CHAPTER 1: INTRODUCTION

Undoubtedly the use of the internet is growing day by day because it is available for cheaper these days and easily available. With the increase in the use of internet the importance and use of websites have also increased.*(Khurana and Kumar, 2019)* Smallest to smallest information is also available on the internet and websites are the only sources of that information. Organizations and companies are hugely relied on the web to deliver their products and services to the customers and they have succeeded.*(Lawrence, 2017)* Not just this but the technologies available for building the websites are also evolving. The technologies used for building websites include HTML, JavaScript, CSS, etc. But to full fill, the current market needs the traditional approach to build websites that are not considered good enough in terms of its efficiency, performance, etc*(Mesbah and Deursen, 2007; Wang et al., 2008)*. So to overcome this the new approach of web sometimes referred to as 2.0 has evolved. This approach is called Single Page Applications*(Molin, 2016)*. Using this approach building websites has become much easier not just that but websites have become more responsive and efficient and resource savings.

1.1 Conventional Approach

As discussed above the websites built in older times were not so advanced. Most of the websites were built using server-side rendering technology. In the server-side rendering, all the data that needs to be shown on the browser was already fed to the HTML page and that page is sent to the client-side. So all the content will be visible in one go at the browser. So if the size of the webpage is large it would take significant time on the browser to display the content. Also if one has to update only the specific part on the webpage, the whole page has to reload, which means all the data will again be fetched from the server and displayed on the browser. But it has a major disadvantage that even the updated data will also be downloaded again with the static data and that is wastage of resources. Static data like headers, footers logo, etc doesn't need to be downloaded again. This increases network latency and interfaces complexity. This pattern is also called the request-wait pattern.*(Mesbah and Deursen, 2007; Wang et al., 2008)*

Also, while writing the code, code repetition should be avoided as much as possible. But in the older approach, the content which should be displayed on all the pages has to be written separately which is bad practice. *(Moreno and Robles, 2015)* To overcome issues like this, new technologies were introduced called a single page application SPA.

1.2 Single Page Applications & AJAX

Single-page applications are composed of several different independent components that can be updated or replaced dynamically so that the enter web page is not required to reload on every interaction of the user with the webpage. Sing page application runs inside the browser instead of fetching data every time from the server. Because of this, the websites have become more interactive and dynamics and innovations are being added day by day. Also these days the user-friendly ness of websites cannot be ignored. *(Davila and Navon, 2015; Voutilainen, 2017)*

Single-page applications are heavily dependent on the ajax. Ajax is Asynchronous JavaScript And XML. As the core technology of web 2.0, AJAX has got more and more attention. Because as mentioned earlier the quality of user interactivity cannot be ignored in modern-day websites so the rich client-side technology called ajax evolved. AJAX is nothing new but just a new way of using the old standards. All the work of fetching data from the server in runtime and reducing the server side and client side time is done by the ajax and it helps to improve the user experience. Traditionally XML was the choice of data format for the data to be transferred but Nowadays JSON is chosen. *('Ajax Comparison of Javascript Frameworks, Json, Xmlhttprequest, Comet, Ajax, Comparison of Javascript-Based Source Code EditorsSeptember 2010.pdf', no date; Smith, no date; Jadhav et al., 2015)*

1.3 JavaScript Frameworks

The existence of javascript frameworks is since 1995, and it is one of the most widely known and used programming language for front end web development. Still, JavaScript is growing and many new features are available now to enhance the user experience. With the evolution of Javascript language for web development, many JavaScript frameworks are also coming out to support web development. Frameworks are nothing but a set predefined code and functionality which user can use and enhance them according to their needs. Writing everything from a scratch is time-consuming therefore the use of frameworks comes in handy. Also, managing and maintaining code is as important as developing it. So architecture provided by frameworks is also important in this place. A typical JSF will provide functionality like DOM traversal and manipulation, AJAX manipulation managing layout and inserting effects, MVC architecture, URL redirecting, Routing, Stage management, Session Management, etc.

1.4 Need for Research

As discussed above to improve the web development to the next level there is a jungle of JavaScript frameworks are available. Sometimes developers may choose more than one framework to fulfill the requirement of applications, so there is always a conflict of which framework to choose.*(Graziotin and Abrahamsson, 2013)* Also, it's not just about choosing the right framework but there are so many performance factors to be considered while choosing the framework. One of the important aspects of this framework is its performance in the browser. There are many more factors that may be considered while choosing the frameworks it includes factors like maintainability, validity, Lines of code, Active community. Therefore this research work will be done to compare the latest Single Page Application frameworks and how they perform in the browser. So based on performance and need developers can choose the framework. This work will mostly try to evaluate the browser-specific performance of the number of different Javascript frameworks. The chosen JavaScript frameworks and performance parameters will be discussed in-depth in the next chapters.

1.5 Research Question

This research will mostly try to evaluate the browser-specific performance of javascript frameworks on the browser. Because if your browser is taking more than 3 seconds to show a particular website then there are high chances of users navigating to some other website. So

the websites display speed is one of the important factors. So based on the above criteria following research questions have been formed.

1. Evaluating how different is the performance of Different JavaScript frameworks?
2. Evaluating how difficult or easy the frameworks are in terms of writing the code from the developer's perspective.

1.6 The hypothesis to be tested

Having worked as a full-stack developer for more than two years, I realized the importance of frameworks and how they can play a major role in developing any kind of software. Not just in JavaScript but any other language like Java, PHP, Python, etc.

So the main hypothesis to be tested is, using various javascript frameworks can we build a robust, scalable single-page web application. Also how the performance of this application differs in the browser in the same environment. The amount of code required to bootstrap the application so it can be maintained in the future will be tested.

The reason for choosing the above topic is because I am very much interested in software development and I would like to pursue this field as my career. Therefore, I wanted to test the different frameworks as I have some experience working with them. Also in my taught masters, I had the subject related to the Front-End web development and Android development where I have worked with the JavaScript, JQuery, Angular 8, and Ionic framework using Angular 8 and hence I wanted to focus on this specific subject area.

1.7 Roadmap for the dissertation

This dissertation is carried out in the following steps. Chapter 2 the details about the previous research have been discussed. Their methodologies, frameworks used by them, and metrics used by them are discussed. The next chapter is the methodology, in this chapter how this research will be carried out, which frameworks will be chosen what metrics will be chosen is discussed. The next chapter will be the development and results. Here the development of the application using different frameworks will be discussed and after the development, their performance will be computed. After the development, the next chapter is evaluation and discussion where all the findings and results will be discussed. And the last chapter will be the conclusion and future scope.

CHP 1. INTRODUCTION	• This chapter introduces the Background infromation, Need for research and hypothesis to be tested.
CHP 2. LITERATURE REVIEW	• This chapter discusses about the previous works and their findings
CHP 3 . METHODOLOGY	• In this section how this dissertation will be carried out is discusses
CHP 4. DEVELOPMENTS & FINDINGS	• In this particular chapter the development of software will be done and results will be finded.
CHP 5 . Discussion & Evaluation	• All the findings and results will be discussed here
CHP 6. CONCLUSION & FUTURE SCOPE	• Consclusion and future work will be mentioned in this chapter.