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Job Management Portal Software Review

by

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and

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This essay describes the tasks and responsibilities I performed during my computer science capstone project. The goals for my capstone project was to create a website for a non-profit organization called Abilities At Work, where the website allows employment specialists to enter information regarding a client, including their current stage in the process, job goal, where they are seeking work, barriers to employment, transportation needs, due dates for paperwork, and applied jobs. Also, the management must be able to track client status and employment specialist caseloads. This system will help support the employees to manage the job portal and support individuals who experience intellectual/developmental disabilities with finding meaningful employment. This website allows staff to identify available jobs in the community, which others can use to match with clients on their caseload. The staff can tag a job with labels such as part-time/full-time, area, A.M./P.M., industry, etc. Staff will receive a notification if a form is submitted with tags for a job that match at least one tag for their client (and be able to search the forms with a filter). The website also needs to be secure as sensitive information can be stored. It also needed to be maintainable as they work without a dedicated IT department, with their team consisting of some data system contractors and other non-technical employees. This capstone project was completed as part of a team of nine software developers.

This essay is written for my Honors degree in addition to the 2-term capstone project in Computer Science. By exploring the various stages of the capstone project, we can gain a better understanding of its structure and the key elements involved in the successful project completion. Additionally, this essay showcases the parallels between the capstone project and real-world software development, offering valuable insights for prospective students and professionals who sponsor projects.

The capstone project is taken once students have completed the required prerequisites, elements of software engineering, operating systems, principles of programming languages, algorithms, and a programming intensive course. I completed all my prerequisites in spring 2022, and then chose fall 2022 for my capstone start. Our capstone was divided to two terms, fall 2022 and winter 2023; the first part was spent in understanding the requirements about the project and tools and technologies needed to work on the project. The roles for the capstone project were assigned based on our personal interests, and I chose to work as a developer. Our team leads met with the sponsor from Abilities at Work weekly where they gathered detailed information and gave updates regarding the project status.

We followed an Agile software development principle, meetings twice per week, meeting stand-ups and continuous communication via Discord. Agile work environment is an iterative approach to project management and software development that helps in faster delivery of a product with continuous and consistent work being performed. In Agile, we have a Sprint, where we select a task and work on it for two weeks and deliver a completed version of the task at the end of the Sprint. In a Sprint, we have Scrum meetings which consist of stand-up where each member of the team provides status updates regarding our findings and the work we had done. In Sprint meetings, we also discuss any questions or concerns we have regarding the project, need any help from other members of the team or team leads, or assist others with their tasks. Scrum meetings are weekly meetings where the entire team is present and each team member gives an update on their tasks.

During the first term of capstone, we started the project by understanding the tools and technology involved, taking time and revisiting the past classes where we had learned relevant skills, and reading documentation regarding those tools. Then, the team leads decided to run a

poll among the team members through which the entire team decided what tools to use. For example, in the poll we had options for our desired frontend framework between ReactJS and VueJS, and for our database we had the option to choose between MongoDB and SQL. MongoDB and SQL were the popular choice. We presented our findings and decisions to our sponsor and followed with the next step of creating the architecture for the application before we started writing the code. We created an architecture of the app too, where an architecture entails all the key components of the application in a pictorial representation and explains how to communicate between different tools. So, for the architecture, we created a pictorial representation of what frontend technologies we had chosen and how they would work with the backend. At the end of the first term, we presented our architecture to our instructor and the sponsor of the capstone project.

In the second term of the capstone project, we started writing the code for the application. We narrowed our work into a bunch of small tasks where we paired up any other team member to complete the task. For most of the tasks, my teammate and I performed pair-programming in which we had one person writing the code and the other guiding the person writing the code. For other tasks, I had one teammate who preferred code handover, where we write some code each day and at the end of the day the other teammate takes over. I enjoyed the former structure more because when we are working together, we can get a hold of each other's mistakes faster. A potential downside for pair programming is development cost as two developers will be working on the same task. Code handover poses a solution for such an issue, but its downside is the higher potential of software bugs in the future. My first task for coding was to write database schemas for mongoDB, which consists of the major components of each section of the app. For example, the user schema has information like the username, whereas the jobs schema has

information about first name, middle name, last name, industry, work hours, etc. I also worked on user login authentication tasks for secure backend authentication. This was particularly challenging because it involved tools like Passport.js which I had never used before. My teammate for this task helped me through this task as he had immense knowledge from past experience of using Passport.js. Biggest task that I took up was matching jobs to client tasks, which took up two sprints (4 weeks) completed. This task involved updating the database, writing the backend logic for matching the jobs and writing the code of the frontend for the users to use. All of the tasks were placed on pull requests in which my code was tested and code quality was evaluated by team leads in order to make sure the coding standards are strictly met. Additionally, each pull request required two approvals from different reviewers to ensure code quality. The pull request reviewers also played an important role in making sure the user experience for the application was as simple and straightforward as possible.

During our capstone project, we faced various challenges. Firstly, working as part of a Sprint Planning Team proved to be difficult as we lacked sufficient experience in this format. We encountered a few setbacks when some team members missed meetings and when the sponsor requested changes to the product requirements. Initially, we were tasked with migrating Abilities At Work's existing job management portal from a spreadsheet to our new website. However, towards the end, we were informed by our sponsor that this was no longer necessary, resulting in a considerable amount of time and effort being spent, but not using the designs of this feature. Additionally, we encountered unexpected issues while working remotely on Discord, which was our primary mode of communication. We struggled to share our screens on Discord and often faced technical difficulties.

During my capstone project, I encountered several technical challenges that affected the development process. Designing a user interface that was both simple and efficient proved to be a difficult task. We had different user interfaces for table structured content for a list of jobs, but at the time when we decided to write the code for it, we had trouble implementing the “filter by row” section of the jobs table. We had to throw out my “filter by row” task, and, instead, we found an open source library which took care of filtering, displaying and paging the jobs data, and which made code integration faster and simpler. We also struggled with typed-issues related to passing variables between components, as well as multiple formatters used during development, which created conflicts when we merged our code with the existing one. Furthermore, case sensitivity issues in fields for the database also posed a challenge; for example, if the location field is stored as “oregon” and “Oregon,” our code viewed them as different words, so we were not able to filter it. We had to change the code in order to view all the locations in lowercase to keep data consistent throughout. Lastly, we faced difficulties when creating a Docker container for the project which is a lightweight piece of software that consists of our application code and other dependencies allowing us to deploy multiple versions of our app and support maintenance. The issues we were facing was with Tailwind which is our website styling library that did not pass CSS properly, resulting in a messy containerized version of the project.

We learned several lessons during this experience. During our code development, we made some changes that helped to improve the process. We prioritized using Typescript over Javascript, which provided type safety and helped us recognize bugs before they could cause issues. To help streamline the PR process, we assigned specific members to handle PR testing and approval every week, which prevented PRs from being open for longer than necessary.

However, we still faced some issues due to not having a formatter built into Github, which led to weird commits that caused some confusion. Despite these issues, the project helped us gain a better understanding of full-stack applications and version control (Git), and we were able to learn more about the available tools in both areas.

This capstone project has been a great learning experience and will play a huge role in my career as the structure of software development is very similar to how development is done by professionals. The Scrum and Agile principles followed in this project has helped me understand these concepts and will help me implement them when I join the industry as a professional. This project will also boost my resume as I'll have an open source contribution in my portfolio which also happens to be a long term project.

Towards the end of capstone, all of my capstone team members went on a field trip to Abilities At Work's office in Hillsboro to deploy the website locally so that it is securely located and accessible from the office only. We met with our sponsor and their team in-person, and had a fun time chatting with them and talking over the work they were doing. We received great feedback and appreciation from our sponsor and his team, and from our capstone instructor too. We created a video to demonstrate the finished website and all the team talked about their contributions and views on the project. On the final day, parts of this video were presented to other capstone teams and uploaded to youtube as well. Overall, it was a great success and an experience that will be helpful throughout my career.

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