

Front-End Development and its Impact on End-User Interaction with Companies

A Technical Report submitted to the Department of Computer Science

Presented to the Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

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Spring, 2023

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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CS4991 Capstone Report, 2022

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ABSTRACT

Front-End development is an integral part of the way companies interact with end-users and how their image is promoted in digital spaces. Over the summer I worked as a software development consultant on a second-tier airline client trying to elevate their company's image. The airline hoped to accomplish this goal by implementing a membership system, customer dashboard, but most importantly, a user-friendly website. To produce an effective, user-friendly website, front-end development interns worked to display content, gather information from users, and provide a collective space to promote the airline. By taking on an agile approach, we were able to break down the website into smaller, usable portions and continuously build up design, actions, and customer content so a product was ready at each stage of the work. We streamlined ticket purchasing and created a centralized location where customers could find airline information more easily. Next steps for front-end developers would be to determine which webpages carry the most user traffic and which one's customers are actively avoiding, as well as ensuring that the website is accessible to all customers and their needs.

1. INTRODUCTION

The internet contains a wide variety of products and services, all clicks away and easily available on our screens. While many businesses still have physical locations, their online presence has become an important form

of interaction between them and potential customers. Websites should be clear, concise, and organized in a way that puts the company's best foot forward. This process can be achieved through front-end development, a process that uses languages such as HTML, CSS, JavaScript to create a user interface that engages users to web applications and other platforms. Front-end developers are essentially the architects that build the framework in which customers interact with businesses and help bridge that gap between the two parties.

Over the summer I experienced first-hand the role that front-end developers take on and the importance of communicating the company's image over a digital framework. During my internship I worked on a team of front-end developers to establish a web application for a second-tier airline company. The airline company itself was fictional and all a part of a simulated work client relationship established as a learning objective in my internship. The intent of this learning process was for interns to gain an understanding of real client work in a safe and open learning environment.

2. LITERATURE REVIEW

Before describing the design processes taken during my internship, I investigated the literature and found two papers that provided insight on the topic of front-end development with user perception of companies. One of these, Jooste, et al (2018), is a systemic literature review of 21 different User

Experience (UX) Frameworks and proposes a UX framework aimed at assisting the UX of Business Intelligence (BI) applications [1]. Through the incorporation of UX and BI in web applications, companies can understand and reach different audiences with a business perspective taken into consideration from the beginning of development. In the literature review, the papers were analyzed based on any UX framework components they contained. The paper and its framework components were then added to a table where an individual paper could be compared to the others. To create the researchers' literature-based conceptual framework, they pulled main categories found across the literature pieces and compiled them into a format that answers the questions of "what the main categories of elements are," "how these elements inform experience design through different stages of software development in a lean software environment" and "what future research could be investigated from the literature review"? The researchers concluded that each framework had different levels of abstractions and proposed "different goals and areas of focus."

The second paper, Xing, et al (2019), is an analysis of three primary front-end frameworks and their relation to e-business. Xing, et al included a comparison of React, Angular, and Vue and their functionalities, as well as their pros and cons based on different target audiences [2]. The analysis of the frameworks was broken down into five categories: Data Processing, Volume and Performance, Language-based, Technical Support, and E-Business Solutions. The comparison of the three front-end frameworks was done through these categories. The paper concluded by discussing the complexities of each framework and what type of web application was best handled by each framework. Further steps into this topic would

be to investigate how UI was encompassed in front-end frameworks.

3. PROCESS DESIGN

The simulated airline company was a lower status, domestic group that gained revenue through tickets sales via ticketing operators. The software intern teams were tasked with building a web application from the ground up and having a membership system at its forefront. Throughout this process, front-end development interns went through many different versions of the airline webpages. We had to adjust how user data was collected and went through many testing phases as content and usability adjustments were given.

During this process front-end interns had to produce feasible demonstrations of the website every two weeks and ensure that it performed as needed, anticipating how users would interact with said website. Without a previous foundation, front-end interns chose the overall design of the website and made the decisions on how features were implemented. The overall process was broken down into three overarching steps: UX/UI Design, Implementation of Code, and Testing the Interface.

3.1 UX/UI Design

At the start of each sprint, the front-end development interns began development by designing the user interface, and the functions that would be needed to achieve each sprint goal. Our business interns created user requirements for each new user feature, each containing details on what the feature was intended to do and how the user was intended to interact with it.

With that, front-end interns took the user requirements and used them to help design the new web application feature using the design tool Figma. With Figma, the front-end team collaboratively designed the user-interface and

discussed accessibility concerns prior to implementing any code. After spending some time designing, the front-end team discussed the design and features with the entire team. By discussing as a group before implementation, we were able to determine attainable measures for the design in relation to the different teams and set realistic expectations on the front-end and back-end, as well as in the data and analytics team. After collaborating and evaluating the design, we moved on to implementation.

3.2 Implementation of Code

Implementing new features took on many different forms among the members of the front-end intern team. Each feature had functionality to be implemented, connected with the backend team, and a visual design created. The webapp was created using React and was written in JSX.

The implementation process typically began with creating the code that would send user input to the back end and visa-versa. This was usually the most complex part of the process. We needed to work with the back-end intern team to receive the proper endpoints and discuss the format for sending and receiving user data. From there other members of the front-end team worked on implementing the feature design, using JSX, JavaScript, HTML, and CSS. We encoded the layout to ensure a consistent visual and design layout across all the pages and features of the web application.

3.3 Testing the Interface

The final portion of the front-end process during sprints was the testing phase. This process was reached when code had been implemented and the user-interface as well as its functionality had satisfied the requirements laid out by the business interns. During this stage, business interns were given the latest version of the web application and went through a testing document to ensure that user

requirements were met, accessibility standards had been considered to some extent, and the overall scheme of the web application was harmonious and concise with the branding the business interns were presenting. Revisions typically asked for were adjustments in layout design, readability concerns, and adjustments to make the web app more user-friendly. After this process we went through a round of revisions in the front-end team, the testing documentation was reviewed by the business interns and signed off for deployment or assigned for another round of testing.

4. RESULTS

After four two-week sprints and one three-week sprint, we wrapped development on the airline web application and presented our work to the client. While other deliverables were presented, my focus was on the completion of the web application. By the end of this process, we had implemented a chatbot feature, membership page, FAQ page, customer log-in, ticket purchasing, seat selection and flight check-in feature. During our final presentation to the client, we walked through a user story of someone purchasing a ticket and demonstrated how someone would interact with the other pages and features of the site. We maintained a similar theme throughout the website and implemented clear user features and content to make the user experience enjoyable and simple.

Prior to our creation of the webapp, the airline company had no online presence. With this implementation users now have the ability control their purchases and find useful information of the airline at their own time. The final deliverable contained the new branding for the airline and centralized around the new membership system created to gain loyal members.

As is the hope for any web application, the clients were satisfied with the straightforward

design and simplicity of the user feature options. They felt that the design and implementation of the web application mimicked that of first-rate airlines and would help create a positive online experience that would raise their brand name.

5. CONCLUSION

There are several steps taken when designing a web application, ranging from research to code implementation, and many more that create the complex structure of the software platform. As I stepped into the role of front-end development, there were many key parts that displayed the meticulousness of the front-end process, and how critical it is to keep the company's image in mind throughout development. Wording is critical in creating an image for a company, but how the wording is structured on a screen can equally impact how users form an opinion. Structuring the layout design and webpages is vital to creating a positive environment for users. The front-end perspective of a web application is the primary component in which users are interacting with a company digitally. Front-end development is the primary group in charge of creating that space and setting the company's best foot forward. When creating a digital presence, developers must not follow a cookie-cutter format, but instead consider the intricacies of development with its design, data input, and user experience that will be customizable to each business.

6. FUTURE WORK

The final submission to the client was a ready to deploy web application following their criteria. To further the success of the web application, future steps would be to analyze the user traffic of the web application, such as the duration of time a user is on the application, and the webpages most visited, just to name two. Analyzing the user patterns on the web application would allow the developers to see which aspects of the

application were successful and which needed improvement. This way users would have an enjoyable experience and the client could successfully promote its intended message.

7. REFERENCES

- [1] Chrisna Jooste, Judy Van Biljon, and Adele Botha. 2018. A Conceptual Framework Representing the User Experience for Business Intelligence Front-Ends. In *2018 International Conference on Advances in Big Data, Computing and Data Communication Systems(icABCD)*. Durban, South Africa, 8 pages. Retrieved September 18, 2022 from <https://doi.org/10.1109/ICABCD.2018.8465464>
- [2] YongKang Xing, JiaPeng Huang, and YongYao Lai. 2019. Research and Analysis of the Front-End Frameworks and Libraries in E-Business Development. In *ICCAE 2019: Proceedings of the 2019 11th International Conference on Computer and Automation Engineering*. WN, Perth, AU, 4 pages. Retrieved September 18, 2022 from <https://doi.org/10.1145/3313991.3314021>
- [3] Josh Fruhlinger and Mary K. Pratt. 2022. What is Business intelligence? Transforming data into business insights. (October 2019). Retrieved September 20, 2022 from <https://www.cio.com/article/272364/business-intelligence-definition-and-solutions.html>.