distinct web pages with text forms, both of which serve the same purpose but have slightly different characteristics. The page will still re-render the content form even if the end-user clicks an URL and navigates to a different page due to the distinction between the two webpages. While developing the standard UI component applied over

various websites, the content method would not be re-consolidated since "React" will identify those aspects are similar and will not transform the content to make it look unique. In short, "React" aims to revolutionize front-end progression and establish a new standard for user interface design and development.

Angular is a well-known open access front-end development platform based on JavaScript ES5 and was created in 2010 by Google [9]. The primary development goal of Angular is to aid web designers in constructing a permanent online form that is more efficient than the previous version [9]. As the front-end development history progresses, Angular continuously alters its position to meet more development requirements, allowing web developers to create increasingly complex apps using Angular. On the other hand, Angular architecture has several constraints as a result of its original design paradigm and has fallen significantly beyond further front-end technologies in the current era. For bringing Angular up to date with contemporary technology, the second edition, known as Angular 2, that is published in 2016. This version was redesigned by the Google dev team [10].

One of the fundamental concepts of Angular 1 uses the binding concept of two-way in internet browsers, which reduces the amount of data handling that must be done in the back-end on online servers [9]. The study represents how Angular 1 operates in the context of data binding. It has been integrated into JSON, as well as Angular 1 recognizes such properties as directives that may be used to connect in/out modules of the online site to a concept specified as Scope [9]. The properties of such JS parameters would be modified from active JSON elements, thus, the data will be sent toward the server if the website receives responsive activities from the visitors, as described above [9]. Due to the concept of two-way binding of data in Angular, the full engagement is accomplished in web browsers, which eliminates the need for website upgrades to wait for information processing based on a back-end processing system and instead renders new data in the front-end immediately using the Markup Language. As a result of the Angular 1 technology, the Markup Language processing robustness may be increased besides waiting for a reply from the back-end.

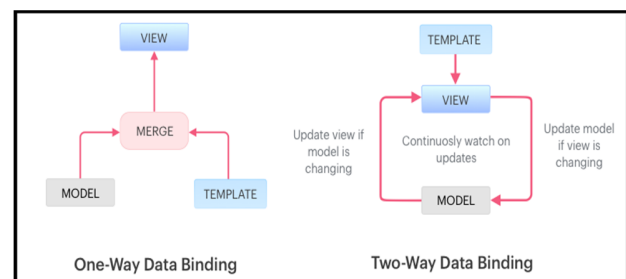


Fig. 3. Binding of Data in Angular 2

Associated to Angular 1, Angular 2 has completely redesigned its idea and optimized the binding process in Angular 1 to make it more efficient. First and foremost, Angular 2 removes the template module and also the controller. It employs a novice module named 'Component' to integrate the two pieces [11]. Figure 3 shows that Angular 2 introduces one-way connection as event binding using the View to the element, previously not the part of Angular 1 [11]. Third, Angular 2 is based on TypeScript rather than JavaScript, a rigorous syntactical JavaScript equivalent created by Microsoft [11]. Fourth, Angular 2 monitors interactive actions using zone.js rather than Scope instead of Angular 1 [11]. Fifth, Angular 1 was specifically designed for desktop web apps with little support for mobile devices, but Angular 2 is designed with a greater emphasis on supporting mobile devices. Because of the optimization and integration of many aspects, Angular 2 is considerably smaller and quicker in response time, critical in mobile development.

2.2 Vue.JS

Vue is a collection of advanced JavaScript frameworks for developing UI, with data driving achieved via the MVVM method of operation. Compared to prior heavier platforms, Vue is developed on the concepts of data-driven and element-based development, and it employs a bottom-up incremental development approach to development. As data & views are divided in the MVVM paradigm, they cannot interact directly with one another. It is necessary to utilize a view-model listener to keep track of the activities on both ends to perform the correct binding procedure at the appropriate time[12].

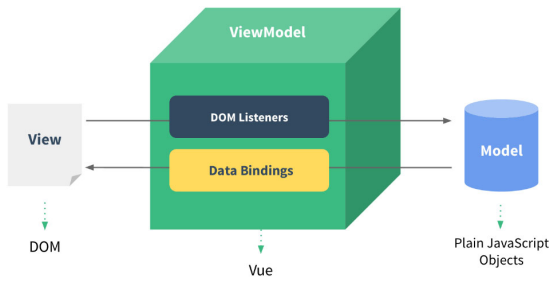


Fig. 4. Data-Driven Approach for Vue.JS

Figure 4 illustrates the MVVM architectural layout of the Vue framework. Compared to DOM components' previous processing, 'Vue.js' is a robust bidirectional binding that responds to user input and output. Once the binding has been established, the DOM would be synchronized with the data. In addition, when the data is changed, the appropriate DOM nodes are likewise modified in a sync form. On the other hand, if the "View"

in the DOM alters, the view-model will invoke the appropriate logic for data integration in the "Model", enabling bidirectional data binding to be achieved via the view-model.

Single Page Applications often consist of a singular HTML document and a small amount of JS that is loaded on request. The only full Webpage in a SPA, as opposed to the typical B/S mode program on a computer system, serves as a container into which code fragments may be inserted before the software can be launched. The design concept is particularly well suited for the creation of mobile applications.

3. Method & Analysis

3.1 Processing of Data

Data processing is a critical component of front-end architecture since the speed and reliability of the data processor determine the customer experience while accessing the site or using the program.

Table 1. Data Binding Approach for Various Front-End Architectures

S. No	Front End Frameworks	One Way	Two Way
1	Angular 1	No	Yes
2	Angular 2	Yes	Yes
3	React	Yes	No
4	Vue	Yes	Yes

The data binding method used by each approach and library is shown in Table 1. Vue may accomplish two-way binding with the use of DOM listeners, or it can perform one-way binding beside the use of DOM listeners. In terms of functionality, the most glaring change among React as well as Angular 1 retains the ability for choosing between one or two-way binding. When contrasted to Angular 1, there is a requirement of React for highly extensive data interpretation owing to the necessity to evaluate the variation between the virtual DOM and the visible DOM. On the other hand, one-way binding is capable of eliminating the problems that can arise when multiple data sources are used, particularly in event-based scenarios. Employing a two-way approach between the element and the View, on the other hand, may result in the elements transitioning into unusual states due to varying data being dispersed from multiple sources. As a result, the Angular 2 team has improved the idea of binding so that developers may utilize both ones as well as two-way binding. Choosing the fusion technique in various situations is ideal for absorbing the benefits of both ones as well as two-way approaches.



### 3.2 Volume Based Efficiency

A greater volume indicates that the architecture has more attributes and functions; nevertheless, it will take longer to load the platform due to the increased volume.

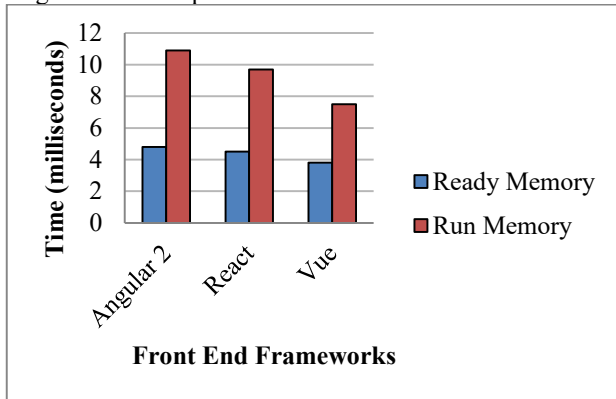


Fig. 5. Front-End Platforms Memory Allocation Performance

In terms of file size, Angular 2 is the most prominent at 143 KBs, followed by Vue at 23 KBs, as well as React at 43 KBs [13]. Because of the vast volume, Angular 2 offers more powerful capabilities and parameters than its predecessor. However, because of its complex structure, there is a possibility that Angular 2's operating speed will be inferior to that of React or Vue, particularly in the area of memory allocation. In Figure 5, it can be seen that Angular 2 takes supplementary time for setting up and operating the memory, but Vue requires shorter effort owing to the flexibility and efficiency of the framework.

### 3.3 Significance of Language

Another important concern is language-based since various languages provide distinct challenges and opportunities for project development, like complexity and effectiveness.

Table 2. Programming Languages for Front End Platforms

S. No	Front End Frameworks	Used Language
1	Angular 1	JS ES5
2	Angular 2	TypeScript
3	React	JS ES6
4	Vue	JS ES6

Table 2 depicts the present state of the language-based scenario in various front-end platforms and their libraries. React, and Vue are built on top of JavaScript ES6, which is the most recent JavaScript mainstream

technology, having been introduced in 2015. Hence, Angular 1 utilizes the JS ES5 programming language, which is the prior edition. As Angular 2 is built on TypeScript, it offers a good environment for type inference that helps to limit the number of defects that may occur in online applications. Moreover, TypeScript aids developers in their efforts to abandon the old JavaScript programming style by streamlining the language's structural framework. TypeScript, on the other hand, has a small number of active community members. Because another new syntactically rigorous superset of JavaScript may develop, there is a possibility that TypeScript may be phased out completely. JavaScript ES6 could be changed, but it will not be phased out since it is the mainstream technology for writing JavaScript scripts.

## 4. Technical Assistance

Technical assistance is also required since greater support may lead to a more positive connection with programmers' societies, which is critical to the architecture's ability to grow in popularity and become more well known. React has excellent technical assistance, and also its API is exceptionally reliable. The official scripts to aid developers in completing the associated update make the process of upgrading and immigrating quite straightforward. In a nutshell, "React" is a technology that delivers enduring digital infrastructure. Angular offers services comparable to React; however, the API may not be as long-lasting as React. APIs from prior versions have been removed from the system. Even though Vue provides a straightforward migration and upgrade process across various versions, the official team does not anticipate releasing an updated plan owing to funding constraints.

### 4.1 Online Businesses

As a result of the above investigation into the many elements of front-end libraries, it is reasonable to conclude that each architectural composition contains its own set of advantages and disadvantages.

Angular 2 gives the best appropriate key in data retrieval when one and two-way data binding is used in conjunction. Furthermore, the official technical assistance provided by the Google development team is solid and dependable, according to the company. However, because of its many functionalities, its volume is much too large to allow for adequate operating speed, and its underlying language has only a small number of communities. Because of this, Angular 2 is well-suited for large-scale e-Business solutions that demand complex functionality and advanced data processing techniques.

React exceptional speed in interpreting modernized DOM, as well as its robust technical assistance and long-

lasting API, enables programmers to eliminate the worries associated with updating and migrating their codebases. Furthermore, developers may construct a React Native smartphone application without first understanding the basics of the React programming language. However, since “React” is a JS framework and its size is not equivalent to that of Angular 2, it doesn’t tend to offer extensive capabilities, and programmers must arrange their applications on their own. Social networking and communication tools are often requested to be re-developed with more customizable functionalities that are also quick to display. Because of this, they are prospective consumers of React services.

When it comes to data processing, Vue offers both two-way as well as one-way binding options. When contrasted to Angular 2 and “React”, it has the lowest volume while also being the utmost competent interpretation and execution. While Vue retains a substantial advantage in terms of flexibility in front-end programming, its procedural assistance is not trustworthy as it consists of limited development team size and surprising official updated programs. Moreover, it has the bare minimum of functionality since it has the lowest capacity. Vue is appropriate for small as well as for medium web applications that demand flexibility and simplicity in development and the robust data processing speed possible, taking into consideration a variety of factors.

## 5. Conclusion

The study discusses various front-end development architectures that may be used in the creation of web applications, as well as viable solutions for the development of a web application, in one document. Three different libraries and frameworks are considered in this research. By comparing and contrasting data across Vue, Angular 2 and “React” in different perspectives such as data binding, programming language, procedural assistance, volume, and efficiency. It is feasible to infer that Angular 2 is capable of extensive roles and capabilities ideal for large commercial plans, particularly in the online business sector. Vue, and “React”, both are excellent in providing live streaming, networking, blogging, and various other small to medium-sized projects. A UI framework is required to develop a whole front-end component to demonstrate a professional user interface design. Future research will broaden the scope of our study to include discussions of more front-end development methods, as well as an examination of their operating principles in the context of developing web applications.

## Acknowledgments

Insert acknowledgment, if any.

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