

**Internal Web Application: How Dynamically Displayed Data
Can Improve Company Organization**

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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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Abstract

The Card Tech department of Capital One experienced problems with cataloging feature ownership. Teams and features were stored in spreadsheets, which were frequently out of date and difficult to use. This resulted in many management issues, including orphaned features when teams dissolved and mass testing when software engineers could not ask specific teams.

A team of software engineers and I created a full stack web application to dynamically display multiple databases, and allow Capital One employees to keep track of feature ownership among the teams. We implemented the application using Angular for the frontend, Python and FastAPI in the orchestration layer, and PostgreSQL, Jenkins, and Lambda to run on a serverless Amazon Web Service environment. We added Single Sign On authentication to the application to allow all Capital One employees reading capabilities, but only specific managers writing capabilities. To solve testing we displayed contact information for each team. We solved the problem of orphaned features by creating an error when users try to delete a team without first rehomeing the features they own.

At the end of the internship, my team showcased a viable product that is now in use among the Card Tech department's engineers and management. This project could be enhanced by returning to the department in a year to get feedback on what is working and what needs to be changed.

1. Introduction/Background

Companies that focus entirely on producing for the client do not realize how an internal tool can make development more efficient and result in better products faster. When features are developed for applications at Capital One, its team is responsible for any maintenance and testing

that is required. Therefore, when a team dissolves, their features need to be transferred in ownership to another team in the department. If there is no structured method to transfer ownership, the features end up becoming orphaned with no team responsible for it.

The Card Tech department stored all team ownership in spreadsheets that were frequently out of date, causing employees to not utilize them. When teams create or update their features, they need to test the features that could be affected by the changes. Since the team and feature storage was out of date, the teams would need to do mass testing to make sure they encompassed the features that could be affected.

These inefficiencies could be solved by creating a dynamic application, accessible to all employees and updated by specific managers. Therefore, my team created a web application that considered specific problems the department was having with the spreadsheets and attempted to solve them.

2. Related Works

Past research has found convincing evidence that the companies with superior performance are distinguished from their competitors by practicing effective internal communication. According to Wyatt's 2005 research, "companies that excel in internal communication also have a higher market premium, higher shareholder returns over five years, higher levels of employee engagement, and lower employee turnover."² Through creating an internal web application, my team promoted better communication between employees, resulting in more effective production.

The team of interns I was a part of, relied on Capital One managers and software engineers, our clients, to explicitly express the minimum viable product and the tools we should use to complete it. Capital One requires all applications to use tools created by employees and specific

to the company.¹ The team, therefore, completed research on the unknown technologies through proprietary documentation before beginning the project.

3. Process Design

Through consistent presentations to clients for feedback and viable product requirements the team solved the challenges with feature management.

3.1 Technologies

We implemented the application using Angular for the frontend, Python and FastAPI in the orchestration layer, and PostgreSQL, Jenkins, and Lambda in order to run on a serverless Amazon Web Service environment.

3.2 Features

Our application had different pages to present table views of features, teams, and microservices, which included searching and filtering capabilities for ease of use. For each item in the tables, the user could access a details page and internal and external links to relevant information. In order to solve the problem, the teams faced when testing, we displayed contact information for each team. We also added data exporting capabilities for employees to use. We added Single Sign On authentication to the application in order to allow all Capital One employees reading capabilities, but only specific managers writing capabilities. We solved the problem of orphaned features by creating an error when trying to delete a team without first rehomeing the features they own.

4. Results

At the end of the internship, my team showcased a viable application that was put into production in the Card Tech department amongst engineers and management. The managers were excited about the prospect of making this internal tool available for more departments in order to spread the value to the entirety of Capital One.

5. Conclusion

By creating a web application to dynamically display vital information, our team gave Capital One employees the tools to standardize team and software feature details. When the web application is used, it can provide employees with many advantages: efficiency, organization, and preventing mistakes.

6. Future Work

Since the use of our application is propriety, the statistics involving use of the deployed application versus the former spread sheets are not available. This, however, is very important for planning future work. Speaking with the user of the product helps us to know whether the design is working specifically for their needs and usability. If the website is not being used more, what functionalities could we add that would make it more conducive to their work?

The managers were also discussing how this system should be implemented for all of the departments across Capital One. This would require web applications with similar structure and functionality, but specified to meet the needs and data of the department.

7. UVA Evaluation

Introduction to Programming with Professor Cohoon, provided me with a python base that helped me to write our python code. I wish; however, I had a higher level of python knowledge. Python is a very common language in modern software development at Capital One, whereas C++ is not.

The class that helped me the most with this internship was Advanced Software Development with Professor Sherriff. This class introduced me to Agile programming with a team and developing an application from scratch. Most of the knowledge I had about my internship came from Advanced Software Development.

I also applied Software Testing with Professor Praphamontripong. Capital One is a company that requires a lot of testing because of the importance of their products; therefore, it was important for me to have that testing base.

Some classes that I wish I could have taken before my internship that also would have helped are Programming Languages for Web Applications with Professor Hott and Database Systems with Professor Praphamontripong. Both classes are preparing me well for my future job at Capital One.

8. Acknowledgments

I would like to recognize my manager at Capital One, Gary Mason. He had a vision for this product and was very excited to see it through. My intern team of Anthony Bravo, LaDawna McEnhiner, and Ron Laniado worked really well together in a virtual environment. We would not have been able to get this application ready for production in nine weeks without other Capital One software engineers helping us: David Stoker and Bala Bala.

References

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