Thesis for the Degree of
Masters of Engineering

To Build a Front-End Web Application Which JavaScript Framework is Trending Nowadays

The Graduate School
University of Ulsan

Department of Global Smart IT Convergence Engineering

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To Build a Front-End Web Application Which JavaScript Framework is Trending Nowadays

Supervisor: Chong, Ui Pil

A Dissertation

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by

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Department of Global Smart IT
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Ulsan, Korea

July 2022

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Abstract

It is the year 2022, and we have already reached the last decade of the twenty-first century. This era is changing so rapidly, especially with the blessing of the internet. Web development is the most crucial part of this web 3.0 era. There are over 1.6 billion websites now on the internet. It's the fastest-growing industry in the web world. Because every small enterprise to big giant everyone needs their website to promote themselves and their products all over the world.

However, It's not easy to make a website in a day or a week, or a month. It takes time to make a smooth and user-friendly web application. But without the help of a framework, it's quite impossible to make a dynamic web application. Because web development frameworks are a useful and most necessary tool nowadays. For front-end web applications there are so many JavaScript frameworks over the internet. In this thesis, we are talking mostly about using frameworks by a front-end developer and they are React, Angular, Vue, and Ember.

All previous research is too much old which is against to now trending world and also previous research we found an only comparison between frameworks and their pros and cons. But no one thinks about what a developer chooses to build a web application. In this thought, we design this thesis theoretically and practically to survey developers' preferences. It will be helpful for those who want to come into this industry as newcomers and also experts can take an easy decision for making good web applications. So, we can say that after studying all of the above information why need this thesis to find out which web frameworks are trending nowadays and what is the next.

Keywords: *Web Application Framework, JavaScript, Questionnaire, Trending Framework*

Acknowledgments

In this very special moment, first and foremost I would like to express my heartiest gratitude to the almighty Allah for allowing me to accomplish this Master's study. I am thankful for the enormous blessings that the almighty has bestowed upon me not only during my study period but also throughout my life.

In achieving the gigantic goal, I have gone through the interactions with and help from other people and would like to extend my deepest appreciation to those who have effectively contributed to this dissertation itself.

This thesis is based on the work done at the Department of Global Smart IT Convergence Engineering, the Graduate School, University of Ulsan, from September 2021 to April 2022 and supervised by Professor Chong, Ui Pil, to whom the author wishes to express his since gratitude for the continuous support and guidance.

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Also, I'd like to express my gratitude to my friends who have voluntarily expressed their thoughts with me throughout this journey. I'd like to express my gratitude to my dear ones for their unwavering support throughout the process, both in regards to keeping me peaceful and helping me in putting the components together. I will be forever thankful for your generosity.

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1. INTRODUCTION

1.1 INTRODUCTION TO FRAMEWORK

What is a framework?

A simple word framework is a skeleton, shape, or a basic structure underlying a system.

In programing, a package framework is an Associate in Nursing abstraction within which a package, provides generic practicality, perhaps by using a selection that has been modified by additional subscriber code, resulting in a software package. It provides a consistent approach to developing and distributing applications, and it could be a generic, usable package environment that delivers certain functionality as part of a larger package platform to improve package software, products, and solutions more accessible. package frameworks could embrace support programs, compilers, code libraries, toolsets, and application programming interfaces (APIs) that compile all the various parts to alter the development of a project or system [1].

Why developer needs a framework because the framework is s time-consuming system and this platform is extremely dynamic, reusable, and features helpful tools that enable developers to figure additional expeditiously. The framework has so many advantages which are below

- It makes coding simpler and more effective
- Cybersecurity threats are less likely to affect data.
- Fully accessible programming fosters collaboration and discussion.
- They collect and combine data from several sources.
- They provide developers the freedom to do just what they perform effectively.

In this thesis, we are talking about JavaScript-based front-end frameworks which are most popular

nowadays all over the world. To make a web application every developer needs to adopt at least one or two frameworks. Moreover, without this skill, no one will be a good developer or hired anywhere. So, it's the most important part for a developer to learn a web framework that is easy to understand and works smoothly.

1.2 THESIS BACKGROUND AND OBJECTIVES

Web frameworks are quite useful, and they assist web developers in a variety of ways by providing various features and functions [2]. The biggest advantage of the framework is it saves huge time, flexibility, secure code, scalable, fast and secure, easy deployment, and many more.

As an author, I had previous experience in this field as an intern looking out for every aspect of a developer. I worked with so many experienced developers and I tried to understand their feelings and thought. After that, I believe that it’s too much important to adopt a web framework because in this new era it’s crucial for making web projects. But while I was working there I feel that many new developers like me were a little bit confusing which framework will easy to learn and very demand fully.

In this thesis, my main objective is to give some ideas about industry trending frameworks for newbies by theoretically exploring developer thought through a survey. To begin the thesis, it is also necessary to develop a research question and sub questions. The sole purpose of the research paper is to clear the concept of some questions. Firstly, we describe Why we need to learn frameworks; secondly, some ideas about industry-leading frameworks, and finally which frameworks are most popular nowadays on the internet. As per popularity, we choose four major JavaScript frameworks for our thesis.

1.3 THESIS LIMITATIONS

Every thesis paper has some limitations and in this way, we have also two limitations in this paper. Firstly, all over the world, maybe 26.2 million people are directly or indirectly involved in web development technology. So, it's not possible to take every one opinion and feelings about frameworks. But we tried to rich industries most senior web engineers who are in this field for a long time and are also experienced. On the other hand, framework popularity is the varying person to person, from region to region, and from company to company. Like some regions, they mostly used their framework because they are disconnecting from our real world.

2 RESEARCH METHODOLOGY

There are two main types of research points of view: the reasonable approach and the generalization approach. In this thesis, we follow the first one which begins with the hypotheses and is tested through data analysis. For, the research method we were trying to implement the Quantitative and Qualitative methods. Though utilizing the quantitative method we built a questionnaire with multiple-choice, for the qualitative method we set an open question among all participants. But we should describe at least some words about both methods and how they work actually.

2.1 QUANTITATIVE METHOD

The systematic exploration of phenomena using measurable data and analytical, scientific, or digital methodologies is referred to as quantitative research. Quantitative research collects information from existing and potential clients through sampling methods and the distribution of online surveys, polls, interviews, and other types of data collection with numerical findings. After you have a complete understanding of these figures, you can forecast the growth of an item or brand and make suitable adjustments. [3].

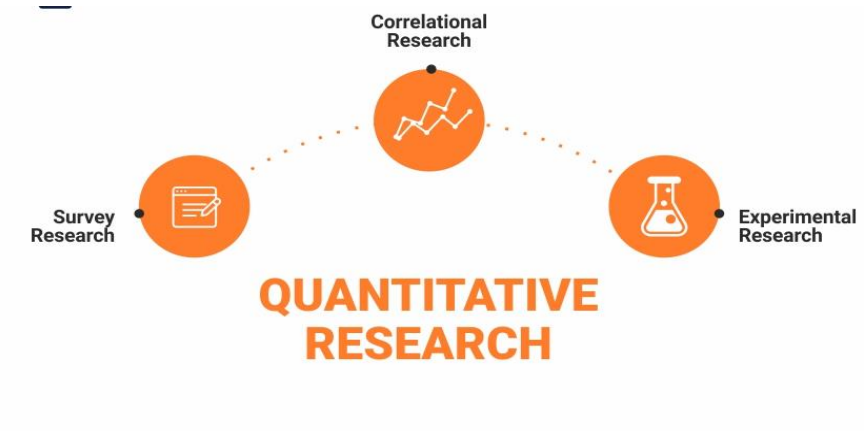

Figure 1 : Quantitative Research [3]

2.2 QUALITATIVE METHOD

Qualitative analysis comprises acquiring and interpreting non-numerical data in order to comprehend ideas, views, or experiences (e.g., text, video, or audio). They are often accustomed get an in-depth understanding of a topic or developing contemporary analysis ideas. Quantitative analysis involves grouping and analyzing applied math statistics, whereas qualitative analysis doesn't. within the humanities and sciences, qualitative analysis is usually utilized in areas like history, social science, administration, medical sciences, anthropology, and so on [4].

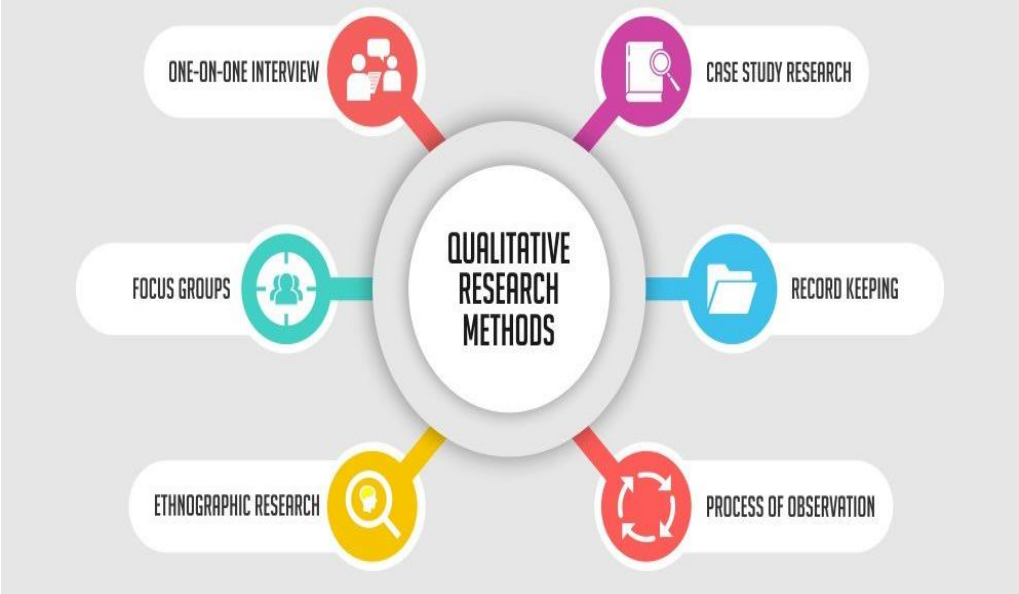

Figure 2: Qualitative Research [5]

2.3 Data Collection

For this thesis, there were two types of data we sorted from several sources. Our primary data was collected from various types of online journals, blogs, developer's communities, programming groups, e-books, applications, authors' own knowledge, and with the help of google.

The secondary data we found from our questionnaire survey's result which we were sent to a web development group and their maximum people are a programmer from a long period. Also, they are from various countries across the world. In this way, we try to utilize both research methodology and hope so we did it perfectly.

3 WEB DEVELOPMENT OVERVIEW

In this chapter, we are discussing regard web development's mandatory skills; without those skills, it's not possible to make a web application and it's a basic fundamental for a developer.

3.1 HTML

HTML stands for hypertext mark-up language. Sir Tim Berners-Lee devised HTML in late 1991, but it was never publicly released. HTML 2.0 was first published in 1995. HTML 4.01 was a major version of HTML that was released in late 1999. HTML 5 is a more advanced version of HTML 4.01, which was first published in 2012 [6].

HTML is called the skeleton of a website. Without this component, it's not possible to make a website. HTML elements are the components that make up HTML pages. Images and other objects, such as interactive forms, can be embedded in the produced page using HTML structures. HTML allows you to create organized documents by indicating structural semantics for text elements like headers, paragraphs, lists, links, quotations, and other elements. Tags, which are written in curly brackets, separate HTML elements. Tags like <image /> and <input /> provide data to the website directly. Other tags, such as <p/>, wrap and provide information regarding document text, and may comprise sub-elements such as other tags. The HTML tags are not displayed by browsers, but they are used to read the page's content. [7]. There are 119 HTML tags that all are not necessary to learn. For newbies there are some major tags which is compulsory to learn. Anyone can find it on google.

Figure- 3: HTML input & output

3.2 CSS

Cascading Style Sheets (CSS) is an acronym for Cascading Style Sheets. CSS is an imperative programming system that allows web designers, programmers, and others to create distinctive and appealing websites. CSS enables dynamic the layout of a page, change the colors and fonts, and add effects to graphics, among other things. [8]. CSS was first proposed by Hakon Wium Lie on October 10, 1994. Now, CSS3 is the latest version. There are so many CSS frameworks available nowadays. Developers use those frameworks for consuming their time. But everything is not possible by frameworks that's why every developer needs to know vanilla CSS. There are so many advantages of CSS, like- easier to maintain, greater design, lightweight code, download times faster than before, SEO benefits, and accessibility.

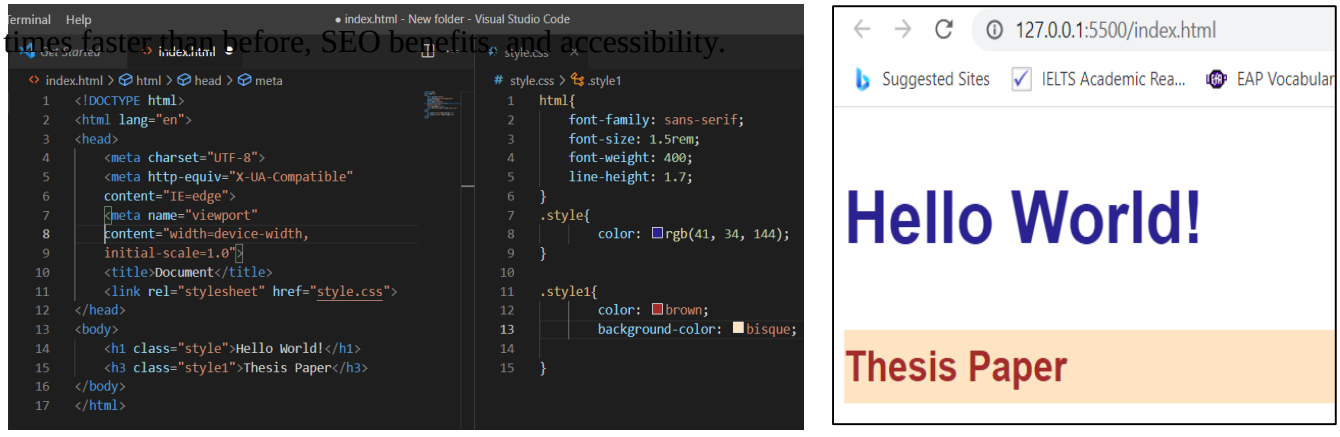

Figure- 4: CSS input & output

3.3 JavaScript

JavaScript is a scripting language that is used to create websites. It is one of the three main languages used to create websites. Unlike HTML and CSS, which provide structure and design to a website, JavaScript allows you to add interactivity and actions to your webpage, allowing users to interact with material in a variety of ways. JavaScript is largely a client-side language, which means it runs in your browser on your computer. However, with the arrival of Node.js, JavaScript can now run code on servers as well [9].

Brandan Eich, a Netscape programmer, created JavaScript in 1995. Last 7-8 years JavaScript is dominating others and it has been ranked among the most used programming languages. It was created out of need and is now used to create 95.2 percent (1.52 billion) of all webpages, including many of the biggest in the world, such as Facebook and YouTube. We wouldn't have renowned and essential web applications including Google Maps and eBay without this [9]. In this thesis, we are mainly focused on the JavaScript front-end framework. So, before learning a framework, developers need to learn JavaScript fully otherwise it's difficult to understand the framework or library.

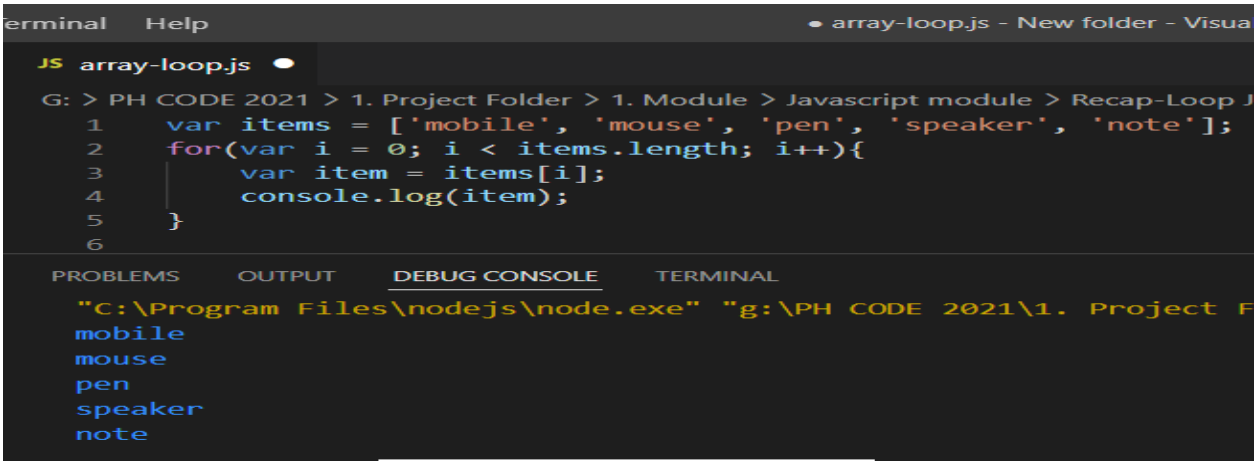

Figure- 5: JS input & output

3.4 Front-End & Back-End

First of all, in building a website there are two different parts called Front-End and Back-End. Front-End is called client-side means which interface we see usually when we enter into any website. Front-End developers build so many components, like- images, content, navigation, graphics, animations, buttons, layouts, etc. It makes a website functional and dynamic by the use of HTML, CSS, and JavaScript.

Back-End is called server-side development which we are not able to see. It makes a site interactive, secure, and fast. Back-End developers mainly work on tasks like- framework utilization, code building, troubleshooting, debugging websites, and database management. Both developers work in different programming languages. Front-end developers usually work with Angular, React, Vue, Ember, jQuery, Sass, and so on. On the other hand, PHP, C++, Java, Ruby, Python, JavaScript, Node.js, and other languages are used by back-end developers [10]. So, if anyone knows both side languages and frameworks then they are called by Full Stack Developer.

Figure- 6: Front-End vs. Back-End [11]

4 JAVASCRIPT FRAMEWORK FOR FRONT-END DEVELOPMENT

4.1 Popular Framework and Their History

In this thesis, we focus on industries four most popular frameworks, like-React.js, Angular.js, Ember.js, and Vue.js. Because of my previous experience and analysis of the internet, I got that those four are the major framework which is used by developer all over the world for front-end development. Now, we discuss deeper regarding those frameworks.

4.2 React.js

Jordan Walke, a Facebook programmer, designed React. React 16.0 was released to the public on September 26, 2017. React (also known as React.js or ReactJS) is a free and open-source JavaScript front-end library for developing user interfaces using UI components. Meta (formerly Facebook) and a community of individual developers and organizations nurture it. With frameworks like Next.js, React may be used as a platform for building single-page, mobile, or server-rendered applications. React, on either end, is solely concerned with state management and rendering that data to the DOM, so generating React programs generally necessitates the adoption of different components for routing and client-side functionality. [12].

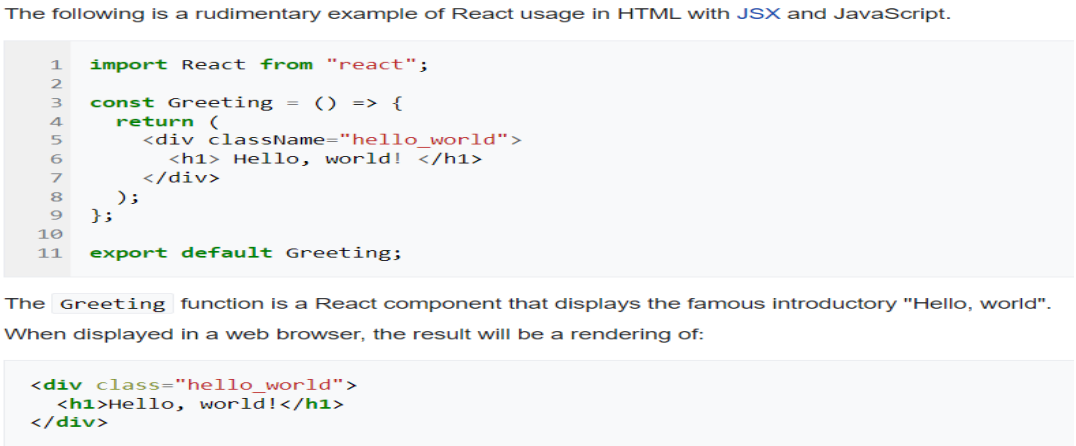

Figure-7: React Fundamentals in HTML [12]

React has user-friendly so many components, like- class-based components, functional components, virtual DOM (Document Object Model), lifecycle methods, JSX (JavaScript Syntax Extension), architecture beyond HTML, react hooks, and so on.

As a popular framework, it has so many advantages and disadvantages. Now, we'll go over the different benefits that make it so popular among start-ups and Fortune 500 corporations.

4.2.1 Advantages & Disadvantages of React

Advantages

- Codes become more flexible and sustainable rather than others
- It has its own virtual Document Object Module (DOM)
- Write once and learn anywhere
- It has Search Engine Optimization friendly features
- It is so simple to learn because it's similar like html
- It is famous for its single page application features
- Building a dynamic website, it's become easier in this framework

✓ **Disadvantages**

- React uses JSX which is a JavaScript syntax. Developers need to learn again JSX
- If a developer wants to change the code, he has to re-write the whole code again.
- Lack of proper documentation
- The high pace of updates

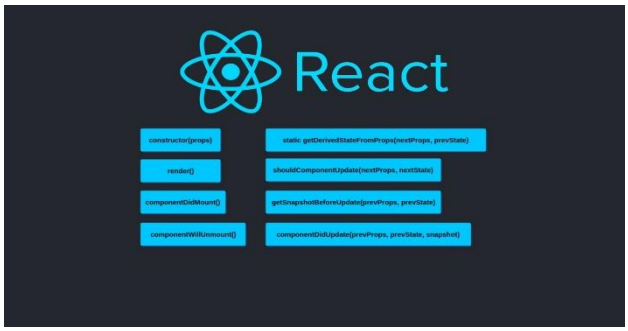

Figure-8: React.js [13]

4.3 Angular.js

Angular (also known as "Angular 2+" or "Angular CLI") is a TypeScript-based free and open-source web application framework built by Google's Angular Team and a community of individual and firms. Angular is a complete rewrite of the AngularJS system by the same team that created AngularJS. The MEAN stack, consisting comprises the MongoDB database, Express.js web application server framework, Angular (or AngularJS), and the Node.js server runtime environment, includes Angular as the frontend. [14].

In 2009, Angular.js was started by Misko Hevery and Adam Abron and it's maintained by Google. On June 02, 2022, angular version 14 was released all over the world. Microsoft Office, Deutsche Bank, Mixer, Santander, Gmail, Forbes, Upwork, Paypal, and a slew of other major corporations continue to use the angular framework to build their websites.

Figure-9: Industries Using Angular [15]

4.3.1 Advantages & Disadvantages of Angular

✓ **Advantages**

- Faster than other frameworks
- It has a cross-platform feature with the ability to create a mobile app
- It has huge tools and design templates for developer
- Its code structure is simple
- Strong connections between app components
- It has a clean UI design
- Angular supports end to end testing
- Angular has great support from a big giant like- Google and Microsoft
- It has a two-way data-binding facility

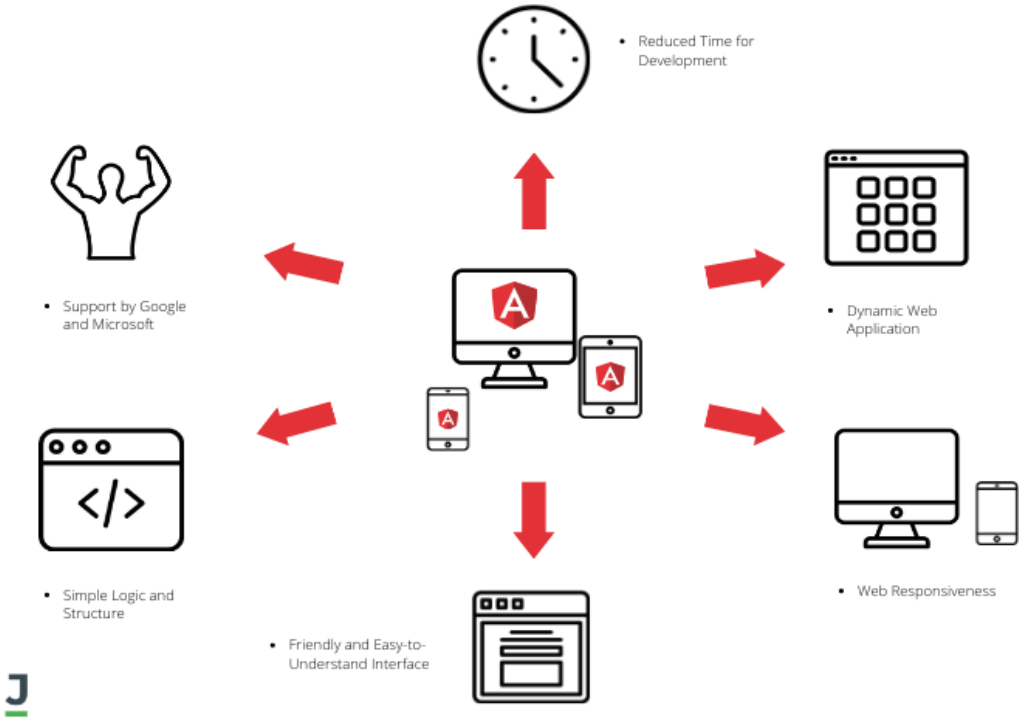

Figure-10: Advantages of Angular [15]

- ✓ **Disadvantages**
    - Limited SEO options and poor accessibility
    - It’s quite difficult to learn because of complex web modules and coding
    - For small projects sometimes it has some drawbacks
    - If a developer wants to change the code he has to re-write the whole code again.
    - Slightly difficult framework for debugging
    - Heavily weighted framework among all of those

4.4 Ember.js

Ember.js is a component-service template open-source JavaScript web framework. By incorporating common idioms, best practices, and patterns from other single-page-app ecosystem patterns into the framework, developers can create scalable single-page web applications [16]. To prevent confusion between the application framework and the widget library of SproutCore 1.0, the SproutCore 2.0 framework was renamed Ember.js in December 2011. Yehuda Katz, a member of the jQuery, Ruby on Rails, and SproutCore core teams, invented the framework. It, like many of Katz's other projects, favors convention to configuration. [16].

Ember has five key components – Services, Templates, Components, Routes, and Models. For this reason, so many big industries use this framework including Intercom, Discourse, LinkedIn, Live Nation, Ghost, Twitch, Apple Music, Square, Digital Ocean, and so on. It has a hybrid app pattern facility to build both desktop and mobile applications.

4.4.1 Advantages and Disadvantages of Ember

✓ **Advantages**

- It has add-ons facilities by using typical NPM (Node Packaged Module) packages
- Command Line Interface(CLI) is so cool in Ember
- Enhancing the developer's productivity ember will make a fantastic choice
- Every six weeks' regular basis updates and realize features
- There is a strong sense of community. On GitHub, there are roughly 900 contributors, while on Stack overflow, there are over 24,000 requests. [17]
- Native JavaScript classes, incremental rendering, tree-shaking, rehydration, and much more improvements will be included in Ember Octane. [17]
- It has also a two-way data-binding process

✓ **Disadvantages**

- Complex Application Programming Interface(API)
- If a developer wants to change the code, he has to re-write the whole code again
- Difficult to learn this framework rather than others
- The popularity level is low
- For a modest project, it's too huge.
- The most robust framework

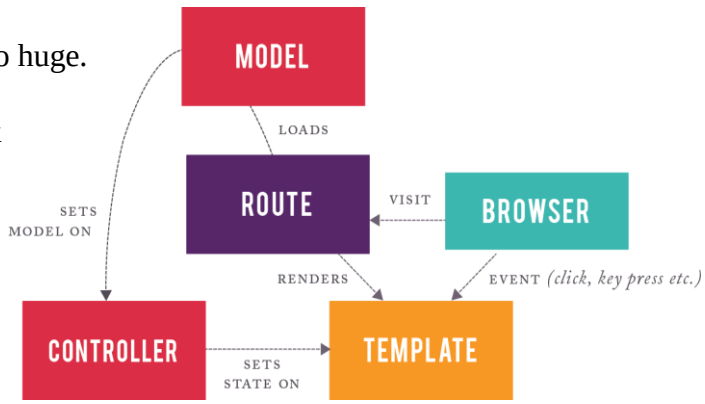

Figure- 11: Ember.js work process [18]

4.5 Vue.js

Vue is a free, open-source model-view front-end JavaScript tool for building single-page and UI (User Interface) applications. Evan You developed Vue after working for Google on various projects that used AngularJS. "I wondered, what if I could just extract the stuff that I liked about Angular and develop something lightweight," he explained later. The project's initial source code commit occurred in July 2013, and Vue was first released in February 2014. [19].

Manga and anime, the majority of which are in the science fiction genre, are frequently used to create version names. It has also some basic key components, like- HTML elements, Templates, Reactivity, Transitions, Routing, etc. In, 2021 it released its version 3.2. It has four official libraries which help developers to smooth their work. Like- such as Vue Router, Vuex, Vue Server Renderer, Pinia, etc, and also it has some official tools- Devtools, Vue CLI, and Vue Loader. So many big industries are using the Vue.js framework for their website. Such as Facebook, Netflix, Grammarly, Gitlab, Adobe, Xiaomi, UpWork, Netflix, Nasa, and so on.

Figure- 12: Vue.js Using Companies [20]

4.5.1 Advantages & Disadvantages of Vue

- ✓ **Advantages**
    - Vue has proper documentation on their site
    - Vue has a strong community build-up and pretty active member
    - Easy to adopt this framework
    - Unit testing facilities are awesome
    - The developer can reuse the component
    - Elements can be created in HTML, CSS, and JavaScript without having to split them up into many files [21].
    - Vue is renowned for its tiny size, maximum size is 18KB
    - It has virtual DOM rendering and well performance
- ✓ **Disadvantages**
    - It has a language barrier as Xiaomi and Alibaba helped to popularize this framework. So many crucial parts and content are described in the Chinese language.
    - It's not good for large scale projects and the flexibility problem
    - Vue has a lack of experienced developers that's why they have limited resources
    - If a developer wants to change the code, he has to re-write the whole code again

4.6 Theoretical Breakdown

In this paper, it's important to discuss the theoretical background which we already discussed above all features. We saw that every framework has pros and cons. But some advantages are similar among all four frameworks. Like- every framework provides single-page application facilities. Also, all frameworks have a two-way data-binding process except Vue. On the other hand, everyone has virtual DOM. If we look into Vue, it has only tiny application facilities among others. Ember and Angular are difficult to learn for a developer but React and Vue is easy to learn for their flexibility.

Therefore, if we go for disadvantages then we saw that one thing is common in every framework, sometimes developers need to change their code but if they want to change their code they have to re-write the whole code again. So, It's a huge disadvantage because time matters. One more noticeable thing is the lack of proper documentation. Despite all of the pros and cons, we can say that based on theory React.js and Angular.js have better than other frameworks nowadays.

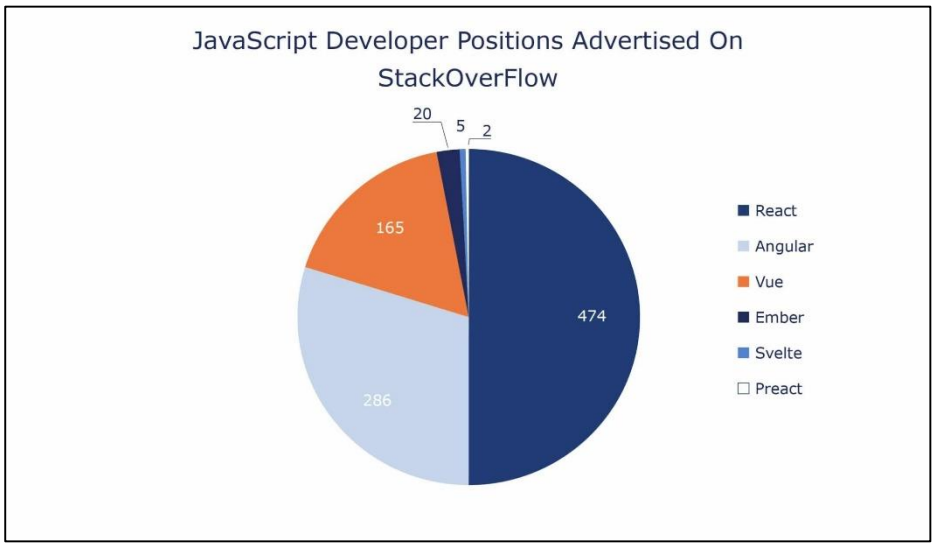

Figure- 13: Popularity Based on Internet and Theory [22]

5 RESULTS AND DISCUSSIONS

5.1 Questionnaire Analysis

In this chapter, we discuss our secondary data which we found conducted by a survey. We have already discussed and verified all primary data above which we found from various journals, articles, and google. But it's more important to know what developers thinking about the framework and their preferences. That's why we conducted this survey. The secondary data we found from our questionnaire survey's result which we were sent to a web development group and their maximum people are a programmer from a long period. Also, they are from various countries across the world. In this survey 39 programmers willingly participate and give their valuable feedback.

5.1.1 Quantitative Data Analysis

Followed by the quantitative research methodology formula we set three multiple-choice questions for all developers. With the help of google, the auto-generate feature helps us to lot to analyze the whole data. Analysis Results:

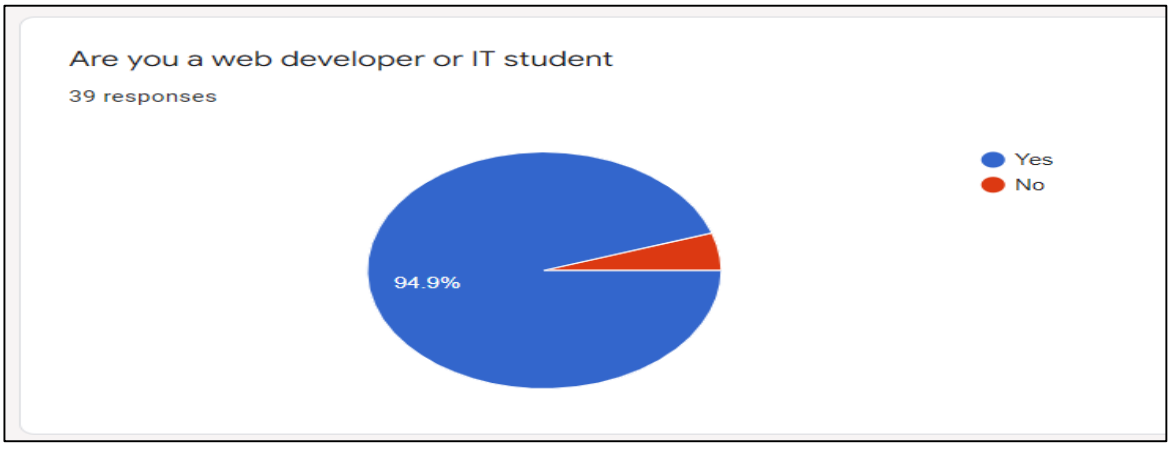

Figure- 14: Participants Profession

As we see in our survey first we try to sort out about participant's profession. Because it's necessary to know about their qualification. Among 39 participants 37 people are found who was a developer or IT students, occupying 94.9% out of 39 participants. The rest of the people (2 participants) wasn't a developer or an IT student which is respectively 5.1%. That means they are from a non-programming background but they know about web development.

Secondly, we set our second question based on how much the developer knows about the JavaScript front-end framework. That means are they familiar with the JavaScript framework?

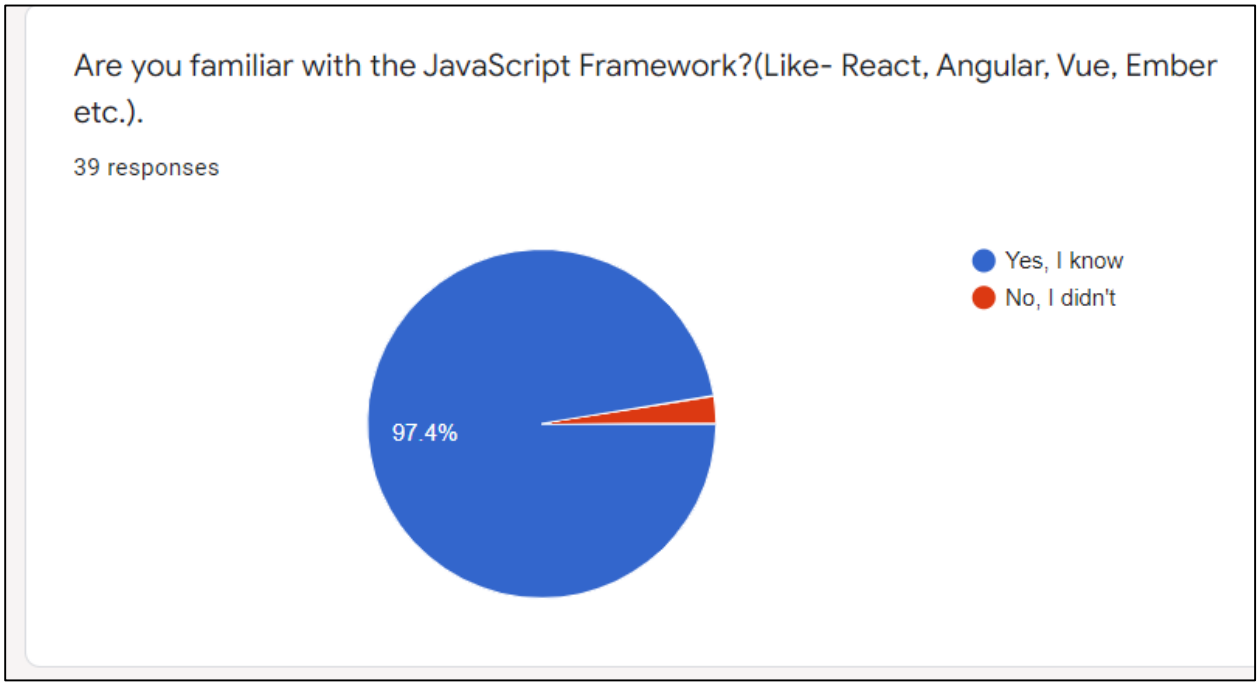

Figure- 15: Familiarity with JavaScript Framework

Here we can see among 39 participants, 38 people or 97.4% knew about the JavaScript framework for a front-end web application. The rest of the 1 people 2.6% didn't know about this. That means he or she may be familiar with another framework. Based on the second question we set our final questions.

Finally, we set our last question which is based on our thesis title which frameworks are most popular nowadays for front-end development. If we look into the results, there is a lot of variety in the survey.

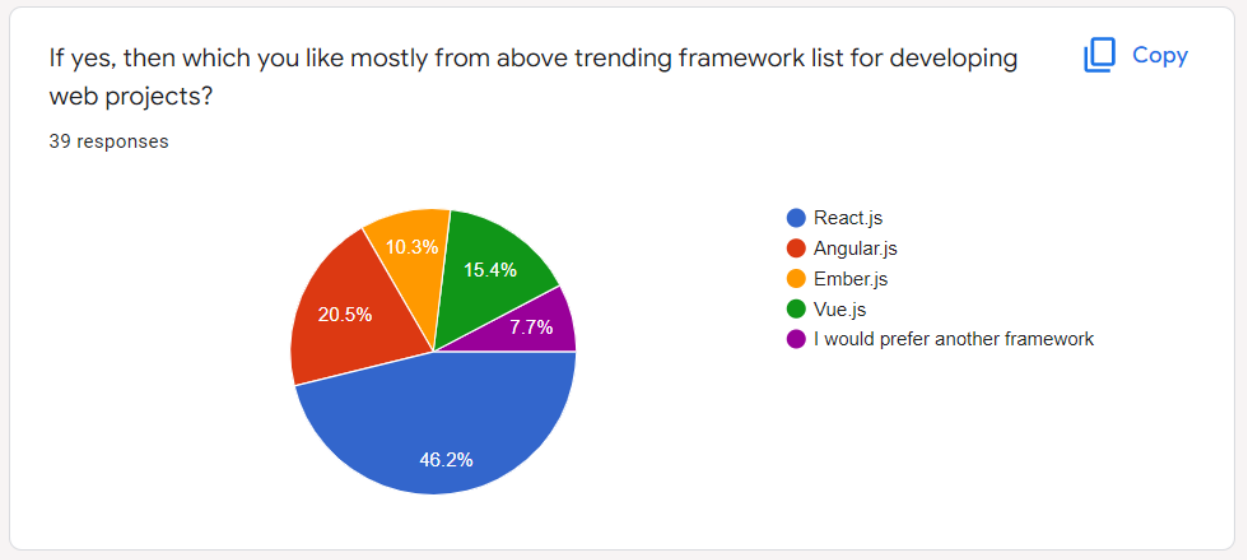

Figure- 16: Trending Framework

So, we can see among 39 participants, 18 people- 46.2% choose React.js for developing web projects. On the other hand, 8 people- 20.5% choose Angular.js; 6 people- 15.4% choose Vue.js; 4 people- 10.3% picked Ember.js and rest the 3 participants- 7.7% decided to prefer another framework respectively.

With all this data we finally decided that almost half percent of programmers choose React.js for their projects and Angular.js, Vue.js and Ember.js stood last. All the results are participants' personal preferences and choices. And also if we see both theoretical and numerical parts react.js is a trending framework all over the world.

5.1.2 Qualitative Data Analysis

Followed by the quantitative research methodology formula we set open questions to all 39 participants and asked for their small comments on their chosen framework. For most of the answers, we sorted and try to analyze their comments.

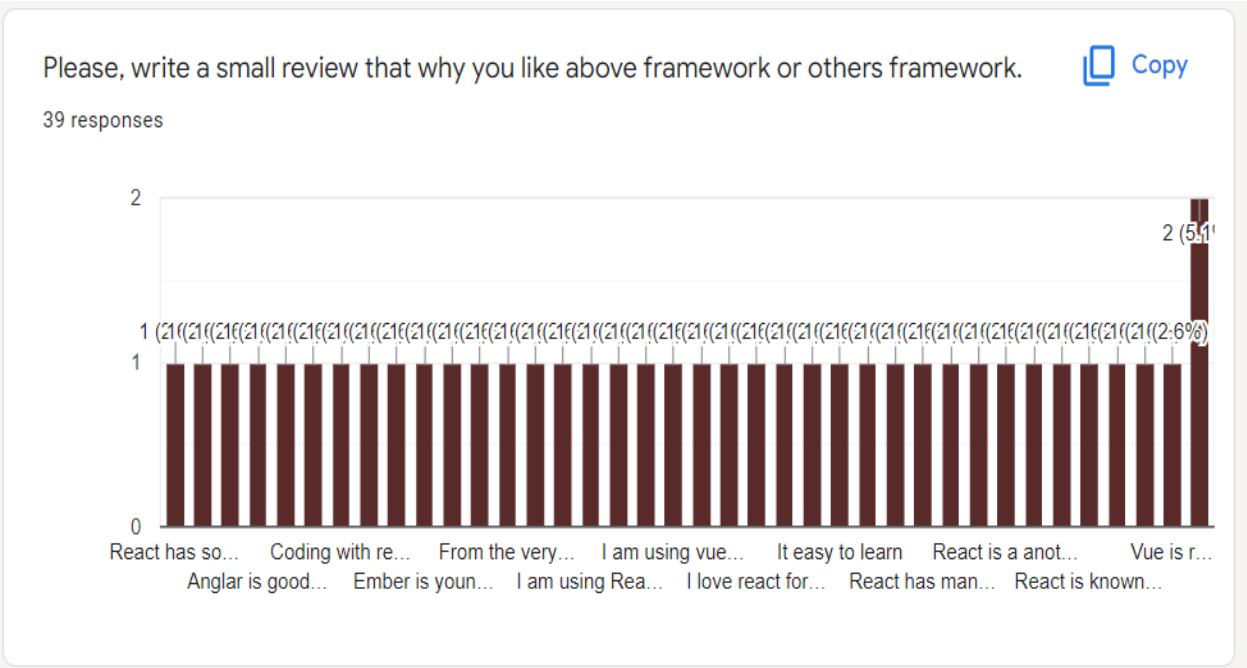

Figure- 17: Small Review of Framework

Among all the participants who chose React (46.2%) their comments are likely- React is easy to learn, it's another version of HTML, react is SEO friendly, react is now boom the industry, its data rendering quality is good, code testing facilities, user-friendly features, easy to learn, the User interface is good, and so on. 8 people talking about Angular.js and they said: fast for time-consuming, data binding process, oldest framework, the old user of angular, and so on. On the other hand, Vue and Ember users said that Vue is lighter than others, Ember is the future, Ember stability is awesome, Ember has potent add-ons, Vue is simple and faster, and so on. The rest of the others 7.7% either like another framework or no comments.

6 CONCLUSION AND FUTURE WORKS

6.1 Summary

It is concluded in this paper, that front-end web development is so popular and essential things all over the world. Without a website, no company or big industry will get successful. In 2021, only USA made revenue from this industry of nearly $40.8 billion, and also the highest-paid industry.

In my thesis, our main focus is on why should people need to learn web development, industry-leading frameworks, and which are much more popular among developers as I said earlier in my introduction part. Based on this we tried to explain the web development history and its pros and cons in the framework overview. Secondly, we tried to judge the popularity both theoretically and numerically in other chapters. The most essential part of this thesis is the questionnaire survey that we conducted among all programmers. We overlook everyone's preferences about the framework. We mainly focus on four major front-end frameworks because of their popularity and uses case. Every framework has its advantages and disadvantages. Shortly who will read this paper if they wish can easily decide or adopt their preference framework.

Also, everyone's choice is to vary from person to person and region to region. Sometimes hiring companies also have their preferences. But if we follow the latest trend in front-end web development then we have to say that React.js is a better and so much more popular JavaScript front-end framework all over the world. After that Angular.js which is once upon a time in the number one ranking but nowadays for some advantages, it has less popularity rather than before. As we know that web technology updates and features change continuously; from the view of this point may be in near future any other framework also can be dominating React.js.

6.2 Future Works

In this paper, we try to cover the JavaScript front-end development framework's popularity all over the world and we think we achieved it successfully. But there is always a scope for further research or improvement because of this type of trending topic. So here also some future research works-

- ✓ Using React.js we can develop a whole project
- ✓ Analysis of performance and quality of React vs Angular
- ✓ Back-end popular frameworks and their pros and cons
- ✓ Comparison between CSS framework (Bootstrap vs Material UI)
- ✓ How does JavaScript work on the internet?

Above all topics are related to my recent thesis paper and also there is so much scope to work further on those topics in near future.

REFERENCES

1. Software Framework, Available at: https://www.en.wikipedia.org/wiki/Software_framework
2. Cuelogic, 2014. How useful are web application frameworks? Available at: https://www.cuelogic.com/blog/how-useful-are-web-application-frameworks-how-do-i-know-which-framework-would-suit-me
3. Quantitative Research: Definition, Methods, Types and Example, Available at: https://www.questionpro.com/blog/quantitative-research/
4. Pritha Bhandari, 2020. What is Qualitative Research? Available at: https://www.scribbr.com/methodology/qualitative-research/
5. Qualitative Research: Definition, Methods, Types and Example, Available at: https://www.questionpro.com/blog/qualitative-research-methods/
6. HTML History, Avalable at: https://www.w3schools.in/html/history
7. HTML, Available at: https://www.en.wikipedia.org/wiki/HTML
8. Ageek.dev, 2021. The Evolution of CSS in 3 Decades, Available at: https://www.ageek.dev/css-evolution
9. T.J DeGroat, 2019. The History of JavaScript: Everything You need to Know, Available at: https://www.springboard.com/blog/data-science/history-of-javascript/
10. Kenzie Academy, 2020. Front-End vs. Back-End: What's the Difference? Available at: https://www.kenzie.snhu.edu/blog/front-end-vs-back-end-whats-the-difference/
11. Divya Jose, 2021. What is the Difference Between Front-End, Back-End, Full-Stack Development, Available at: https://www.cleffex.com/blog/whats-the-difference-between-front-end-back-end-full-stack-development/

12. React(JavaScript Libary), February 2022. Available at: https://www.en.wikipedia.org/wiki/React_(JavaScript_library)

13. React: Metodos del ciclo de vida de un componente, El Mayo, 2018. Available at: https://www.pensemosweb.com/react-metodos-ciclo-vida-componente/

14. Angular (Web Framework), April 2021. Available at: https://www.en.wikipedia.org/wiki/Angular_(web_framework)

15. Why Does IT-World Use Angular? Ellen Pace, Dec 2021. Available at: https://www.jevera.software/post/why-do-it-world-use-angular

16. Ember.js, September 2020. Available at: https://en.wikipedia.org/wiki/Ember.js

17. Ember JS with its Pros and Cons. Jatin Panchal, January 2021. Available at: https://www.rlogical.com/blog/ember-js-with-its-pros-and-cons/

18. Shared Terminology Yet Different Concepts Between Ember.js and Rails. Tute Costa, March 2019. Available at: https://www.thoughtbot.com/blog/shared-terminology-yet-different-concepts-between-emberjs-and-rails

19. Vue.js, January 2021. Available at: https://www.en.wikipedia.org/wiki/Vue.js

20. Why We Love, Use, And Support Vue.js. Damian Dulisz, June 2017. Available at: https://www.monterail.com/blog/why-we-use-vuejs

21. The Good and the Bad of Vue.js Framework Programming, September 2019. Available at: https://www.altexsoft.com/blog/engineering/pros-and-cons-of-vue-js/

22. The most popular JavaScript frameworks in 2022- strengths, weaknesses, and use cases. John Adam, January 2022. Available at: https://www.kruschecompany.com/ember-jquery-angular-react-vue-what-to-choose/

SAMPLE OF QUESTIONNAIRE

Front-End Development Frameworks

I am Hossain Mohammad Faruque who study in South Korea as a IT student. For my thesis I need to do this survey. Please co-operate with it honestly.

Are you a web developer or IT student *

- Yes
- No

Are you familiar with the JavaScript Framework?(Like- React, Angular, Vue, jQuery etc.).

- Yes, I know
- No, I didn't

If yes, then which you like mostly from above trending framework list for developing web projects?

- React.js
- Angular.js
- Ember.js
- Vue.js

Please, write a small review about each or only one of these frameworks.

Short answer text