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April 26, 2023

National Science Foundation
2415 Eisenhower Ave
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To the NSF Program Officers,

On March 3rd, 2023, we received an RFP from the National Science Foundation. The intent of the RFP is to provide funding for student-led STEM design projects to supplement student research with an engineering design experience. Attached is our proposal in response to the NSF RFP. The goal of our project is to develop a new scheduling app that combines popular planning features into a single easy-to-use application that helps students manage their time more effectively.

Time management is an important skill to have, but many people still struggle to plan out their days. As technology progressed, many time management apps were developed, but lacked certain valued features, forcing people to use multiple calendars if they wanted to organize their tasks in a certain way. To further examine this problem, a research survey was conducted. The survey found that the majority of respondents struggle with time management. This issue demonstrates a need for a better solution that combines calendars and features into one app.

Therefore, developing a new scheduling app that integrates with other apps and includes many features will aid people's time management. A consolidated calendar may help students relieve stress because they can keep everything in one place, where deadlines are easily visible. The user interface will include many valuable features in one place, with options to customize the calendar. This project will create a way to schedule and integrate diverse events in one place.

Our team is composed of majors from various engineering disciplines and we are excited to see what our combined efforts can bring to the table to create a universal time management solution. An effective calendar app could greatly increase UF students' success and happiness. This proposed project proposes an innovative technological design backed by research, and is within budget of the NSF RPF. Please reach out to us at the number (xxx) xxx-xxxx if you would like to contact us. We are excited to hear from you.

Sincerely,
Sneha Alluru, Ginger Arnold, Kyle Holt, Dayanita Kumar, and Ashley Maurer

MergeCal

Sneha Alluru
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Kyle Holt
Dayanita Kumar
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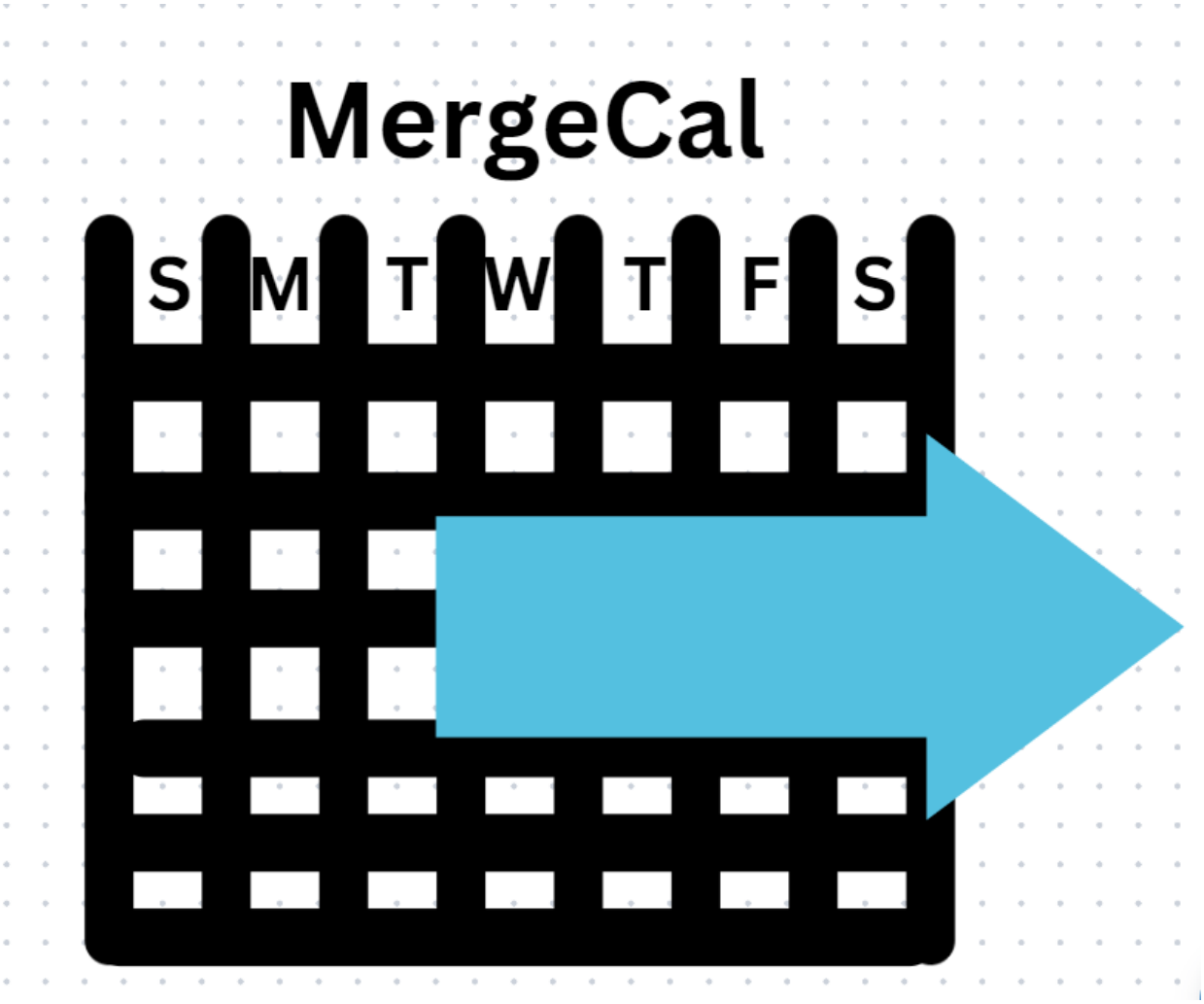
April 24th, 2023



Executive Summary

Due to COVID-19, there have been significant shifts towards online learning and working. Online tools have become increasingly important due to this recent shift since most students do a significant portion of their course work or even all their coursework online. This online learning phenomenon has led to the widespread use and creation of several different online scheduling and organizational tools to help students navigate their busy schedules and manage their time effectively. Although these online tools are helpful for students and can make organization easier than traditional paper methods like physical agendas or calendars, they have their own pitfalls. Many students find themselves using several different online scheduling tools because there is no centralized tool that has all scheduling related tasks. In addition, their professors or employers may use several different online platforms and calendars to organize their classes and schedules. This can make it extremely frustrating for students to use these tools efficiently and it could hinder their ability to manage their time effectively. In response to this, we propose developing a one-stop online scheduling tool that includes all the important scheduling tasks and tools in one place.

The scheduling tool would consist of all the scheduling tasks that students at the University of Florida deem valuable. This includes multiple calendar views, notifications, reminders, to-do lists and various other functionalities. In addition, the scheduling tool would include a functionality that allows users to sync various calendars they may have such as Apple Calendar or Outlook Calendar in one convenient location, so they don't miss out on important events or deadlines. Both web and native versions of the scheduling tool would be created so that it could be used over an internet browser or installed on a particular device like an iPhone. The user interface for this app would be intuitive and easy to use. The app would follow user experience principles and guidelines and would consist of an intuitive and visually aesthetic user interface for all students. By creating this tool, students will have better visibility of their schedules and they will no longer be frustrated by the chaos and haphazardness of having to use multiple scheduling tools.

This app would first be used by University of Florida students but could later be modified to apply to students at other schools as well. Developing and implementing the software and graphic design needed for this scheduling tool, along with a few other expenses, will cost about $71,500 due to complexities of the app's functionality and design. Funding for this STEM design project would give the university an opportunity to help students improve their time management skills, thus promoting better morale overall, and would give us an opportunity to develop valuable engineering skills. The project would be scheduled for completion around August 10th 2023 and would be ready to launch by the time the fall semester begins so that students can begin their new school year with this tool at their disposal. We plan to track and measure the impact of our proposed project on students by monitoring changes in student grades, frequency of app usage, and responses to our surveys.

Table of Contents

Table of Figures and Tables

Problem Statement

Many students in college tend to feel overwhelmed by all the tasks they must complete. Students are typically juggling their course load along with extracurricular activities on campus, work, doctors' appointments, and other commitments. Studies have shown that time management is a vital component in decreasing stress amongst college students [1]. In addition, findings from studies have revealed that there is a direct correlation between time management and grades [2]. The better a student can manage their time, the better their grades. By managing their time more efficiently, students are able to allocate an appropriate amount of time to each task based on the difficulty of the task.

Recently, students have shifted away from the more traditional form of organizing and planning using handheld agendas and paper calendars. Instead, most students use online organizational and scheduling tools to stay organized. Many students have found that switching to a digital format of organizational and scheduling resources has increased their usage of these resources overall when compared to using traditional paper forms of these resources [3]. Although online scheduling tools improve time management overall, students have still identified pertinent issues with these tools that hinder their ability to use these resources effectively. Some of these issues stem from the limited functions of the current tools available. On the other hand, several of these usability issues are user design or user experience issues that stem from the design of the interface itself [4].

Due to rapid advances in technology facilitated by circumstances during COVID, most students in university including students at the University of Florida now complete most of their coursework online. Students typically use several different platforms to organize their school work, extracurricular activities, and other obligations. This can quickly become confusing because different organizations and people may use different online calendars and organizational resources. One study's respondents said that it was difficult to find tasks when using multiple calendars [5]. Students must keep up with all these different calendars and resources to stay organized, which can be overwhelming, and many continue to struggle with time management.

Time management using online tools and resources is a relevant topic in education as hybrid and online forms of learning and communicating in the classroom become increasingly popular. Incorporating a usable and convenient time management tool will hopefully help enhance the hybrid and online learning experience for students at the University of Florida. In the face of rapidly advancing technology, it is expected that more and more organizations will start using online scheduling tools. Thus, it is important that our scheduling application is able to provide students with a satisfactory experience so that they are able to keep up with all that they have to do.

Background Research

Introduction

Time management is an important skill for both students and working professionals [7, 1], but many people still struggle with efficiently completing their work [6, 1]. As distractions from phones and other devices continue to increase, it is imperative that new solutions are developed to help people focus.

Time management is defined as the skills people need to organize their time [6, 7], including monitoring their schedules and obligations to prioritize important tasks [1], time allocation [7], and awareness of time [6]. Time management helps people balance their time between work and life [1, 6] and create goals for the future [6]. Many studies have reported the benefits of good time management in relation to academic success, such as a high GPA and greater motivation [6, 1, 5]. Effective time management also can benefit people by reducing stress and anxiety [6, 7, 5].

Scheduling apps can aid in time management by providing students with a way to visualize tasks, set goals, form a routine, and reduce procrastination and stress [5, 8, 9]. Working professionals often use scheduling apps and 63% of them say that scheduling apps are “very important” [5].

In one paper, a majority of students said that they would use an app to help them with time management [9]. This paper outlined how developing an app to plan repeated tasks with AI can help students with setting goals and estimating their workload [9]. The new scheduling app can include features to plan both repeated and one-time tasks in one place without sacrificing other valuable features common in popular calendars.

Notion is a versatile app that has features for creating notes and schedules, but it is difficult to use [10]. The new scheduling app will be able to include popular features from apps like Notion with a simple user interface. In Google Calendar, events and to-do list items can be created with the same button [10]. This user interface is intuitive and simple, and can be implemented in the new scheduling app.

There is an abundance of research on time management and the benefits of scheduling tools, but less about the specific apps and features that people find effective. This study aims to answer the research questions “How do college students view time management?” and “What features do college students use their time management apps for?”

College students are an important demographic to study because they have a diverse range of obligations including school, work, and extracurriculars. The outcomes of this study are applicable to discovering the specific features and tasks that college students use scheduling apps for, which will lead to the development of better time management apps in the future.

Methods

To gather data about how college students view time management and use scheduling tools, a survey was conducted. The survey was opened on March 10th, 2023 and closed on March 25th, 2023, resulting in data gathered across 15 days. The survey was conducted through a five-question survey created on Google forms, and 46 participants were recruited to answer the survey electronically through a link to the

survey posted on Instagram Story and Discord. The questions included topics about the participants' views on time management and what features they valued and used in scheduling apps.

Results

As demonstrated by figure 1, 56.5% of students responded "No" to the question "Do you consider yourself to be good at time management. In figure 2, 41.3% of respondents responded "Yes" to the question "Do you ever miss important deadlines because you missed it in a particular calendar or scheduling app?" Also, a majority of respondents say that they use only one scheduling tool.

Figure 1: *Pie chart for time management*

Figure 2: *Pie chart for missing deadlines*

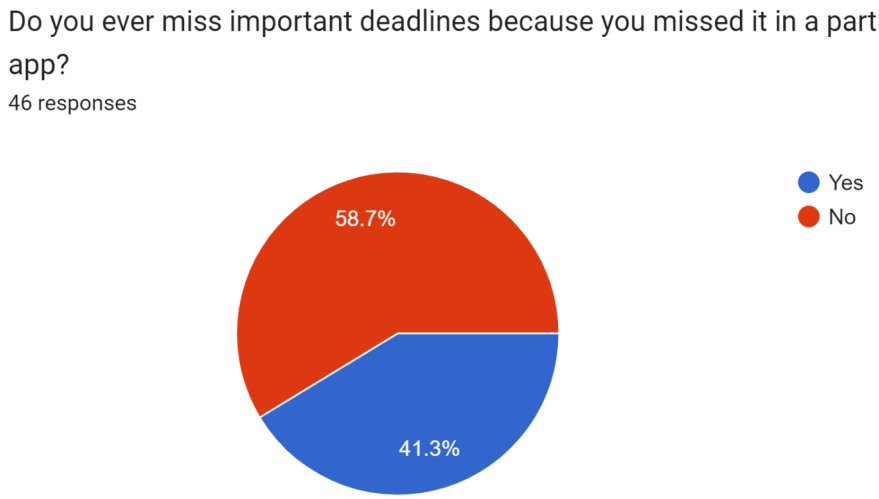
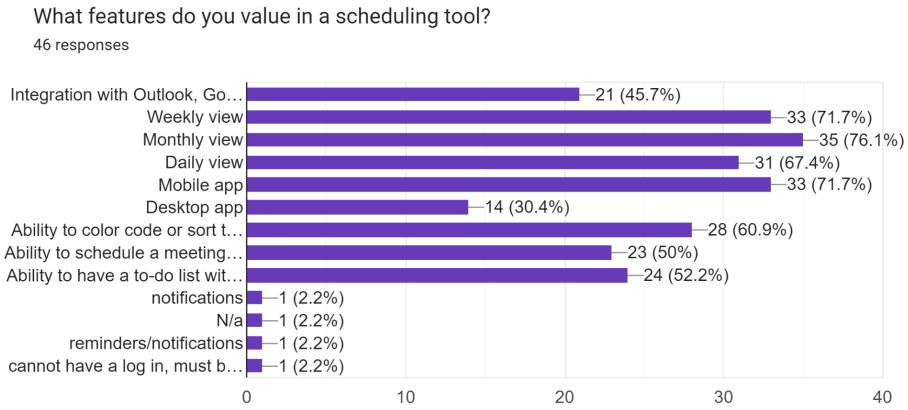


Figure 3: *Bar chart of most valuable scheduling tool features*



The most valuable feature of a scheduling tool is the monthly view of tasks, with 76.1% of respondents saying that they valued it [Fig. 3]. A weekly view is also important (71.7%), while a daily view isn't as crucial (67.4%). 71.7% of respondents said that a mobile app is important for a scheduling tool, while only 30.4% value a desktop app. Integration with calendars like Outlook and Google Calendar (45.7%), ability to color code or sort tasks (60.9%), ability to schedule a meeting (50%), and ability to create a to-do list (52.2%) are all highly valued as well. Notably, two respondents wrote in that they value notifications.

Discussion and Conclusion

Based on the results of this study, many people use at least one scheduling app for various tasks, but still feel like they are not good at time management. All features were valued highly, suggesting a need for a new electronic time management tool that includes more features to increase scheduling capabilities.

Perception of Time Management

55.5% of respondents said that they didn't consider themselves to be good at time management, which is similar to the results of [6, 1], which found that students had difficulty with time management, especially in regards to balancing their school and work lives. In [7], participants said that an app that automatically suggests time management strategies and solutions would be helpful. 41.3% of respondents said that they missed important deadlines because they missed it in a calendar app, which is similar to the results of [5], whose respondents said that they had difficulty locating tasks, especially when using multiple calendar apps. This shows that there is a desire for a better time management app in order to help people who struggle with this skill and to reduce the amount of calendars people need to use.

Valuable Features

The results of the survey show that people value many different features of scheduling apps. The monthly view feature is the most important with 76.1% saying they value it, which contrasts with the opinions of the informants from [5], who stated that the monthly view showed them too many tasks at once, causing stress. The informants from [4] ranked the weekly view as more important. The results also show that weekly (71.7%) and daily views (67.4%) are important, which are similar to [7] and [11], where people also said they value multiple views to visualize different lengths of time.

The results show that a meeting feature (50%) and a to-do list feature (52.2%) are important, which is similar to the results of [5]. The ability to color code or sort tasks is also important (60.9%), which is similar to the results of other studies [7, 5, 11]. In the other studies, participants also pointed out the importance of viewing different types of tasks separately, and keeping some events private and others public [7, 11].
Additionally, a majority of respondents said that they use only one scheduling tool, which contrasts with the results of [5], which found that their informants commonly had many different scheduling tools. This may be because it is difficult to switch between multiple scheduling tools. Therefore, the new scheduling app that combines all valued features will be popular with customers.

Conclusion

The results of this study show that college students value many different calendar features like monthly, weekly, and daily views, meetings, to-do lists, and sortable tasks. Many students don't feel confident in their time management abilities and miss deadlines due to a poor scheduling app design.
The limitations of this study are its smaller sample size and potential bias from the way participants were recruited. Response was voluntary, and a certain type of person may be more likely to follow the personal Instagram account where the survey was advertised.
The results of this study are applicable to the development and improvement of scheduling app features because they provide a new understanding of how college students manage their time electronically. Time management is still a problem for many students, and a new scheduling app that centralizes all valued features is a needed resource that will improve productivity and health.

Technical Plan

Introduction

UF students are currently using a variety of mobile apps to keep themselves organized and manage deadlines. Examples include Google Calendar, Apple Calendar, Outlook Calendar, and various reminders and note taking apps. By using so many time management tools, students are adding extra clutter and stress to their lives - the opposite of their goal. We are proposing a new application that solves this problem by bringing together popular features from a variety of different time management tools, while also allowing for implementation with a host of commonly used time management applications.

UI Considerations

Students have a variety of needs. Based on our research and Huang's study [5], it is clear that there is no one size fits all solution to time management. Because of this, our UI needs to be adaptable to the individual needs of the user. In other words, the individual user should be able to pick and choose what elements they want to be displayed, allowing them to ignore elements that are not useful to them and create their own personalized space. One way to accomplish this is by using a block based layout. Users will be able to drag and drop blocks containing various elements into the main workspace. They will be able to arrange these blocks in a way that is optimal for their personal time management strategy. For example, a user could choose to have their calendar next to their to-do list, with a list of general reminders

underneath. These various blocks will be synchronized so that elements in one type of block can be shown in others as well. For example, items on the to-do list could also be shown on the calendar, and users could set goals for undated items that could also be shown on the calendar.

Our UI will also contain the ability to create categories for items and tasks placed in the various elements, and to color-code these items according to their category. This will not only make the UI more visually appealing, but make it vastly easier to visualize what type of items are being shown and gauge their relative urgency.

The UI will be the first main part of the development process. First, further research will be conducted to identify and examine current calendar apps' most popular features. Next, software developers will work to combine these features in an intuitive user interface. The main design of the app and the code behind it will be implemented.

Integration with other widely used applications

A key aspect of our proposed application is integration with other time management apps. Groups and organizations use a variety of calendars to manage assignments, meetings, projects, and other dated items. When a person is caught using multiple calendars, it becomes incredibly difficult to remember to check all of them [5, 7, 11]. For this reason, our proposed app allows users to import all of their calendars, making them easily accessible in one place. Users will then be able to use the block based UI to choose how to represent and organize all of the items from these calendars. Accomplishing this will require the use of the respective APIs provided by each of the companies. This will make our proposed app the only place that a user needs to go to accomplish all of their time management needs.

Integration with other apps will be the second main part of the development process. Software developers will work to connect the events from other calendar apps to the new app. Further research may be required. The processes and apps supported will be documented as the project continues.

Notifications and Reminders

The ability to set useful and timely notifications is an important feature of any time management tool. Because of this, the ability to set notifications is an important feature that will be present in MergeCal. Rather than have reminders at set intervals, MergeCal will allow users to set reminders whenever they choose. This will allow the user ultimate flexibility in determining when they need to be reminded about an important task, meeting, event, or other scheduled item. MergeCal will use push notifications, ensuring that the user does not overlook these notifications.

This feature is the second to last part of the development process, and will be completed when the app is mostly finished. Key features will be completed, and notifications can be designed based on what types of events and reminders are supported for the finished app. For the new mobile app, push notifications will be implemented. If a desktop app is created, desktop notifications will be created.

Analytics and Time Tracking

The ultimate goal of MergeCal is to help users improve their own time management skills. Because of this, MergeCal will feature the useful integration of Analytics and Time Tracking tools. The app will collect data on the user's completed tasks, time spent on each task, and the number of tasks completed per day/week/month. This data will be presented to the user in a dashboard, allowing them to

see their progress over time. Users will be able to set goals and view their progress towards those goals. The app will also feature a timer to help users track their time spent on tasks.

Data collection is the last part of the development process. This feature is not only useful for users, but for the developers as well. The data will be analyzed and used to evaluate the features the app provides.

Testing and Deployment

Before the launch of MergeCal, the app will undergo extensive testing to ensure its functionality and user experience. Testing will be done using automated testing tools and real users. We will allow limited access for beta testers to provide input on the applications functionality. Feedback from beta testers will be used to improve the app before its release.

MergeCal will be deployed on app stores, such as Apple App Store and Google Play Store, as well as desktop app stores, such as Microsoft Store and Mac App Store. The app will be marketed through social media, digital ads, and influencer marketing.

Once the app is launched, regular maintenance and post launch user surveys will ensure the continuing success of the app.

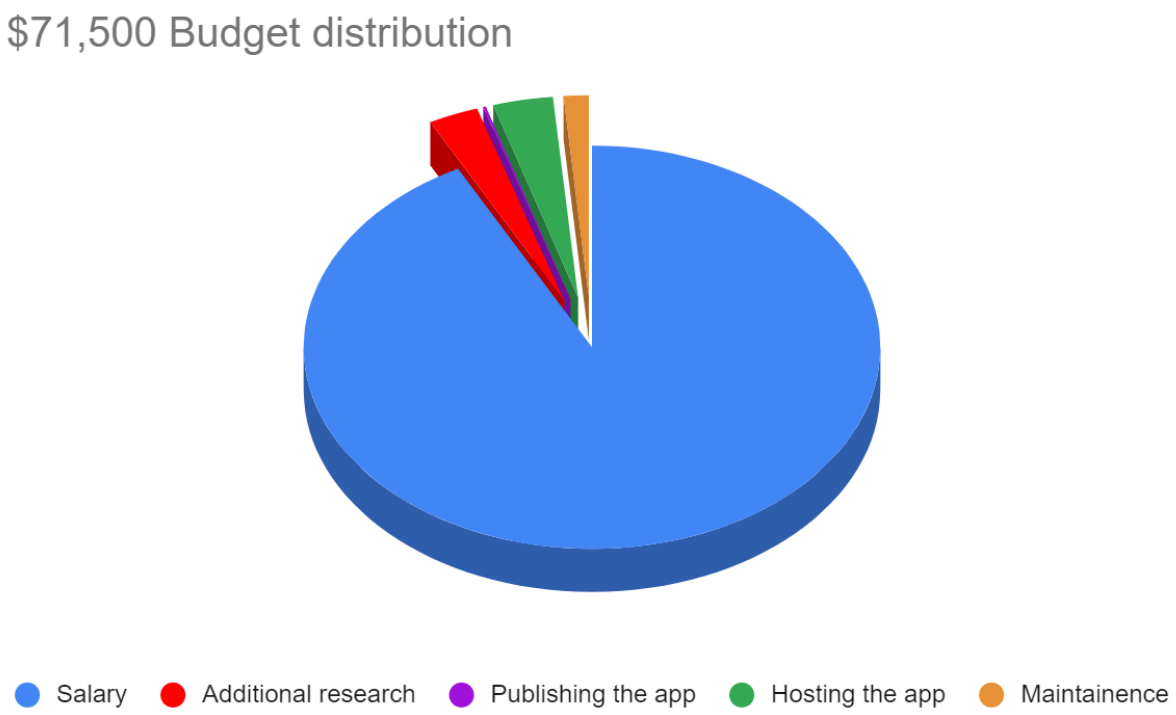
Monetization Strategy

MergeCal will be monetized through a subscription model. Users will be able to use the app for free for a limited period, after which they will need to subscribe to continue using the app. The app will also feature in-app purchases, such as additional customizations for the user interface. Users will be able to choose from different subscription options, such as monthly or yearly subscriptions. The app will also offer a free trial period to encourage users to try out the app and get a feel for its features.

Budget and Schedule

The budget consists of staff and equipment costs. Two developers for the project will cost approximately $33,000 each, if they are working for 4 months and their average annual income is $100,000. Additional research will cost about $2,000, if a researcher conducts and analyzes surveys for two weeks at a rate of $20/hr. It costs $100 dollars to publish an app on the Apple app store. The server to host the app will cost about $200/month, so the cost to host the app for the first year will be $2,400. Other software costs are negligible, since IDEs like Unity and VS Code are available to use at no cost. An additional $1,000 will be set aside for maintenance costs. Overall, the project will cost $71,500, which is within the NSF CFP Budget of $150,000.

Figure 4: *Budget Distribution*



The schedule for the project will begin on April 26th when the Proposal is accepted. After this, development will be broken up into blocks discussed in the Technical Plan. The project is scheduled to be completed on August 10th.

Schedule

April 26th: Proposal is accepted.

April 27th: Development of UI and features begins.

April 28th: Further research on the app's key features will begin.

May 12th: Research is completed.

May 26th: Development of UI and features is completed.

May 27th: Development of Integration feature begins.

June 17th: Development of Integration feature is completed.

June 18th: Development of Notification feature begins.

June 25th: Development of Notification feature is completed.

June 26th: Testing and further development begins.

August 1st: Testing and further development is completed.

August 2nd: Preparation for launch of the app begins.

August 10th: App is launched.

Evaluation Plan

There is always the potential for our proposed application to face obstacles; however, our team has a plan in place to continually evaluate and revise our app. In order to ensure that our app is functioning as intended and has the intended impact for college students, it is necessary for us to evaluate how the app is performing. This will be done in a number of ways to ensure that all components of the app are functioning and that the student population is content with the app. The information gathered from these evaluation methods will be regularly reported to the funding agency in Progress Report format to ensure the project is on track.

During Development: Trial Group Survey

In order to measure students' contentment with the app, we can first test the app amongst a small test group of students. While the app is still in a developmental stage, we can have the students use the app for a short time period. After this time period, we can survey the students, asking questions such as how often they use the app in their day and which features they find the most and least effective. We can pay attention to which features are working well and which may need modification. We can also accept input from the students as to what would make the app more helpful to them.

During Development: Fix Bugs

Secondly, this would also be an ideal time to locate any bugs in the app's functionality. We can utilize software testing methods to test the program. We can isolate individual features to ensure they all work as intended, while simultaneously ensuring that the app runs smoothly overall.

After receiving this feedback, we can determine how well the app is doing, and make sure that we repair any issues users are having before the app is finalized.

Post Development: Measure Time Spent on Features

One way that we can evaluate the app in a more qualitative manner is by monitoring the amount of time users spend on our unique features, such as the integrated calendar and block-based user interface. This will ensure that all of the features of the app are being actively used. If certain features are not often used by users, we can discuss removing said features after a point or upgrading and editing those features in some way. Further research can determine what users would prefer in these areas. Contrarily, if certain features are used more, we can see that those features are potentially more helpful to students. The features that would be evaluated in this manner include the monthly view, weekly view, daily view, meeting event, to-do list, and color coding of tasks.

Post Development: User Survey

We will also release a survey to the app's users on a larger scale once they have had access to the app for a longer time period. We can ask similar questions as in the test group stage, to determine whether students feel that the app functions well and improves their overall time management abilities. We will report the findings from these evaluations to the NSF.

Post Development: Regular Maintenance

Once the app is out of development, it is still important to continuously monitor the operation of the app software for bugs and other issues. The app will be evaluated with regular maintenance to ensure that it is functioning properly.

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Appendix

Survey Questions
What scheduling apps/tools do you currently use to plan ahead?
What features do you value in a scheduling tool?
Do you consider yourself to be good at time management?
Do you ever miss important deadlines because you missed it in a particular calendar or scheduling app?
What types of tasks do you schedule in a planning tool?