

# **THE DIFFERENCE IN UX DESIGN FOR INTERNAL VS. EXTERNAL SOFTWARE TOOLS**

A Research Paper submitted to the Department of Computer Science  
In Partial Fulfillment of the Requirements for the Degree  
Bachelor of Science in Computer Science

By

Alicia Land

April 27, 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.

ADVISOR

Briana Morrison, Department of Computer Science

# The Difference in UX Design for Internal vs. External Software Tools

CS4991 Capstone Report, 2023

Alicia Land  
Computer Science  
The University of Virginia  
School of Engineering and Applied Science  
Charlottesville, Virginia USA  
[adl9fd@virginia.edu](mailto:adl9fd@virginia.edu)

## ABSTRACT

When it comes to developing tools for interval vs. external use, engineers must shift the way they are designing these products, in order to make the best fit product for the user and prioritize their differing needs, which is not seen much in these products today. Google, Inc., where I served as an intern for two summers, wanted to explore the difference in design when creating external vs. internal tools through front-end software development. Through a variety of projects, we worked closely with the user experience (UX) team to create technology to increase usability and learnability and understand how these factors differed based on the user of the product. We also reflected on our own experiences as engineers to identify ways we as users interact with technology differently than those for whom we usually create. From this experience, I found that the difference in development came at the design stage and determined who must be involved and consulted (e.g., customer/client versus past technology) in order to create the best user experience. Both processes must prioritize creating technology that is accessible for all. In the future, the importance of creating both external and internal tools for the user experience is essential if we are going to create a software development industry that is more accessible and equitable.

## 1. INTRODUCTION

The ability to create technology and innovate is truly what rules our society and makes the world what we know today. As humans, we are consumed with getting and creating the next important thing that will take us into a better future. However, most of the time this obsession has caused us to lose sight of why we are creating this technology: for humans.

To create the best technology for humans, we must take into consideration the complex relationship between humans and computers. Engineers and scientists have been able to do this by focusing on and designing according to the user experience and catering to the users' specific needs. User experience design can be defined as: "The creation and synchronization of the elements that affect users' experience with a particular company, with the intent of influencing their perceptions and behaviors" (Khillar, 2012, para. 6.) This way of designing allows us to truly create for our users and have an impact on how they will interact with the technology by paying attention to factors such as usability, accessibility, learnability, and how to design for their diverse perspectives.

When we think of what that user looks like, frequently it is an outside party that we are impacting from a distance through user experience design. However, how does this change the way we design when the users are the engineers themselves? Engineers must

shift or change the way we design technology based on whether they will have an internal or external use, especially when it comes to user experience and what this looks like for different types of products.

## **2. RELATED WORKS**

From the beginning of the project, I knew I wanted focus on UX and draw on my experience completing projects as a Software Engineering Intern at Google, Inc. As I delved into the topic, I discovered Gualtieri's (2009) discussion of putting yourself into the shoes of the user in order to create a usable design and product for them. He posited that in any software development having this perspective is a major advantage, though he does not go into how this may look different for internal v. external tools, not a prevalent concern in software development. My project uses this broad idea of the best way to design for your user but delineates between internal and external tools and applies the best design process to both.

Another source of inspiration, from Budibase (2022), discusses how internal tools indeed the unsung heroes of the industry. The article describes how the process of building internal tools is unique and can make or break a good company that produces good products. My project borrowed the bases of how these tools are created and what internal tools are considered great but builds upon this by discussing where the shortcomings are in the current software development industry.

## **3. PROCESS DESIGN**

During the summer months of 2021 and 2022, I had the opportunity to work on different product areas, although both still focused on the front-end and user interface development of the Google Cloud and Google Ads platforms. Although they were the same overall focus of creating the most user-friendly user interface and tools, there was a

large shift in that one was for external use and the other internal. It is important to understand where this difference comes from—most prominently in the users.

As a part of the Google Cloud Platform front-end team, my main project consisted of developing a new page of the Google Cloud Platform Filestore UI. This component allows users or companies to create and manage a resource for their stored data in the cloud and, thus, it is considered an external tool. One of the most impactful portions of the project was producing the ideal user interface, which was done by the user experience (UX) team. A large part of the project was to increase the usability and learnability of the tool. Since this is an external tool, intended to be used by those whose technical experience ranges from a little to a lot, this was a large factor in the design process.

When designing, the team had to consider factors including what order of the fields would make the most sense when first viewing the page, how to thoroughly explain the instructions without having to flesh out the details of the system, and how to make the external tool most efficient for its intended goal. Through this technique, the UX team part of the Google Cloud Platform was able to create a design that was later implemented into the UI of the component for the external tool.

During the summer of 2022, I designed and implemented a tool to improve the understanding and readability of rules that define the Google Ads client platform. The tool allows engineers to see exactly how their code changes will ultimately affect the configurable UI by creating a standard and assisting with migration. I worked with the front-end development language called Dart to create algorithms in order to achieve the ultimate goal.

I worked with the engineers that would be using the product so I could fully understand the users' needs. These tools are being designed for further designing, so the goal changes overall.

#### **4. RESULTS**

The projects that created the internal and external were both being used or had been rolled out by the end of the summer. The external component tool created for the Google Cloud Platform team is currently in use and allows users to receive a full overview of their data at their own request. The users of this snapshot tool are large companies that are using Google to promote their business. During development a main factor we took into consideration was that a range of users would be utilizing the product and we defined the future work based on their experiences.

The internal migration tool created for the Google Ad UI team was already in use by the engineers on our team during the summer. This ability to easily gain access and understanding the user experiences after use allowed us to improve the tool quickly and efficiently.

#### **5. CONCLUSION**

Studies say that the first step is to: "Become your user to know how to design for them" (Gualtieri, 2009). As engineers, this is not always the easiest thing, as it may be assumed the user has more or less knowledge than initially anticipated. But, in order to fully create both internal and external tools, we must be able to flip these perspectives and create with experience in mind.

In reflecting on my experience from the summer before, the process in which the design of the internal tool was created differed quite a bit, especially when it came

to including user experience. Like external tools, engineers want to put themselves into the shoes of the user, but they are the user. This changes our perspective and makes us engineers have to reflect on our own experience and communicate with those around us to understand how to design the technology, but this does not make it easier. So, in order to gain this knowledge for further development, we must be able to challenge ourselves and push the boundaries to create most inclusive and accessible user product.

Throughout the process, I was able to see how the tools were fleshed out and ultimately utilized by the end users. Especially when it comes to front-end and front-end development, the work never ends.

#### **6. FUTURE WORK**

Creating internal and external tools is the heart of the software development industry and is something that will continue to grow and shift. With this in mind, in order to further develop the tools, I had the opportunity to create the past two summers, accessibility and equity must be considered through user experience.

In the future, the internal tool meant to help those on the Google Ads UI team, will continue to develop and adapt to the team's needs. The plans for this include having as many users utilize it as possible and putting more focus on the actual user experience within the user interface.

As for the external tool, allowing users to create components for their stored advertisement data, similar to that of the internal tool, will also continue to change. Since it is due to clients' needs, this may have a chance of being terminated. Although it is daunting, it lets us understand the complexity and dynamic manner of development with users' needs in mind.

## REFERENCES

Khalid, H. M. (July 2006). Embracing diversity in user needs for affective design. *Applied Ergonomics Volume 37, Issue 4, Pages 409-418*. Retrieved on (March, 24 2023)

<https://www.sciencedirect.com/science/article/abs/pii/S0003687006000470>

Gualtieri, M. (Sept 4, 2009). Best Practices in User Experience (UX) Design. *Forrester*. Retrieved on (March, 24 2023)  
<http://web.uchile.cl/DctosIntranet/05UsabilidadExperienciaUsuario/BuenasPracticas/BestPracticesUserExperience.pdf>

Budibase.com. (2022). The definitive guide to internal tools in 2022. *Budibase*. Retrieved on (March, 24 2023)  
<https://budibase.com/internal-tools/>