Software Engineering: Providing Organizations with Cost-Saving Recommendations

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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 business metrics platform for a large-sized tech company lacked a cost-saving suggestions feature which caused service owners to have to utilize numerous other platforms to harness all necessary information. To resolve this issue, I developed a full-stack feature for the web application which would provide important cost-saving recommendations. I first created a proposed data schema, determined the technologies to be used, and drafted a UI design for the feature in Figma. I developed the new feature for the web app using C# and .NET for the back end and Angular, Node.js, and TypeScript for the front end. The finalized project now provides services within the company with a centralized platform to access both important business and security metrics and cost-saving recommendations to significantly reduce operating costs. In the future, the company could incorporate other key recommendations into the web portal powered by artificial intelligence models.

1. INTRODUCTION

Within the last couple of decades, business decision-making has shifted from inference-based to data-driven, and with that shift has come the need for data-driven cost-saving recommendations. For a business to succeed it must be efficient and the most important step to promoting business efficiency is reducing operating costs. As a software engineer intern this past summer, I was responsible for developing a solution to address this growing need for the company.

The large-sized tech company I interned for already had a platform that provided customers and internal services with cost-saving recommendations. However, I needed to determine an efficient process to provide similar recommendations within my team's metrics portal to ensure efficiency and centralization. To fully understand the extent of this problem, I first familiarized myself with the existing solution and determined the pros and cons of that platform. Since I was developing a new feature that was loosely based on an already completed platform, it was necessary to determine the aspects of the portal that customers liked and did not like to ensure I was developing this new feature from the eyes of the customer, rather than from a developer's perspective.

Early estimates stated that this new feature on the metrics portal could save services within the company over $100,000 per year. Although the cost-saving recommendations were already on an existing platform, service owners often did not take the additional time to navigate between multiple portals to view important business metrics in addition to those cost-saving recommendations. In an attempt to address this issue, I was asked to integrate similar cost-saving metrics into the existing

metrics portal for service owners to conveniently access.

2. RELATED WORKS

Before beginning work on the project, I needed to familiarize myself with existing solutions, where I discovered the Azure Advisor platform. As Patricio (2021) explains, "Azure Advisor is a built-in tool available on your Azure tenant that provides recommendations based on priorities…and gives you the information on how to …save costs [for] your environment." To develop a sound solution for services within the company, I began analyzing the major advantages and drawbacks of this platform to determine how I could effectively address the customer's needs without recreating an existing product. In doing just that, I set out to familiarize myself with the documentation that Microsoft devised.

The primary feature that resonated with me was the ability to have "personalized best practices recommendations" that Zotova et. al (2022) explained in the documentation. I knew this was a necessity for my project to ensure a seamless customer experience. In order to ensure the personalization of recommendations, I delved further into the specific documentation for the Advisor cost recommendations. As Allen et. al (2023) explain, "Azure Advisor helps you optimize and reduce your overall Azure spend by identifying idle and underutilized resources."

With the information I gained from the documentation, I had the necessary knowledge basis to begin devising an initial blueprint for my project. Although I would be using the same cost recommendations as Azure Advisor for my product, the distinguishing factor between the two solutions would be accessibility and centralization. The company already had a platform that provided security risks, key performance indicators (KPIs), and numerous other important metrics used by service owners, so why should they have to navigate to a different portal to view these cost-saving recommendations? My project would integrate those recommendations into the existing portal to ensure a seamless customer experience and still allow for personalization for services to view their own cost-saving solutions.

3. PROJECT DESIGN

The process of developing the full-stack feature for the web app that was developed.

3.1. Full-Stack Feature for Web App

Overview of the tech stack for the project and the requirements and challenges I experienced during the development phase.

3.1.1. Overview of Tech Stack

Implementing the full-stack feature for the existing metrics portal involves many different technologies that must be known before beginning development. The back end of the application utilized C# and the .NET framework to make API calls to the CosmosDB collection. On the front end, Angular, Node.js, TypeScript, and HTML/CSS were used to implement the user interface of the new feature. Additionally, Figma was used to draft a blueprint of the proposed design, and Git and Azure DevOps were used once again for version control.

3.1.2. Requirements

Services within the company needed access to cost-saving recommendations beyond the existing Azure Advisor platform. Leadership wanted those recommendations within the existing metrics portal to promote centralization and reduce time spent navigating between various platforms. In order to make this solution worth the investment, it needed to ensure that it would reduce operating costs for services within the company upon deployment.

3.1.3. Key Components

After eliciting the requirements and tech stack for the project, it is important to

introduce the specifications, challenges, and solutions that resulted from the project.

3.1.3.1. Specifications

The specifications for the cost-saving recommendations feature were very straightforward. Users, which in this case were service leadership, should be able to view up-to-date cost-saving recommendations from the metrics portal and have the ability to filter by specific subscriptions to enhance customization. In regard to more of the technical requirements of the feature, a series of API calls should be made upon the initial load, to CosmosDB which stores the recommendation data. From there, that data would be formatted and cleaned up before being displayed in a tabular format on the front end of the portal.

3.1.3.2. Challenges

During the development of the feature for the web application, I encountered fewer issues than I had previously come across during the implementation of the data pipeline. The primary challenges that occurred during this part of the project were decreasing the knowledge gap and familiarizing myself with a series of new programming languages and frameworks that I had yet to interact with prior to this project. More specifically, Angular, Node.js, and TypeScript were all very new to me and I had no prior experience working with these technologies.

In order to resolve the lack of experience challenges that I encountered, I completed tutorials that walked me through the basics of the various frameworks and programming languages that were new to me. Once I had completed the tutorials, I read through the existing code base on my team and familiarized myself with realistic examples of these new tools in action. Through the completion of numerous tutorials and extensive read-throughs of the team's code base, I was able to develop the understanding

necessary to successfully implement the cost-savings recommendation feature on the metrics portal.

3.1.3.3. Solutions

The completed cost-savings recommendation feature provided service leadership with the ability to access up-to-date data in order to promote efficiency and reduce operating costs in and around the company. The feature began by making API calls to the CosmosDB and placing that collected data into the back end of the platform where it was then properly formatted. Once formatted and cleaned, the data was organized into a table and placed on the front end of the portal. Users could interact with the front end to view recommendations and filter by specific subscriptions in order to get a better understanding of which resources tend to cost the most to sustain.

4. RESULTS

With the completion of the feature for the metrics portal, over 300 services within the company have the ability to view real-time cost-saving recommendations. The new feature allows leadership to reduce the time spent searching for these recommendations by an average of 2 minutes, which represents a 98% reduction in time spent. Not only does this promote time efficiency, but with convenient access to the recommendations, services have the opportunity to save over $100,000 in annual operating costs. This product provides services with a customizable solution to save time and money.

5. CONCLUSION

The development of a full-stack cost-saving recommendations feature for the existing metrics portal has addressed a critical need within the large-sized tech company. With the transition from inference-based to data-driven decision-making, the importance of this feature of significant. The project aimed to streamline and centralize cost-saving

information, preserving valuable time and resources for service owners. By integrating these recommendations into the portal, the project was able to successfully achieve this goal.

6. FUTURE WORK

In addition to the immediate impact this project has on services throughout the company, there are a series of future enhancements that can be made to increase the significance. The data schema was constructed to prioritize scalability so that alongside cost-saving recommendations, other recommendations such as security, availability, and reliability can be implemented with little to no additional overhead. Also, there is another series of cost-saving recommendations that are specifically for determining whether services can downgrade to smaller database solutions based on the size of data used.

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