

Balance Me: Final Report

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INTRODUCTION

The digital world in which we now live has given us access to an exceedingly large amount of information at our fingertips. While beneficial, this vast amount of information and the constant connection to it may be distracting to teenagers, especially those with intellectual or developmental disabilities (IDD). These individuals might have difficulty balancing their time between required tasks and recreational ones. While there are multiple solutions currently on the market for keeping on task, most of them are either too simple (i.e., countdown clocks) or too complex. The goal of this project has been to develop an interactive and minimalist smartphone application and companion smartwatch application to help teenagers with and without IDD manage their required work while still making time to do things they want to do.

Motivation

There are approximately 6.5 million people with an intellectual or developmental disability in the United States [1]. The capabilities of people with IDD can vary, but they tend to have trouble focusing on a single task. It is just not people with IDD that suffer from poor time management; on a regular day, all of us can be distracted by a multitude of virtual activities like social media and streaming media. With the number of distractions around us, it is no wonder we find it difficult to remain focused on one task. With a fixed amount of time, people feel stressed when faced with multiple pending tasks. In reality, people usually have more time than enough time to accomplish everything they need to; the only thing standing in the way of this are poor time management skills. It is important to focus on one task at a time. On the other side of the spectrum, some people do not have trouble focusing on a task, and yet they still face physical and mental distress due to overworking. People that overwork focus on their work disproportionately, leading to negative effects for their mental and physical health such as fatigue, depression and apathy. In a study by UCL, it was found that people who worked three or more hours longer had a 60% higher risk of heart-related problems [2].

To help sustain focus for users with and without IDD, *Balance Me* assists users with their everyday tasks via time management utilities. Time management can help a person drastically improve the amount of work they can accomplish in a short period of time. By improving the user's time management

skills, the user will have more time for self-improvement or leisure activities. Also, by balancing the amount of time spent on work versus self-improvement or leisure activities, the user may see a large reduction in stress and anxiety.

RELATED WORK

Currently, there are many different types of time management and task tracking applications on the market; some specialize in scheduling, habits, and routines while others emphasize focus and what the user is spending their time on. The top applications on the Apple Store for time management are *Focus Keeper*, *Productivity*, and *Toggl*. *Focus Keeper* utilizes an onscreen timer to keep you on track and focused. Additionally, users can set schedule breaks and session lengths [3]. *Productivity* is more of a planner and goal tracker [4]. *Toggl* is the most comprehensive application out of the three as it combines both feature sets; you are able to track and monitor the time you spend on activities, while also setting goals and plans [5]. Applications like *Stepping Stones* and *CanPlan* are geared towards users with disabilities, both creating routines for users to modify and stick to [6, 7]. *Stepping Stones* consists of very detailed steps in which a user should complete each day [6].

In terms of wearable technology, there are not as many time-management products on the market, making this a niche field. Existing products here include *TimeFlip* and *Timeular*, the latter of which combines a smart gadget and a mobile application to manage your time. Both of these products are used by taking a multi-faced object with different symbols on each side representing different activities one could engage in, and flipping it to the corresponding side that will be tracked by the mobile application [8, 9]. One other interesting piece of technology is a stress tracking wristband, which might be useful to helping those looking for a balance between work and play.

What separates *BalanceMe* from other existing technologies is the combination of individual and team task management, along with a wearable child application to ensure that time management tasks are completed. With most existing time management technologies, the focus tends to be on either managing an individual's work-life balance, or group related task management activities. By combining both sides of task management, those using our application are able to view all tasks in one place in a format that is easy to use. Our goal is to make tasks easy to create, view, and log for those who might have IDD, while also keeping the individual aware of time constraints and upcoming tasks that need to be completed.

Existing applications geared towards time management are often either too complicated for adolescents with intellectual disabilities, or too simple to be stimulating and useful long term. For instance, the application *Focus Keeper* [3] encourages users to focus via starting and stopping a timer, but fails

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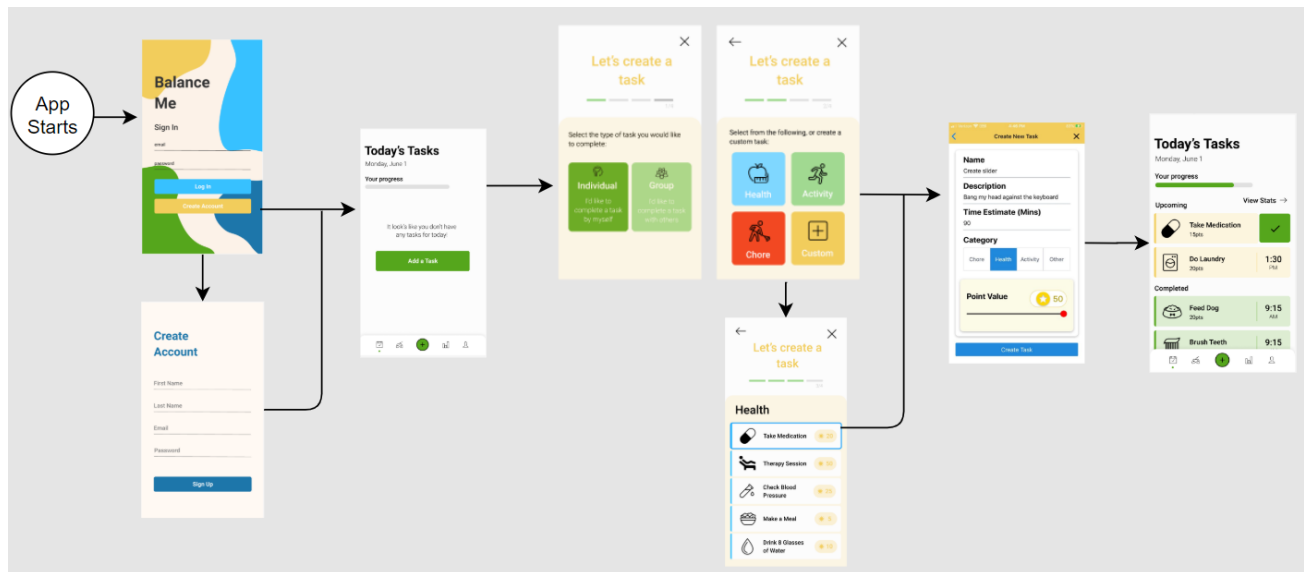


Figure 1. The flow of screens the user sees when creating a task in the *BalanceMe* mobile app.

to incorporate scheduling of future tasks or the creation of different types of tasks. Time management technologies geared towards those with developmental disabilities, such as *Task Timer* [10], are too simple to be used by those with and without intellectual disabilities. In comparison, *Monday.com* [11] provides a solution to group task management and allows for the managing, creation, and scheduling of tasks, but is too complicated for individuals looking for a simplified time management tool. *BalanceMe* aims to provide a middle ground in the form of an easily navigable application that incorporates existing wearable technology to reinforce time management goals.

CURRENT WORK

Our team divided the work into mobile application front-end development, back-end development, and wearable Fitbit application development. This section talks about the work that was accomplished this semester on all fronts.

Front-End Development

With basic needs in mind, *BalanceMe* achieves the requirements that one would expect from a task management app. To differentiate ourselves, we focused on providing functionalities that would allow the user to create, start and finish a task with ease. To create a task, a user goes through a series of screens that guide the user in creating the task (see Figure 1). Each screen provides the user with 2-4 options that will decide what type of task will be created. These options are presented as large colorful buttons that are light on text. For re-usability purposes, a custom task created by users will be saved in the local storage as part of the category tasks list. Currently, the application only supports individual tasks. To aid the user in performing the task, the user can add steps to the task during the creation process. These steps will be displayed when the user starts the task. The user can also decide to start the task now or schedule it for a later date.

For simplicity, tasks scheduled for within the 24 hours of the current day will be displayed on the “My Tasks” screen. From here, the user can either choose to quickly complete a task or dive into a more guided step-by-step view by clicking the task. On the “My Tasks” screen, each task is listed under one of the four statuses: upcoming, in progress, completed, and overdue or missed. For a visual cue, each task is color-coded to represent one of the four statuses. As a motivational game element, the user can currently earn points for task completion. Each task is assigned a point value, and users can view how many points they have accrued on the “My Tasks” page. This feature is part of a larger effort to add game elements to the *BalanceMe* app, which can be improved upon in future work.

Back-End Development

Our goal for the back-end design was to create a RESTful API that had direct communication with our database. To do this, we used Express, Node.js, and Mongoose for our server communication. For our database, we are using MongoDB Atlas, as it provides us a database with lenient reading/writing and plenty of space to hold our data. Furthermore, we are using Heroku to host our back-end repository, which lets us make calls to our API from any device.

The reason we chose to use Mongoose is its models. Mongoose models utilize schemas to let us easily layout what data we want each object type to encapsulate. For the *BalanceMe* app, this is the creation of two main object types: User and Task. The user model holds information about each individual user’s data, such as their first name and their email (see Figure 2).

In contrast to the simple user model, we created a task model that would be capable of dynamic updates and easy repetition (see Figure 3).

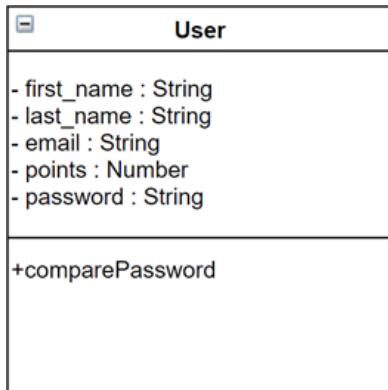


Figure 2. A description of the User object type as it is stored in the *BalanceMe* database.

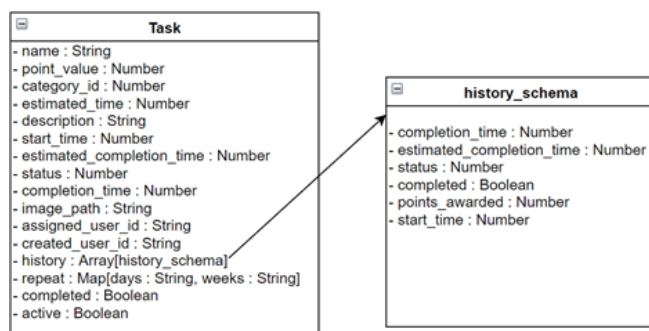


Figure 3. A description of the Task object type as it is stored in the *BalanceMe* database.

Each task is referring to the user who created it and the user it is assigned to. This allows for the possibility of another “parent” account to create a task and assign it to a “child” account. This is outlined as a feature in the *Future Work* section of the document.

Another feature of our current implementation of the back-end is the creation of local storage. We are using AsyncStorage to save a local user and local default tasks. This allows us to have the user be automatically logged in when they open the app and it allows for the use of quick default tasks for the user to choose from. The local storage for the user’s information is directly synced with the remote database. This allows the user to see their changes directly and in real-time. The default task list is not directly synced with the remote database, as we wanted each user’s default tasks to be individualized. This creates a personalized list of both the original default tasks and the user’s previously created tasks. We created the default task list so that task creation could be quick and easy.

Wearable Development

Our companion application is a Fitbit smartwatch app. The goal of the companion is to allow the user to be able to start and complete tasks from their watch, and then sync up this data with the primary mobile app. We were able to complete the first portion of this, and currently the user is allowed to select from a preset list of tasks which they can then set a timer and complete, or set a time to be completed later that day. The application has several screens, starting with the list of preset tasks the user is allowed to choose from. Once a task is selected, the user can then decide if they want to start the task now or later. If the user chooses to start the task at the current time, a timer screen is shown and the user can swipe to select the duration of the task and the countdown will begin. If the user chooses to start the task at a later time, they are taken to a screen that allows them to swipe up or down to select a time. In the future, the smartwatch will vibrate or send a notification to alert the user that it is time to complete the task.

DISCUSSION

Reflecting back on our project, one of the most important learning outcomes ended up being learning how to mix our initial goals with realistic outcomes. At the midterm point in the project, we decided to re-evaluate our goals and focus on the most important aspects and leave additional features to be added in at the end if time permitted. This meant that instead of rushing to get everything done, we instead placed an emphasis on quality over quantity. For quantity, there were several parts of our original design, such as the gamification and statistics screens, that we decided to leave out; they didn’t fall in line as closely with the original aims of our project and we realized we would not be able to complete them to the best of our ability given the time constraints. To place an emphasis on quality, we decided to do extensive testing and made smaller, minor improvements to improve the quality of the app instead of major new features that were not guaranteed to be completed on time.

Many of our group meetings revolved around this, and our project meetings started to more resemble those in real-world

software development companies. We developed one week sprint cycles and created a priority list to sort through the most important aspects of the application that needed to be completed in order to provide a quality application to our end users. By the end of the project, we were able to narrow the list to small bug fixes to improve existing mobile and smartwatch screens, and the list was completed in the final week of production.

This shift in thinking and implementation offered an interesting learning opportunity. As enthusiastic software developers, we all enjoyed brainstorming and coming up with exciting and large new features to make our application incredible. So, this decision to shift gears and slow down on the development of major features and instead focus on minor improvements was a major change, but we realized it was also still exciting and more akin to real world production development. We ended up happier with the final product as a result, which allowed us to create a quality product that demonstrated our hard work and commitment to the project.

FUTURE WORK

While we accomplished a great deal over the course of this project, there is still much more that can be done to improve the functionality and overall user experience of *BalanceMe*. These improvements are divided into three larger categories: gamification and socialization, wearable expansion, and general usability.

Gamification and Socialization

When we began work on this project, we set out to encourage users to complete tasks by incorporating game elements into the app. In its current state, *BalanceMe* includes the ability to assign point values to each task, and users can keep track of how many points they have earned via a progress bar on the task list page. While this is a great foundation of a gamified task app, future work could expand even further on this. Given more time, we would have liked to include an avatar of the user's choice as well as a progress tracking dynamic graphic, such as a mountain with a climber that gets closer to the peak the more points are earned. In addition to this, a reward could be given to the user for reaching certain point goals. Rewards that were considered for this feature included allotted relaxation time, virtual items like new avatars and dynamic graphics, and custom rewards as dictated by the user's parent or guardian.

This heavier emphasis on game elements would go hand in hand with added socialization features, including social media integration and designated parent/guardian accounts. Ideally, the user would be able to connect *BalanceMe* to their Facebook or Twitter accounts and would then be able to automatically post to their feeds whenever they accomplish a point milestone goal. Additionally, *BalanceMe* would be able to search the user's social media friends lists to find friends who have *BalanceMe* accounts. Users would be able to compete with their *BalanceMe* friends to see who could score the most points each week, adding yet another motivational game element to the app.

The ability to connect with other *BalanceMe* users would be a necessary step to incorporate parent accounts into the app. Once implemented, a parent account would have pseudo-admin privileges over their child's *BalanceMe* account. This means that the parent or guardian could assign their child tasks and keep an eye on their progress, all on their own mobile device. This feature would be incredibly useful for parents of children with and without IDD.

Wearable Expansion

In its current state, the *BalanceMe* Fitbit application has much less functionality than the mobile application, which is how we planned it to be; the Fitbit app should serve as a companion to the mobile app, with the Fitbit providing richer functionality to the mobile experience instead of an experience of its own. To that end, there is still more to be done on the Fitbit side, namely implementing context awareness and cross-device synchronization.

Our original idea for incorporating the wearable application into the *BalanceMe* project was to use its onboard sensors to provide real-time context of a user's actions. GPS and accelerometer data could be used to determine a user's location and intensity of motion, and microphones or light sensors could provide even more contextual data. For example, if the app sees that the user is mostly stationary (via accelerometer data) and has a task due in 15 minutes, it would be able to send a reminder to the user to get up and complete the task. This context awareness would be a cornerstone of *BalanceMe*'s functionality and is a great example of the usefulness of ubiquitous computing.

To get this function to work properly, we would need to complete the cross-device synchronization feature between the Fitbit and the mobile device. Ideally, the user would be able to start a task on their Fitbit device using the quickstart menu and then mark it as completed on their mobile app. This feature would make using *BalanceMe* much more convenient for the user.

General Usability

Further enhancements to the *BalanceMe* experience include adding cross-device system-level notifications for upcoming and in progress tasks, scheduling conflict error handling, the ability to change the profile picture and user password, and adding colors to the navigation tab bar on the mobile app. The most important addition in this category would be to add a statistics page where the user could see their task success and failures over time. This data would be helpful for the user to analyze their task completion habits and make meaningful changes to their routines.

CONCLUSION

With the development of *BalanceMe* we set out to create a product that can help teenagers with and without IDD balance their time between required tasks and leisure activities. The work that has been accomplished this semester has led to the creation a useful, if basic, application. There is still more work that can be done in the future, but the groundwork has been laid for a for a comprehensive time management solution for teens everywhere.

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