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Preventing Burnout in Healthcare Settings Using Mobile Technology

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Abstract

The goal of this project was to develop a technology-based intervention to reduce the physical, emotional, and spiritual burnout experienced by providers and staff in healthcare settings. We used Rapid Application Development (RAD) methodology to develop a web application prototype that allows the user to track daily habits and manage journal entries that will help them to rest and renew their energy levels.

Executive Summary

The goal of this project was to develop a technology-based intervention to reduce provider and staff burnout within Reliant Medical Group. We first completed a literature review and market analysis to better understand the prevalence of physician burnout and the current intervention applications in the market. Next, we gathered requirements through joint application design sessions at Reliant Medical Group. We held weekly meetings with our sponsor to understand user needs, to learn sponsor expectations, and to refine our scope. After gathering requirements, our team proceeded with rapid application development methodology to develop a prototype application through multiple iterations. Finally, we evaluated the final version of our application through field usability testing. In this, we received general feedback and suggestions for future implementations of the application.

In the prototyping phase, our team finalized the functions and features that would be included in the application. We developed iterations through a “Design, Assess, Refine” process where we formed an understanding of user preferences. After four sets of weekly interviews, we created a refined list of functional requirements and began development.

After implementing the features included in our refined list of requirements, we underwent a field-usability study which allowed participants to get experience with the application. Their feedback and suggestions from this study was used to form recommendations for future implementations of the application.

We recommend that development be moved to a native platform as it will allow the implementation of push notifications (a highly valued feature by the majority of participants). We also recommend that future teams conduct a longer field usability study and carry out an in-person application launch for testing.

Over the course of this project, we built a habit tracking application that allows the user to customize and track daily habits and input and edit journal entries. Overall, the *Rest & Renew* mobile web application serves its intended purpose by keeping users mindful of the daily habits that help them to maintain healthy physical, emotional, and spiritual energy levels.

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Chapter 1: Introduction

Burnout has been plaguing workers all over the United States at substantial levels for several years; especially in healthcare settings where providers and staff are overworked and in constant high stress (West, Dyrbye, & Shanafelt, 2018). “Burnout” is a complex psychological syndrome commonly represented by feelings of anxiety, tension, mental fatigue, and physical exhaustion (Murthy, nd.). It can take many forms, and can affect people across disciplines. The U.S. National Institute of Occupational Safety and Health (NIOSH) reported that twenty-six percent of workers often feel burnt out or stressed by their work (McCormack & Cotter, 2013). To avoid the threat of hurting their career, healthcare providers and staff continue to push themselves to perform tasks past what they can physically, emotionally, and spiritually endure (West, Dyrbye, & Shanafelt, 2018). These feelings of distress, alienation, and inadequacy are not only dangerous for the medical professionals, but also for the patients they are caring for.

Managing and overcoming burnout is not the same as preventing burnout. The question may no longer be how to avoid it, rather, how to cope with it once it has already established itself (McCormack & Cotter, 2013). To understand the best treatment for burnout, it is important to understand the most common causes of burnout. The factors that affect burnout can be categorized as (1) individual and socio-demographic, and (2) environmental and organizational (McCormack & Cotter, 2013). Being overworked combined with lack of rest causes energy levels to deteriorate over the course of one’s career, leading to negative impacts on providers and staff, patients and healthcare organizations and systems (West, 2018). Currently, the treatment for provider and staff burnout is delivered in various forms of interventions. An intervention is a disruption in routine to remind the individual of their own mental state (Swensen, Kabacennell, Shanafelt, & Sinha, 2016). One common form of this is the use of mobile technology. In recent years, smartphones have been used for many health and wellness-related interventions.

After completing an analysis of the intervention application market, we determined that there exists a few mobile applications that allow for a medical team to prevent and treat burnout amongst the staff. Our analysis of the market shows that there currently is a

limited number of burnout prevention applications, hence there is room for our technology-based intervention.

With the help of Reliant Medical Group, we created a burnout intervention application, *Rest & Renew*, that provides the user with resources that prevent and treat provider and staff burnout. Using rapid application development methodology, our team designed and refined the application throughout four sets of paper prototypes sessions with Reliant Medical Group staff members. After we developed a prototype that satisfied our refined requirements, we conducted a week-long field usability study during which the staff members were able to use the application. Upon completion of the study period, the team returned for a final set of interviews with the participants. Ultimately, designing a series of iterations allowed our team to create a customized application that increased the mindfulness of healthcare professionals at Reliant Medical Group.

In summary, our goal was to develop a technology-based intervention to reduce provider and staff burnout within Reliant Medical Group. We achieved our goal through the completion of the following objectives:

1. Reviewed the literature and marketplace to determine interventions for provider and staff burnout.
2. Conducted requirements gathering at Reliant Medical Group through joint application design sessions.
3. Used prototyping, a rapid application development methodology, developed and tested *Rest & Renew* while continuously receiving feedback from potential users.
4. Conducted usability and feasibility testing of the application through a one-week field usability study.
5. Developed recommendations to turn our application into an intervention tool at the Reliant Medical Group.

Chapter 2: Background

In order to develop a better understanding of provider and staff burnout, the team conducted a literature review and market analysis on relevant background topics, including burnout on a broad scale, physician burnout, existing technology solutions, and how technology can help prevent medical staff from burning out over the course of their careers.

2.1 Burnout on a Broad Scale

Consider a battery-operated toy car that has been gifted to a young child. In order for the toy car to perform to its greatest ability, it is required that the toy be sustained by fully-charged batteries. The functionality of the car primarily depends on the physical account of the battery life that sustains it. Depending on how frequently the child utilizes the toy and how long the child allows the toy to run at each use, the battery life will eventually exhaust, causing the toy to stop functioning like it once was able to. Over time, the functionality of the toy will get weaker and less reliable until the battery completely burns out. An excited child will have no regard for the preliminary signs of an overworked, battery-operated toy and will continue to play until the toy stops working altogether.

At its core, burnout refers to feeling distressed, alienated, inadequate, or unmotivated. It can take many forms, and can affect people across disciplines. According to one of the most widely cited definitions, which comes from the highest regarded burnout assessment tool (Maslach, Jackson, & Leiter, 1996), burnout is a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishments. Several studies have been conducted to analyze the causes and ultimate results of burnout. Some authors claim that burnout can occur in any discipline and is not only caused by the individual's mindset (Garton, 2017). It can be environmentally-rooted as well. Burnout distresses hundreds of people; typically affecting individuals that work in a social capacity (McCormack & Cotter, 2013a). A study performed by the US National Institute of Occupational Safety and Health (NIOSH) reported that 26 percent of workers often feel burnt out or stressed by their full-time jobs (McCormack & Cotter, 2013). To understand burnout further, it is important to understand the factors that contribute to its conception.

2.1.1 Factors that Cause Burnout

The factors that affect burnout can be categorized as individual and socio-demographic, as well as environmental and organizational factors (McCormack & Cotter, 2013b). Some of the individual and socio-demographic factors include personality and expectations. Certain personality types, such as workaholics and enthusiastic high-achievers, are reported to be more likely to burn out because they derive a large part of their identity through their work and career (McCormack & Cotter, 2013b). Expectation is often a factor of burnout when there is a gap between an individual's expectations of a job in comparison to the reality of what the job is (McCormack & Cotter, 2013b). Some of the environmental and organizational factors that could impact burnout include excessive collaboration and leadership style (Garton, 2017). When employees are not as productive as they could be it is usually rooted in the fault of the organization. High priorities and expectations encourage employees to multitask, but this causes employees to become exhausted which is counterproductive to their original goals (Garton, 2017). Management can often be the root of emotion in the workplace, so it is not surprising that the leadership style can change an employee's workplace emotion to a negative one (McCormack & Cotter, 2013). A study by Basch and Fisher showed that acts of management contributed to 22 percent of negative emotional events, as opposed to seven percent for positive emotional events (Basch & Fisher, 2000). These factors and causes of burnout have an effect on both people and the companies around them.

Within every individual, there are three types of energy accounts present in the body (Drummond, 2015): physical, emotional, and spiritual. All three accounts require constant energy deposits in order for the account to keep a positive balance. To keep that positive balance it is important to remain well-rested, exercise, and maintain a nutritious diet. Additionally, in order for providers and staff to be emotionally available to their patients, they must first take care of their own emotional status. Their own emotional status can be kept in track by building and maintaining healthy relationships, spending time with loved ones, or pursuing a hobby of personal interest (West, Dyrbye, & Shanafelt, 2018). Finally, spiritual energy can come from a discovered and reassured sense of

purpose. Many providers and staff members could have pursued different career paths but it is important to be reminded of why healthcare was the industry they chose to contribute.

According to the first Medscape National Report on Physician Burnout and Depression, nearly two-thirds of United States physicians report feeling burned out, depressed, or both (DKC, 2018). Figure 1 illustrates the Medscape study results of a burnout survey completed by more than 15,000 U.S. physicians across 29 specialties (DKC, 2018). The reason so many physicians feel this way is because they feel drained in one of the three areas of energy loss.

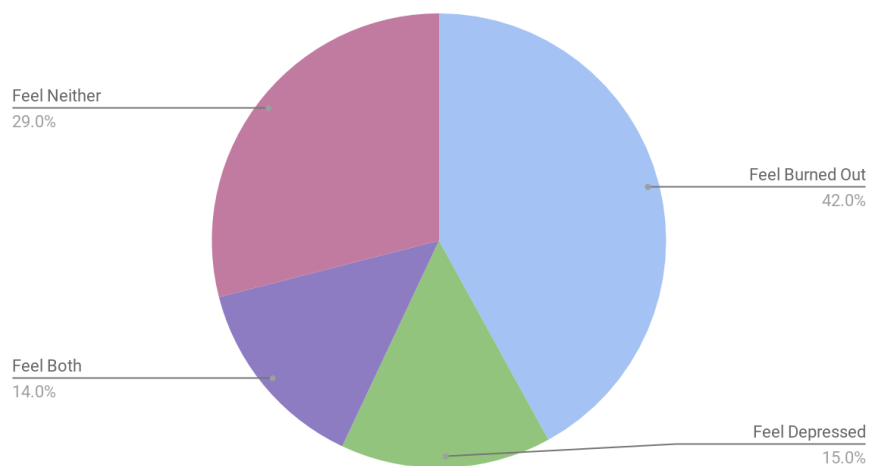


Figure 1: Physician Burnout in the United States

Self-care, relationship building, and acquiring a sense of purpose are all vital when maintaining the accounts within the body. If a provider or staff member is feeling burned out, it is likely they struggle balancing these areas and work responsibilities. In addition to the individual characteristics that play a role in provider and staff burnout, the conditions of the environment in which the provider and staff members work can have a strong impact on the workers as well (Azam, Khan, & Alam, 2017). “Therefore, proactive interventions should be taken at individual and institutional levels for preventing physician burnout by improving the personal lifestyle of physician and working environment in hospitals” (Azam, Khan, & Alam, 2017).

Depersonalization is a major cause of provider and staff burnout, and technology can both help and hurt. Many medical professionals use Electronic Health Record (EHR) systems that are designed to help keep track of patients’ medical information and streamline workflow between staff members (Electronic Health Records: The Basics,

2018). EHR has many benefits including improved patient care, improved care coordination, improved diagnostics and patient outcomes (Electronic Health Records: The Basics, 2018). Digital communication has streamlined a process that saves time and lives, but with increased screen time, the Canadian Medical Association Journal believes that it may be causing a great deal of additional stress (Collier, 2017). Many individuals described in the study feel as though they have a weakened connection with patients due to the increased screen time. Although the EHR system is extremely beneficial, there are limitations to the system, most notably, taking away the personal connections from the record system.

2.1.2 Impact of Burnout

Burnout does not only have an effect of individuals but also on organizations as a whole, which can be measured in terms of the costs associated with burnout. A study by the American Institute of Stress has estimated stress and burnout on the job cost U.S. businesses around \$300 billion per year (McCormack & Cotter, 2013). Costing U.S. businesses billions of dollars a year is extremely detrimental making it important to understand ways to manage and overcome it.

2.1.3 Managing Burnout

Managing and overcoming burnout is not the same as preventing burnout, but the question may no longer be how to avoid it, rather, how to cope with it once it has already established itself (Routledge, 2008). A study by Casserley and Megginson observed that accepting some responsibility for burning out is the difference between it being a significant developmental experience to derailing their future progress (Casserley & Megginson, 2009). Two steps that can be taken to overcome burnout are determining the cause and taking the time to recover. Determining the cause focuses on identifying the factors that lead to the burnout. Taking the time to recover means allocating time and effort into taking active steps, often requiring planning and adjusting one's lifestyle and schedule to accomplish (McCormack & Cotter, 2013c). Burnout is an issue that affects many people, but our focus is healthcare workers.

2.2 Physician Burnout

Healthcare workers (e.g. primary care physicians) have a tendency to put a large focus on their careers, causing them to ignore the signs that their bodies are telling them they are exhausted. Long hours, beginning from medical school, in combination with a high stress environment breeds a high likelihood of burnout in medical professions. According to Kuhn and Flanagan (2017), researchers in the department of anesthesiology at Duke University School of Medicine, burnout has been identified in approximately half of all practicing physicians. Burnout is prevalent amongst not only physicians, but providers and staff all throughout the healthcare industry. Despite the potential severity of this issue, many physicians continue to work and push themselves to perform tasks beyond what they can physically, emotionally, and spiritually endure, all to avoid the threats of hurting their career.

2.2.1 Observed Symptoms of Physician Burnout

Developed by Christina Maslach and her colleagues at the University of San Francisco in the 1970s, the Maslach Burnout Inventory has become the accepted standard for burnout diagnosis (Drummond, 2015). According to Maslach, burnout is “an erosion of the soul caused by a deterioration of one's values, dignity, spirit, and will” (Kumar & Weil, 1998). There are three main symptoms linked to this: exhaustion (physical drain of energy), depersonalization (emotional drain of energy), and a lack of efficacy (spiritual drain of energy).

Exhaustion occurs when one's physical and emotional levels are extremely low. Often times, physicians perform work above what they are scheduled to do in a given day (Kumar & Weil, 1998). This becomes a cycle and, eventually, the overwork starts to have a physical toll on the body. In the long run, this causes a deterioration in emotional energy. In addition, physicians often do not get an adequate amount of sleep per night to compensate for the energy they use to perform their daily tasks (Drummond, 2015). As a result, their body gets less and less capable to withstand the copious amounts of energy wielded by physicians on a day to day basis. A physician may know that they are exhausted when they

experience chronic fatigue, insomnia, forgetfulness, impaired concentration and attention, increased illness, and loss of appetite (Carter, 2013).

Depersonalization, also known as compassion fatigue, is an emotional effect burnout can have on a physician's mind (Kumar & Weil, 1998). It is signaled by pessimism, loss of enjoyment, isolation, cynicism, sarcasm, and detachment. For the physicians, the job will become less enjoyable than it was at the start of their career. A depersonalized physician will often find themselves needing to vent about patients, coworkers, and/or work conditions. This is due to the total wipe out of the emotional energy account.

Lastly, burnt-out physicians feel a lack of efficacy. A physician's sense of purpose has drained, leading to a spiritual detachment from the job. These physicians will question their effectiveness as healthcare professionals. This is commonly signaled by feelings of apathy, hopelessness, increased irritability, a lack of productivity, and poor performance. Such symptoms can be extremely detrimental to the lives with which physicians are entrusted (Kumar & Weil, 1998).

While the symptoms of burnout may sometimes appear subtly, they can also crash down on physicians "in a matter of minutes when it is triggered by a traumatic outcome, lawsuit, devastating medical error, or equally tragic circumstance in [his/her] personal life" (Drummond, 2015). The observed effects of physician burnout can be devastating to not only the physicians themselves, but also the patients and the healthcare system as a whole.

2.2.2 Observed Impact of Physician Burnout

Physician burnout affects patient care, the healthcare system and the physician's health. The Longitudinal Internal Medicine Resident Well-Being (IMWELL) study shows that the beginning stages of physician burnout can be first seen in the lower quality care a patient receives (West, 2018). This may result in major medical errors within the following months after burnout is first experienced (Tawfik et al., 2018).

Physician burnout has also had a negative impact on the general healthcare system and the work environment. Financially, the costs related to burnout have been from the lower quality care patients receive, decrease in patient satisfaction, and the increase in physician turnover (West, 2018). Depending on the field of practice of a given physician,

the estimated costs to replace a physician lost to burnout is roughly \$500,000 in our project site (Garber, 2018). Burnout has been reported to create a work environment with decreased productivity and positivity, and in some cases, violence amongst physicians (Dhaliwal, 2018).

However, the largest impact physician burnout has on someone is on the physicians themselves. A study reported that direct impacts of burnout on physicians include “depression, suicide contemplation, substance abuse, lack of self-care, and increased motor vehicle crashes” (Schernhammer & Colditz, 2004). Same study reported that in comparison with the general population, risk of suicide is 40% and 130% higher for male and female physicians, respectively. Another study completed in western Greece tested the correlation between a physician’s emotional exhaustion and depersonalization in comparison to the satisfaction level of their patients (Anagnostopoulos et al., 2012). The study showed that physicians with high depersonalization and exhaustion had significantly lower satisfaction scores compared to lower depersonalization and exhaustion.

Burnout within physicians has led to the increase in the chance that a physician will commit an error. “Not only are physicians who perceive they have made errors more likely to experience burnout and symptoms of depression, but those who are distressed appear more likely to make an error in the next three months” (Kopynec & Suze, 2018). Some of these errors have led to medical malpractice lawsuits, where stress from these lawsuits have been shown to increase burnout and results in Malpractice Stress Syndrome. These suits can deeply impact physicians and it can take years for a them to recover.

2.2.3 What Can Be Done to Reduce Physician Burnout?

Currently, the main treatment for physician burnout is various forms of interventions. According to Australia’s Department of Health & Human Services, an intervention is a disruption in routine to remind the individual of their own mental state (n.d.). To get a better understanding of the effect that interventions could have on a community, the Mayo Clinic Health System, a collection of family clinics spanning across 60 communities in Iowa, Georgia, Wisconsin and Minnesota, conducted a systematic review of literature containing 2617 articles, 15 randomized trials of 716 physicians and created a

system to quantify physician burnout (Swensen, Kabcenell, Shanafelt, & Sinha, 2016). The study conducted scores based on the Maslach Burnout Inventory Human Services Survey for Medical Personnel (Maslach, Jackson, & Leiter, 1996). The Mayo clinic used this survey, drawing results from the three main categories: emotional exhaustion, depersonalization and personal accomplishment. Through scores of overall burnout, emotional exhaustion, and depersonalization, it was determined individuals showed improvement after interventions were implemented. It was observed that “overall burnout” decreased from 55% to 44%, a score that combined an individual's emotional exhaustion score, depersonalization and personal accomplishment (West et al., 2018). These studies were conducted at the individual and organizational levels, ultimately determining that overall scores decreased in individuals who had some form of intervention introduced into their routine.

In a review of intervention programs by the Hanover Medical School, there are two types of interventions; organizational and individual. In this study, 25 primary intervention studies were reviewed. Of these, 80% of all programs led to an observed reduction in burnout (Awa, Plaumann, Walter 2008). Individual, or person-directed, interventions included online counseling, professional skill training, and recreational music making. The purpose of individual interventions is to provide the medical professional with the coping skills that it takes to handle a high stress job environment. These often focus on relaxation exercises as a way to temporarily separate the individual from the pressure of the environment (Awa, Plaumann, Walter 2008). The benefits of person-directed intervention are felt short term, as people feel a decreased level of stress surrounding their work (Awa, Plaumann, Walter 2008).

An ongoing study at Vanderbilt University Medical Center, similar to Mayo Clinic, (Evaluation of a daily brief exercise intervention on resident clinical staff personal resiliency and burnout (clinical report , 2018)), is observing the effects of interventions in the form of brief periods of exercise on residency students. Brief exercise is described as 15 minutes of exercise that rises the individual’s heart rate above 70 bpm (walking quickly, climbing stairs, jumping jacks etc.), as recommended by the American Heart Association (AHA). Residency students were split into three groups and evaluated using Maslach’s

burnout survey (Maslach, Jackson, & Leiter, 1996). The study found that brief period of exercise decreased overall scores in the main categories of Maslach's survey.

Organizational intervention focuses on restructuring of the work environment as a whole. This can vary from techniques like restructuring the format of an office space to decreasing the demands of the job (e.g Less hours or more breaks). (Awa, Plaumann, Walter 2008). The goal of organization directed intervention is to motivate the group as a whole to reduce their stress. When the physicians are burnt out, it often results in the organization suffering. Organization directed intervention has a longer expected effect on an individual because the environment as a whole has less of the expected factors that result in workplace overload and effort reward imbalance. A combination of person and organization directed intervention is recommended to have the longest lasting impact on an organization as a whole (Awa, Plaumann, Walter 2008).

2.3 How Can Technology Help Address Burnout?

In order to develop an effective application, there needs to be an understanding of good application design and development. The following section outlines the principles for good user experience and user interface design, as well as an analysis of what we found was successful in other applications through an application matrix, in an effort to take positives from other applications and implement them in our own.

2.3.1 Current Applications Market

In October 2018, our team analyzed a list of meditation applications to understand what solutions already exist and the features that these solutions offered and how they can influence our to-be application. This was prior to the realignment of our scope which occurred after our first paper prototyping session due to time and feasibility constraints. Since the refined purpose of our application was for it to serve as a habit tracker, our team analyzed habit tracking applications already in the market. The application analysis and application matrix that primarily focused on meditation applications can be found in Appendix D.

2.3.1.1 Application Comparison Matrix

In order to gain a better understanding of relevant applications, our team created an application assessment tool (see Table 1). Our team looked specifically for certain features such as notifications, charts and statistics, habit creation, the dashboard, and a journal. We analyzed how the features from the applications could improve our application using a 1-5 scale. If the application did not meet the requirement, this would be represented by a “1”. If the requirement was met completely, this would be represented by a “5”. The weight of the numbers in between 1 and 5 differed based on certain criteria outlined in Table 1. The table shows the rubric that the team used to analyze the applications.

Table 1: Application Matrix Rubric

Features	1	3	5
Notifications	No notifications implemented within application	Allows for notifications	Allows for habits to be completed within notifications, without entering application
Charts & statistics	No statistics reflecting application	Charts and statistics based off only weekly, option to view more statistics has to be purchased	Various charts and statistics with option to view daily, weekly, and monthly,
Habit Creation/ Customization	No option to enter custom habit.	Allows for custom habit to be entered however frequency of habit is limited to once a day, and no other design customization to habit	Habit is fully customizable, allows for frequency of habit to be adjusted, also allows for multiple occurrences of habit to be set in one day and set icons and colors to associate with habit
Journaling Feature	No journaling feature within application		Journaling Feature implemented
Dashboard	No dashboard page with habits	Dashboard page only lists habits	Dashboard shows you habits for that day, and allows for completion of habits directly from dashboard page

2.3.1.2 Application Analysis

There are, currently, numerous habit tracking applications available for Android and iOS devices. Our team searched each market by using the key word “habit tracker”. Our team decided that we would only review applications with a minimum rating of 4 stars that had been reviewed by at least 1000 users. These criteria allowed our team to only analyze applications with a large range of ratings and reviews and get inspiration based on what the existing applications are doing well.

We reviewed a total of eleven applications. Eight applications were taken from the iOS App Store. This included the following: *Habit Minder, Strides: Habit Tracker, Productive,*

Today Habit Tracker, Done - A Simple Habit Tracker, Habitify, Way of Life - Habit Tracker, and Habit Hub: Routine & Habits. Two of the applications we analyzed were taken from the Google Play Store for Android devices. This included *Loops: Habit Tracker* and *Habit Hub*. Lastly, there was one habit tracking application that was found on both the iOS App Store and Google Play; *Habitbull*.

In order for our team to understand the market of currently existing habit tracking applications, we made a table highlighting how well each application had implemented certain features. The features that our team looked for within an application was based on our scope realignment and features deemed important by our sponsors and other Reliant staff through our paper prototyping sessions. We also assessed the applications in the market to see what may be important to include in a habit tracking application. Additionally, we got an understanding of some features that could be left out.

We created an application matrix to assess the applications we had chosen to review. In this, we observed that some applications had efficiently implemented some features, while others had not. Features that scored well (e.g. a feature that scored a 5) in our application matrix implemented the specified feature well by the standards set in our rubric. Conversely, if an application scored low in a specified category, the feature was not implemented well. With this information, our team was able to compare and contrast the effectiveness of a variety of features commonly found in habit tracking applications. This provided our team with insight on features that were important for us to consider when designing our application. The matrix scores for the applications that we analyzed can be found in Table 2 below.

Table 2: Application Matrix Scores

	Notifications	Charts & Weekly Summary	Habit Creation/ Customization	Journaling Feature	Dashboard
Habit Minder	3	3	5	1	5
Strides	3	5	5	1	5
Productive	3	5	5	1	5
Today Habit Tracker	3	3	5	1	3
Done	3	5	5	5	5
Habitify	3	3	5	1	5
Way Of Life	3	3	3	5	5
Habit Hub: Routine & Habit	3	5	5	1	5
Loops: Habit Tracker	3	5	5	1	5
Habit Hub	3	5	5	5	3
Habit Bull	3	5	5	1	3

2.3.2 User Experience (UX) & User Interface (UI) Design

User experience and user interface design play an important role in the success of an application. A user’s first impression is gained when they see what the application looks and feels like. By improving the user’s initial impression of an application, you can provide a better platform to have meaningful interactions between the user and the application.

User interface and design greatly impact the user’s overall experience. Therefore, it is important to understand elements of user experience and user interface design principles.

2.3.2.1 Elements of User Experience

One of the biggest reasons user experience matters is because it attempts to fulfill a user's needs and provide a positive experience for him/her. Without a positive experience, it is not likely that the user will continue to use the application. When striving to develop a positive user experience, it is important to practice user-centered design.

User-centered design is the practice of ensuring that no aspect of the user's experience with a product happens without the application designer's conscious, explicit intent (Garret, 2010). This means that when designing the application, one should take into account every action their users are likely to take and understand the users' expectations at every step of the process.

User experience is often broken up into five core components. This includes surface, skeleton, structure, scope, and strategy (Garret, 2010). The surface plane consists of the content the user can see, such as images or text. The skeleton plane consists of the placement and arrangement of elements on the screen, such as the placement of buttons. The structure plan consists of how a user navigates through the application, such as how a user can navigate to access a certain feature. The scope plane consists of the features and functions the product offers. Lastly, the strategy plane consists of the objective of the application.

These five elements are not independent of one another. In fact, they follow a bottom-up approach, working from the bottom, the strategy plane, up to the top, the surface plane. This format is outlined below in Figure 2.

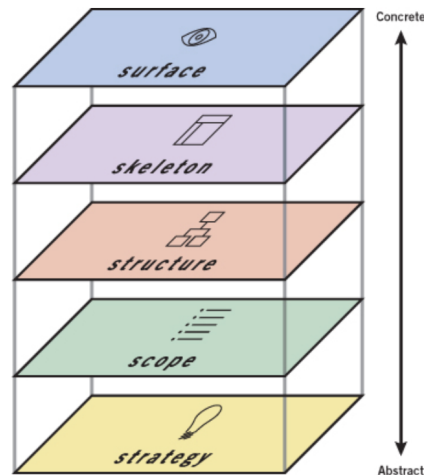


Figure 2: Relationship Between Elements of User Experience (Garret, 2010)

Additionally, developing each of these elements should include overlap (Garret, 2010). For example, the scope plane should be completed before starting to work on the strategy plane, the structure plane should be completed before working on the scope plane, and so on.

2.3.2.2 User Interface Design Principles

Similar to user experience, user interface (UI) is an important factor to consider because it is important to the user. Wilbert O. Galitz, author of *The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques*, defines the UI as “the part of a computer and its software that people can see, hear, touch, talk to, or otherwise understand or direct” (2007). To many users, the interface and screen are the system, so it is important they are able to effectively and efficiently interact with it. A UI can both positively and negatively affect a person. A good design can make it easier for a user, which can save time and allow them to be more productive. On the other hand, a confusing and inefficient UI can cause a user to face difficulties and make mistakes. Following basic principles of UI design can help provide positive experiences for the users.

There are a number of general UI principles. For this project, our team chose to focus on configurability, directness, obviousness, and simplicity. These four principles are outlined in Table 3.

Table 3: UI Design Principles (Galitz, 2007)

Principle	Definition
Configurability	Permit easy personalization, configuration, and reconfiguration of settings.
Directness	Provide direct ways to accomplish tasks.
Obviousness	A system should be easily learned and understood.
Simplicity	Provide as simple an interface as possible.

A configurable design means the user can tailor it to match their personal needs. This is helpful because different people have different features of an application they may want to use. A direct design means the user is able to accomplish tasks easily. This is helpful because it reduces the user’s mental workload, and makes using the app feel easy (Galitz, 2007). An obvious design means the user can easily pick up how to use the application. This is helpful because it means users are able to utilize the app to its full potential. A simple design means the user can easily understand how to use the system. This also means the user will not have a hard time navigating or using the application.

An understanding of these principles allowed us to both analyze existing applications and design our own application better. Instead of trying to make a “good” design, we were able to actually go about designing it with specific principles in mind. These principles can help improve the usability and effectiveness of our application.

Chapter 3: Methodology

Our goal was to develop a technology-based intervention to reduce provider and staff burnout within Reliant Medical Group. To achieve our goal, we::

1. Reviewed the literature and marketplace to determine interventions for provider and staff burnout.
2. Conducted requirements gathering at Reliant Medical Group through joint application design sessions.
3. Used prototyping, a rapid application development methodology, developed and tested Rest & Renew while continuously receiving feedback from potential users.
4. Conducted usability and feasibility testing of the application through a one-week field usability study.
5. Developed recommendations to turn our application into an intervention tool at the Reliant Medical Group.

The rest of this section outlines our methods in detail.

3.1 Literature and Marketplace Review

We conducted a literature review to increase our understanding of our research topics and to determine interventions for provider and staff burnout. An overview of our research areas can be seen in Figure 3. Our main areas of research included provider and staff burnout, the application development process, and the current market of available applications for intervention. Figure 3 shows the intersections between our main areas of research, ultimately creating a rounded analysis of the topics needed to fully build our application.

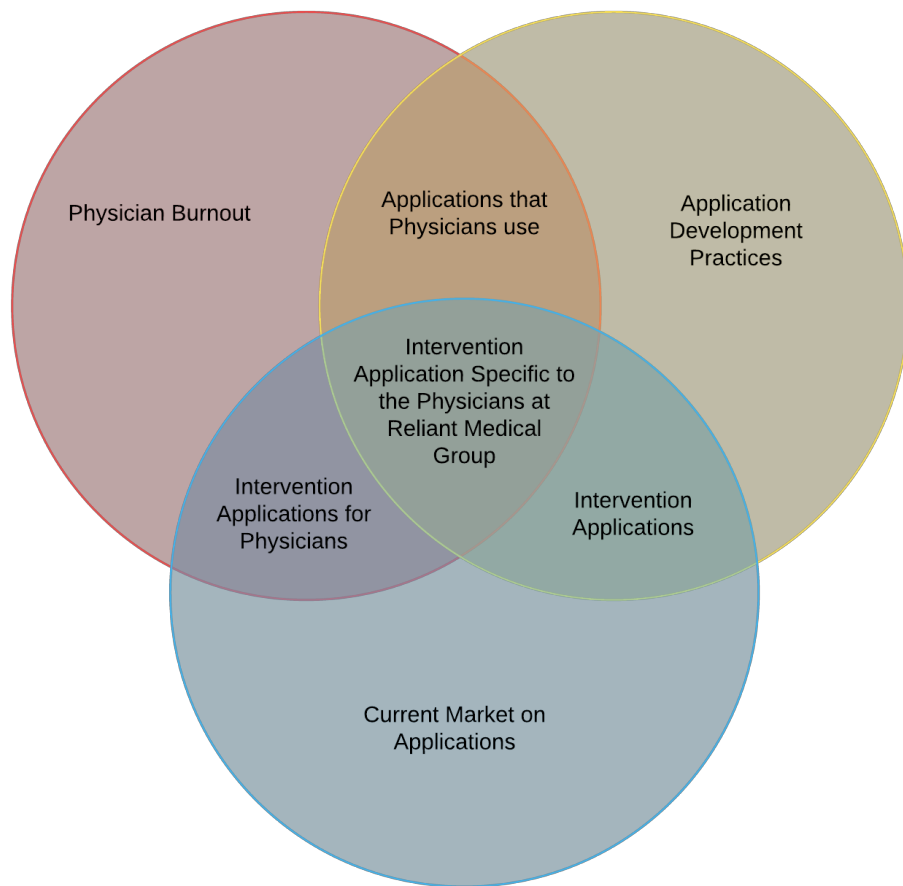


Figure 3: Venn Diagram of Research Topics

The venn diagram allowed our team to visualize where to focus our review to get a complete understanding of the problem domain and to collect relevant information about interventions and existing solutions that helped us as we built our application. We divided our background into sections that were directly connected to one of the three circles. Our application is a product of these three frames. With guidance from WPI’s research librarians, we utilized the library’s resources to access information from a variety of sources. Primarily, we focused our attention in sources found in Business Elite, PubMed, and ACM Digital Library.

Our market research was focused on the interventions discovered through the literature review. Details on our market research can be found in the background section of this report. Research sessions were important for our team’s understanding of what

requirements we would incorporate to best fit our sponsor's needs. Through understanding what provider and staff burnout entails and what intervention measures were currently available, we identified which requirements would be feasible to incorporate in the application while still meeting their needs.

3.2 Requirements Gathering

Before any development, we needed to understand and outline the initial business requirements for the intervention application. This was done through research sessions and two Joint Application Design (JAD) sessions with our sponsors at Reliant Medical Group. This allowed our team to work collaboratively with our sponsors in understanding an alignment between our research and their needs.

3.2.1 Joint Application Design

Our team chose to conduct JAD sessions with our sponsors for requirements gathering. The JAD sessions were held at the Reliant Medical Group facility and was attended by all four team members with one meeting chair and one minute-taker. This allowed us to receive detailed information regarding our sponsors' needs and expectations in an effective manner. Initially, we met to understand the primary need for the application, and the initial requirements our sponsors felt necessary to be in the application. In the following sessions, we proposed more detailed requirements to our sponsor and discussed which ones they felt should be included. We presented ideas from our market research and the potential uses of certain interventions.

During these sessions, we had the opportunity to ask our sponsors questions about potential staff use, available technologies, application needs, and current interventions. These sessions were helpful in determining the scope of our project and the feasibility of incorporating these interventions within the application.

3.2.2 Scope Realignment

Given the timeline for our project, our team decided to realign our scope. The scope realignment occurred after our first paper prototyping session with the staff members at Reliant, where we decided to adjust the application focusing on meditation to become a

habit tracking application. We, then, held a meeting with our sponsor to inform them of the new scope we had planned and the reasoning behind the adjustments we made. Our team had realized the initial features might not be as feasible to implement within the application given the time period, and a habit tracking application would serve as a more effective application for managing the burnout of the Reliant Medical Group staff. This reasoning was confirmed throughout the rest of the paper prototyping sessions. This led our team to diverge from the applications we previously researched as they mainly contained features pertaining to meditation interventions (a feature we removed from our updated scope).

3.3 Interviews

In order to develop an application that met the needs of the user, it was important to understand how the user perceived our application. Throughout this project, there were two rounds of interviews through which we received feedback from users while developing the application.

The first round of interviews utilized the *Prototype Interview Protocol* (see Appendix B) and was conducted in B-Term after every iteration of prototype development. The participants of these interview were a predetermined set of Reliant Medical Group staff members. Each week, the participants provided feedback on the functionality of the application's various, latest features through the use of paper prototypes. The participants were selected by our sponsors from a variety of teams and all had varying job descriptions.

The second round of interviews utilized the *Exit Interview Protocol* (see Appendix B) and took place in C-Term after the field usability study. When we got to the point of the development process where the application could be tested as a whole, we provided the application to eight members of the Reliant Medical Staff to use for a period of one week. Each participant was interviewed by two members of our team (one team member took notes while the other asked the questions and interacted with the participant). During the interviews, the participants were asked questions revolving around the usability and effectiveness of the application as a whole.

The prototype interviews helped us assess the usability of the each iteration of the Rest and Renew application and we used the participants' feedback to make further

adjustments to the design. The feedback we received during the week-long field usability study informed us on the functionality of the fully developed application. Overall, the interviews gave us information the theoretical functionality of the application, rather than the original intended purpose of assessing the users' burnout levels. Upon receiving feedback, the team took the necessary steps to plan for the changes that would need to be made to ensure the client-specified needs were met.

3.3.1 Prototype Interviews

To ensure we were meeting user needs over the course of the development process, our team conducted four sets of prototype interviews with paper prototypes of our application. The paper prototype wireframes we presented can be found in Appendix E. Each week, we highlighted a key aspect of the application we were focusing on and asked additional questions concerning functionality. Our team first designed these paper prototypes to reflect how we imagined the application features should look. Then, with the feedback received through interviews, we updated the design and functionality of the prototypes to reflect user wants and ideas. The specific questions we asked can be found in Appendix B.

Week 1: Navigation

- The first week's paper based wireframing session occurred on November 14, 2018. During this session, our team walked participants through the paper prototypes, showing them the various pages of the application and guiding their navigation from one page to another. We asked questions on the ease of page navigation and the clarity of each page's purpose.

Week 2: Habit Progression

- During the second week, our team's main focus was to see how users will be able to add and track the completion of a habit. We asked questions pertaining to how they would like to mark a habit that has been completed and how they would prefer to track a habit given there are multiple

occurrences of that habit within a single day. We also proposed a weekly summary option. In this, they could review the habits they have and have not completed in the week past.

Week 3: Notifications

- The third round of interviews focused mainly on notification display options. Our team asked if a user would prefer to mark a habit as completed within the notification or if they would rather be redirected to the application on-click. We also asked questions regarding “Remind me later” options and limitations. For example, we asked subjects their preferences on whether to the user should be granted the ability to set their own notification delay time or if the application automatically sets a new notification time. We also expanded on the weekly summary option we had introduced in the previous week to see how users would like the information in the weekly summary presented in the application. The options included graphical, text, and numerical summaries.

Week 4: Weekly Summary

- The fourth and final round four of the interviews solely focused on determining how users would like to access the weekly summaries within the application and whether or not they would like to view previous weeks of their habits. At the same time, we received feedback on the usability and navigability of the application as it stood. We also inquired what the best way to receive feedback during the field usability testing phase would be.

3.4 Application Development Approach

After receiving information on user ideas and preferences, we were able to move forward with the development phase of our project. This section outlines the approach and environment our group used to develop our application.

3.4.1 Rapid Application Development

The application development approach we implemented is called Rapid Application Development (RAD). RAD is a development methodology that focuses heavily on user feedback and prototyping (Mackay, Carne, Beynon-Davies, & Tudhope, 2000). We chose this methodology because of the close communication we had with our sponsors throughout the testing process. As mentioned in Section 3.3, we planned weekly iteration tests during which the users (our sponsors and Reliant staff) provided us with feedback on what they liked and did not like about the application. RAD allowed the development team to split the project up into manageable tasks. This helped keep us on track to finish the application as well as provided us with the opportunity to obtain a consistent stream of feedback. These sessions resulted in the creation of an application that fit the user-specific needs. The personalization aspect was important to us in creating this application because *Rest and Renew* was designed specifically for the Reliant Medical Group staff. A typical RAD process can be seen in Figure 4.

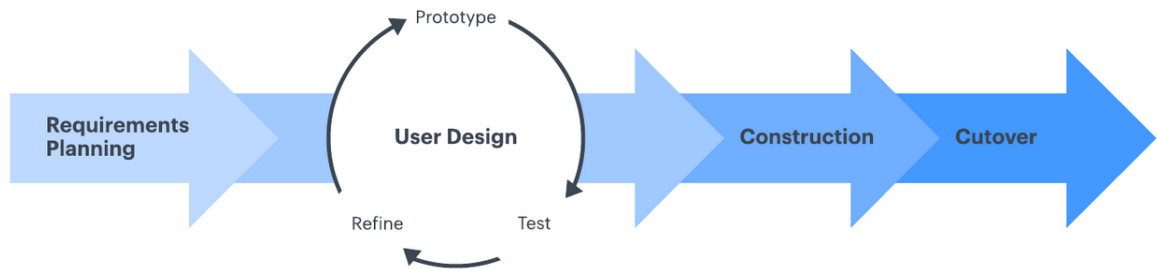


Figure 4: Rapid Application Development (Lucidchart Content Team, 2018)

As seen in our Project Plan (Appendix A), we originally planned on being in the Requirements Planning Phase in A-Term, followed by the User Design and Construction Phase in B-Term and over the winter break. This allowed us to have a functioning prototype to give to our sponsors to test in the middle of C-Term, while our team concurrently worked on fixing bugs and our final paper.

3.4.2 Ionic Framework

The application development framework we used to design *Rest & Renew* was Ionic. Ionic, ideal for building hybrid mobile applications, is a straightforward HTML5 development framework that handles all of the UI interactions an application needs in order to be compelling. It contains support for a broad range of common native mobile components, animations, and designs. A largely beneficial factor in using Ionic for application development is that it is compatible with both iOS and Android devices (“Ionic - Cross-Platform Mobile App Development”, n.d.).

The primary care providers at Reliant Medical Group are supplied with Android company phones for business use; however, other staff (i.e. medical assistants, nurses) will solely rely on their personal mobile phones for the use of the *Rest & Renew* App. This may include both iOS and Android devices. As a result, they were in need of an application that could run on either platform. The utilization of Ionic as a framework ensured this requirement could be met.

3.4.3 Development Environment

The back-end development environment we used was Node.js. A development environment for javascript, Node.js was designed for the purpose of scalable applications. Our application started with a basic framework of features but prototyping sessions proved larger than originally designed. Due to this fact, we wanted a development tool that would allow for scalability.

For ease of development, we worked in IntelliJ IDEA with a Node.js plugin. IntelliJ IDEA was connected to the group’s repository in GitHub (<https://github.com/MISMQP18/RestandRenew>). The team worked with the git workflow (outlined in Figure 5) of keeping a master branch, a development branch and feature requests off of the development branch. This allowed us to develop features individually with a strong redundancy plan.

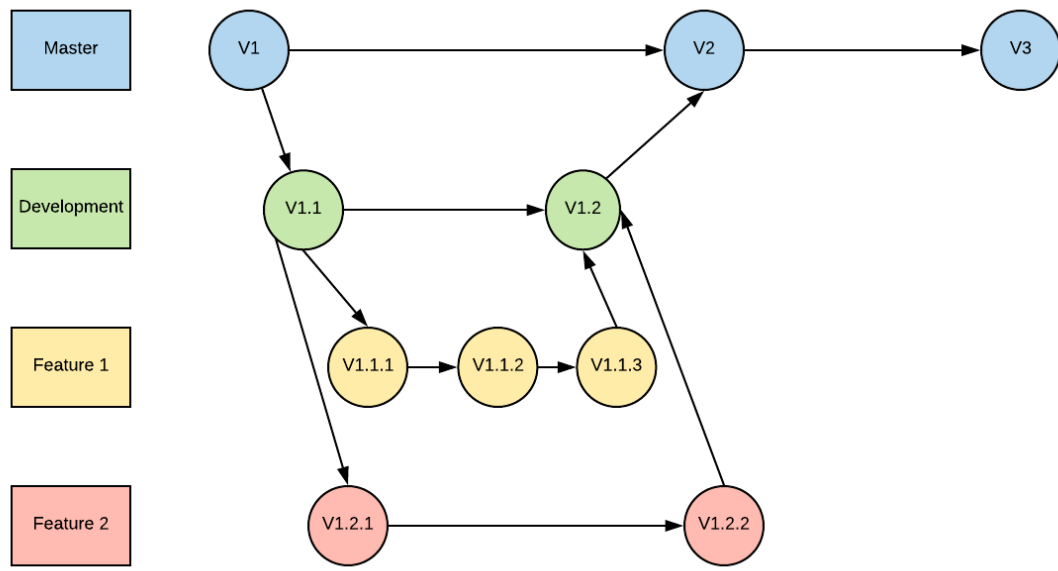


Figure 5: Example Git Workflow Diagram

Our team stored the application on the Linux Virtual Machine on the WPI network. All team members had access to this virtual machine which contained ten gigabytes of storage. We used the virtual machine to run our application.

In C-Term, our team decided to use Firebase as our hosting and database platform. This was due to the compatibility between Firebase and an Ionic application. Our application was deployed using Firebase Hosting, a production-grade web content hosting for developers. Using the Firebase CLI, we were able to set up a hosting project, test on a local development server, and then deploy content. In addition, we used Firebase's Cloud Firestore as our database. Firebase is a Google Application with a NoSQL cloud database that syncs all information in real time.

3.5 Application Design

The process we used to design our application came from a series of diagrams and wireframes. We believe the detailed diagramming work allowed us to have a full picture understanding of the system. Wireframing gave us a visual representation of use flow, while diagramming allowed us to have a graphical representation of information flow.

3.5.1 Wireframing

We utilized the prototyping tool of wireframing to gain insight on the user interface. The process began with drawing each frame of the application and requesting our sponsor to use it as a version of the application. Any stumbling blocks in workflow were identified, and gave us the opportunity to gain general feedback from our sponsor. The wireframes were created using Lucidchart, a free diagramming software. After each week of prototyping interviews with Reliant staff, there were significant changes made to our wireframes. Some examples of the wireframes used in testing can be seen in Figure 6.

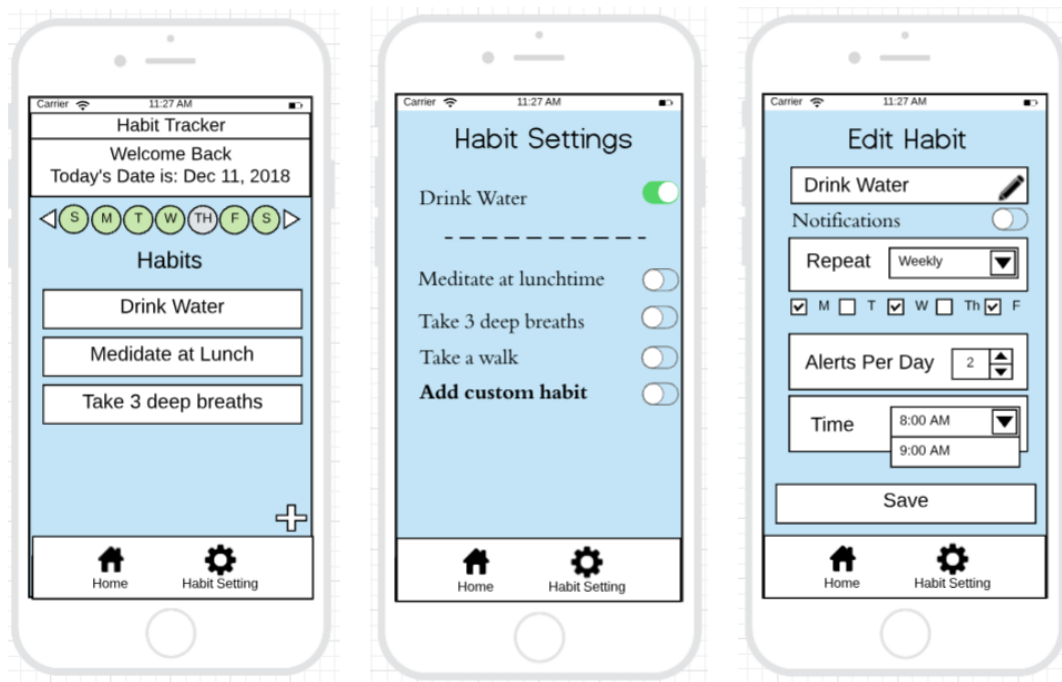


Figure 6: Example Wireframes for Application

3.5.2 Data Flow Diagram

Our team created a data flow diagram to serve as a visual representation of the flow of information through the system. The finalized application follows the same information flow that the diagram represents. Our level 0 data flow diagram can be found in Appendix G, which shows the major, high-level processes of the application and how they are all interrelated. Through the creation of this diagram, the team got a full understanding of where the information is supposed to travel.

3.5.3 Use Cases

We used the use case format based on the 6th edition of the book *Systems Analysis and Design* by Alan Dennis, Barbara Wixom, and Roberta Roth. We added more use cases as we dove deeper into the development of the application. All use cases followed the template displayed in Figure 7. Use cases were created to organize and understand exactly how the user would interact with the system.

Use Case Name:	ID:	Priority:
Actor:		
Description:		
Trigger: Type: <input type="checkbox"/> External <input type="checkbox"/> Temporal		
Preconditions:		
Normal Course:	Information for Steps:	
Alternative Course:		
Postconditions:		

Figure 7: Template for Use Cases

3.5.4 Entity Relationship Diagram

To keep track of the data that we logged within the application, the team created an Entity Relationship Diagram (ERD) which can be found in Section 4.3.1.1. The ERD is a graphical representation illustrating our system and the relationships between individual objects or concepts within that system. The process of creating the ERD was to identify and define the entities while defining and determining the relationship between those entities.

3.6 Prototyping Sessions

As mentioned in Section 3.3, we conducted weekly testing to fully understand how our application would work in the workplace. The sessions took place over the course of approximately two months, following an initial proposal presentation to the Reliant staff. Outlined in Figure 8 is the prototyping calendar we followed.

Prototyping Period Calendar							
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Oct			23	24	25	26	27
			First day of B Term	Proposal Presentation of Application			
Nov	28	29	30	31	1	2	3
	4	5	6	7	8	9	10
	11	12	13	14	15	16	17
				First Iteration			
	18	19	20	21	22	23	24
December	25	26	27	28	29	30	1
				Second Iteration			
	2	3	4	5	6	7	8
				Third Iteration			
	9	10	11	12	13	14	15
				Final Review with sponsors / Fourth Iteration			

Figure 8: Prototyping Calendar

Throughout B-Term, we used a process we titled “Design, Assess, and Refine”. We created an initial design of the interface and features of the application the week prior to the interviews, assessed the usability and functionality of the proposed features during the interviews, and refined our proposed design throughout the week following the interviews.

3.7 Field Usability Study

After our prototyping phase was completed, we entered into brief field usability testing phase. This phase is outlined in the form of a calendar in Figure 9.

Field Usability Study Calendar							
	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
January	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
February	27	28	29	30	31	1	2
	3	4	5	6	7	8	9
			Prototype given to Reliant Medical Teams				
	10	11	12	13	14	15	16
			Final Day of Field Usability Testing	Exit Interviews conducted at Reliant Medical Group			
	17	18	19	20	21	22	23
	24	25	26	27	28	1	
Total days with application: 5							

Figure 9: Extended Pilot Testing Calendar

Our field usability study took place over a one-week period. We provided the participants with our application on February 12th and they were able to use it until February 19th. They were also provided with an instructional documentation on how to setup and use our applications prototype.

This period involved six participants from different medical divisions with varying roles, with a few of those participants also have been involved in our prototyping sessions.

Our choices for participants were made through discussion with our sponsors from Reliant Medical Group. We ensured participants are different so that we can understand how our application is perceived in different work settings, and has progressed from the prototyping sessions.

At the end of the one-week period, we conducted exit interviews. Detailed interview questions can be found in Appendix B.

3.8 Plan Adjustments

Our team initially planned for field usability testing to take place between December 14th and January 14th; however, we decided it would be best to push the testing to (02/12/19 - 02/19/19). Our team decided our prototype would be best assessed with few bugs and functional application features. Therefore, we used our time over the break and the first four weeks of C-Term to develop a more meaningful prototype for the participants to use. This also changed the dates for our exit interviews, which were held on February 20th. We used feedback from the exit interviews to develop a series of recommendations for implementing the application for future teams.

3.9 Project Management

In order to ensure everyone within our group was assigned equally-weighted tasks to complete, our team used Trello.com. Trello is a web-based project management application that allowed us to make task cards that could be assigned to certain group members, allowing us to track each individual's contribution and progress in the project. Trello also allows the tasks cards to be filtered by level of importance and area of focus. Our team also had created a detailed project plan within excel which contained dates that project updates were due, categorized by term and members assigned.

Chapter 4: Results

In order to assess the functionality of the application, our team encouraged feedback from our sponsors throughout the progression of iterations the application went through. As mentioned, there was a series of four interview sessions held at Reliant Medical Group in which we gathered and updated information on the various functions and features our sponsors wanted the application to include.

4.1 Wireframe-based Prototyping

The first iteration of the prototyping phase involved a variety of wireframes of proposed application design ideas. When going in to the first set of prototyping interviews, our team established initial requirements. Over time, however, the functional and nonfunctional requirements of the application evolved.

4.1.1 Initial Business Requirements

Our initial business requirements were determined through a combination of our JAD sessions, literature review, and market research.

Functional Requirements

1. Journals
 - a. The application will allow staff to create and edit daily journals of gratitude.
 - b. The application will trigger push notifications to remind users to use their gratitude journal.
 - c. The application will allow the user to turn this feature off and on as desired.
 - d. The application will store users' daily gratitude journals.
 - e. The application will allow users to view previous journals.
2. Positive Psychology
 - a. The application will prompt users to use an affirmation application (e.g., "Keep up the good work", "Tell a coworker you're grateful for them") of their choosing at a frequency to be determined through requirement refinement sessions.

- b. The application will have an internal timer that then reminds users to smile with a positive affirmation.
- c. The application will allow the user to turn the smile-reminder feature off and on as desired.
- d. The application will allow staff to save affirmations in their gratitude journal.
- e. The application will allow manual affirmation inputs and logged jokes may be accessed offline.

3. Habit Tracking

- a. The application will allow users to create new “habits” (e.g., times used relaxation application).
- b. The application will allow users to set reminders for a habit.
- c. The application will allow users to record completion of a habit instance.
- d. The application will allow users to visually see their tracked habits in the form of a pie chart.
- e. The application will store the user’s habits.
- f. The application will allow users to view habits from prior, present and upcoming weeks.
- g. The application will allow users to see a weekly summary of habits they have completed throughout the week.
- h. The application will allow users to view their habits they have today from the home page.
- i. The application will show users their current habits within the habit settings page and allow them to toggle them on or off.
- j. The application will allow users to add a habit from the home and habit settings page.

4. Meditation Intervention

- a. The application will allow staff to listen to audio of their choosing from 7 different meditation tracks.
- b. Application should save time where track last stopped if track is not finished.
- c. Application will remind users at set times to listen to meditation tracks.

- d. The application must retain 7 meditation tracks.

5. Messaging

- a. Application will allow staff to create a reminder that will notify them to message a loved one.

6. Whiteboard Feature

- a. Application will remind staff to post messages of recognition on a whiteboard.

7. Pictures of Loved Ones

- a. The application will store user pictures inputs.
- b. The application will allow the user to choose a time of the day to display a picture of their choosing.
- c. The application must retain pictures for 14 weeks.
- d. The application must retain 100MB worth of pictures.

Non-Functional Requirements

1. Operational

- a. The application should run on a client's native platform on iOS 8 and later as well as versions 8.0 for android devices.
- b. The application should run on Wi-Fi.
- c. The application should run offline.
- d. The application should be able to work on the default iOS and Android web browsers, Safari and Google Chrome.

2. Performance

- a. The application should support six simultaneous users at one time (a team).
- b. The system should support up to 20 simultaneous users (three teams) between the hours of 9AM-5PM, six simultaneous users at all other times.

3. Security

- a. Only individual staff members will have access to their personal profiles.
- b. Only individual staff members will have access to their progress.
- c. Only individual staff members will have access to their journals.

4. Cultural and Political

- a. The application will contain the Worcester Polytechnic Institute and Reliant Medical Group logos within the application.

4.1.2 Interviews: Round One

After putting the initial requirements in place, we began development and design in iterations. The goal of the first iteration of the application was to design a detailed page layout with the use of wireframes. The first interview session took place on Wednesday, November 14, 2018. There was a total of nine Reliant staff members that participated in the interview over the course of four hours. This session primarily focused on the navigability of pages. We provided several paper-based wireframes we developed with Lucidchart for the Reliant staff to review. Through this, we received feedback on how easy or difficult it was to navigate from page to page. Interviewees were also suggested home screen preferences. The questions asked in the session can be found in Appendix B.

While the majority of interviewees found the flow across pages to be somewhat self-explanatory, we found that many screens could be combined into one. For instance, after logging into the application, any first-time user would have to go through three screens before adding their first habit. There was an application home page, a habit tracking home page, and a separate page for adding and dropping habits. In addition, there was a page in which the user could edit habits and one in which the user could view their habits. When asked, most interviewees were in favor of condensing the number of pages to three main screens: a home page, an edit habits page, and a habit settings page. One staff member also suggested the use of a consistent toolbar at the bottom of the screen. This way, the user has the ability to access any of the three pages regardless of where they are in the application. Another recommendation was to provide each user with two home screen options, a week-by-week view and a month-by-month view. The user can view past and upcoming weeks by pressing the arrows on the screen. The month-by-month view can be seen in Figure 10.

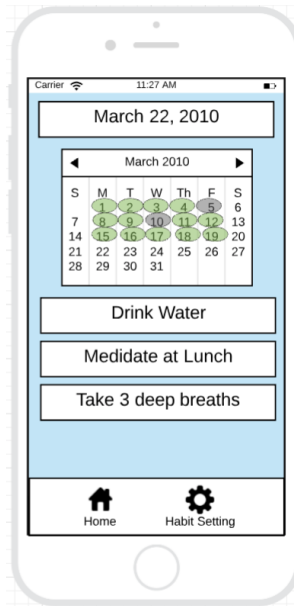


Figure 10: Home Screen Wireframe

4.1.3 Interviews: Round Two

The second set of interviews took place on Wednesday, November 28, 2018. In this session, we focused on how the application handled tracking habit progression day-to-day. For example, if a provider or staff member enabled the “Drink Water” habit tracker, it is likely they would want to track multiple instances of this habit each day. They may want to drink one glass of water at 9:00 AM, another at 11:00 AM, then once more at 2:00 PM. How would the application make the progression of this habit clear to the user? We offered them four options.

The first option was that, on the home page, the “Drink Water” tab would be segmented into three sections. Each time the tab is clicked, one segment of the tab would fill up with green color. This allows the user to visually keep track of how many times they drank the water already in that day, and how many instances of that habit they have left before the habit, in its entirety, is completed.

In addition to the segment option, we offered a counter option as well. In using the counter option, the “Drink Water” tab would display the number “three” at the start of the day. Each time clicked, the number would decrease until it reached “zero”. At that point, the

habit tab would be filled with green signifying a completed habit. This allows the user to numerically track how many instances of a habit remain for any given day.

The third option was a time option. With this, there would be three separate “Drink Water” tabs displayed on the homescreen; one reading “Drink Water (9:00 AM)”, another reading “Drink Water (11:00 AM)”, and the last reading “Drink Water (2:00 PM)”. This would ensure the user is fulfilling their habit instances as their specified, preset times. The more instances they added to a habit, the more tabs would be displayed on the homescreen.

The fourth and final option presented was a progression bar option. Similar to the segment option, the progression bar would visually display habit progression by steadily filling the “Drink Water” tab with green color each time it is pressed. The only difference is the progression bar is not divided using visible segments. The bar would progressively fill until the entire tab is colored green. All four options can be seen in Figure 11 below.



Figure 11: Progress Bar Wireframe

Of the nine Reliant staff members who were interviewed, six found the fourth option, the progression bar, to be the most visually pleasing and effective for tracking multiple instances of a habit. Those opposed to option one stated that black segments

dividing the tab would be too “busy” to the eye. Many stated they do not need bar segments to understand how many instances of a habit they have remaining. For those opposed to the time option, they took issue with the amount of screen space this option would take up, namely if there were more than three instances for any given habit or if there were more than one habit with multiple instances. The user would have to scroll up and down the home page in order to check for habit completion.

4.2 User Interface Prototyping Through Ionic

The second iteration of the prototyping phase utilized the new user interfaces our team developed in Ionic in addition to the paper-based wireframes utilized in the previous iteration. We updated the original wireframes going into the new round of interviews with previous suggestions gathered from the first round. The users got an in-depth understanding of potential application functionality by reviewing the wireframe pages before being presented the actual interface of the mobile application. The functional and nonfunctional requirements of the application had evolved before we proceeded with the third set of interviews.

4.2.1 Updated Functional Requirements

After the first and second rounds of interviews, we refined the scope of our project. This also changed some of the functional requirements of the application. Below are the changes made to the list.

1. The Positive Psychology feature was scoped out of the development plan (FR 2a-e).
2. The user will not be able to view their habits in the form of a pie chart as the visual aesthetics are less pleasing to the user than a worded list (FR 3d).
3. The user will not be able to record multiple habit instances in the style of a progress bar as the development of this feature is out of scope at this time (FR 3c).
4. The following application features were not feasible given time and resource constraints: Meditation Intervention (FR 4a-d), Messaging (FR 5a), Whiteboard Prompts (FR 6a) and Pictures of Loved Ones (FR 7a-d).

4.2.2 Updated Non-functional Requirements

Changes were made to the non-functional requirements following the completion of the first iteration of interviews. This includes the following:

1. The performance requirements were omitted from the scope due to platform constraints (NR 2a-2b).
2. The platform constraints also affect the application's ability run off-line, causing this operational requirement to be out of scope (NR 1c).
3. The application will work on browsers and will be customized for default iOS and Android browsers (Safari and Chrome) (NR 1d).

4.2.3 Interviews: Round Three

The third set of interviews took place on Wednesday, December 5, 2018. The primary focus of this prototyping session was to get user feedback on the notification features of the application. One of the major functions of Rest & Renew are the push notifications. With this, the user will be notified every time they are scheduled to fulfill a certain habit. The user would also have the option to edit the notifications they receive in "Settings".

The Reliant staff was asked whether or not they would like for the notifications to be interactive. If so, the push notification would prompt the user to complete the habit and give them three response options. The first would be to log that they have completed the specified habit. There will be a "Completed" button displayed on the screen that, when clicked, logs the habit on the backend. The user may also select "Dismiss" which sends away the notification without saving any new information in the backend. Lastly, there would be a "Remind Me Later" button. This could either dismiss the notification for a defaulted amount of time or for a period of time chosen by the user. The two "Remind Me Later" options were also presented to the interviewees to get information on preference.

The majority of interviewees liked the idea of having interactive notifications as opposed to being redirected to the application to log their habit. All nine of the interviewees appreciated the option to dismiss and snooze the habit when desired as there may be a time when they are in the middle of tending to a patient, for instance, and will not

be able to immediately perform the task they are prompted to complete. The “Remind Me Later” feature allows users to wrap up the work they are doing first and complete the habit shortly thereafter.

Within the “Remind Me Later” feature, there are also two options: dismiss the notification until a prespecified time (at the discretion of the user), or dismiss the notification for a default amount of time (at the discretion of the app designers). Many participating staff members preferred for the individual user to choose whether they would like to use default settings or choose the time for themselves. Additionally, one interviewee suggested that the default be set to five minutes as this gives users just enough time to wrap up their work and not enough time for the user to get distracted and start a new task.

4.2.4 Interviews: Round Four

The fourth and final prototyping interview session took place on Wednesday, December 12, 2018. The purpose of this session was to get feedback on the Weekly Summary feature of the application. Three options were presented to the participating Reliant Medical Group staff.

The first option presented was a brief weekly summary that was embedded in the home screen. At the bottom of the page, at the end of each week, there would be a short paragraph stating the total number of days the user completed all of their habits.

The second option was a separate weekly summary page that contained a short “Congratulations” message and listed out the number of days each habit was completed. The user is also provided with the option to review their habits. This allows user to retrospectively consider how well he/she did this week and make any necessary adjustments to the following week’s habits as he/she sees fit.

The third and final option was a weekly summary page that contained graphics of the percentages of days all habits were completed. This would include bar graphs, pie charts, and other visual means of summing up information. This option also provides the user with the ability to review and adjust their habit settings for the upcoming week.

The majority of participating staff preferred the second option, a separate weekly summary page that had a written summary of the number of days all habits were

completed. One interviewee suggested that the language of the summary be changed to summarize the number of habits that have been completed as opposed to the number of days in which all habits were completed. Users have the ability to view the summaries of prior and upcoming weeks as well. Figure 12 displays how this weekly summary page would look in the Rest & Renew app.



Figure 12: Weekly Summary Wireframe

4.3 Fully Functioning Prototype

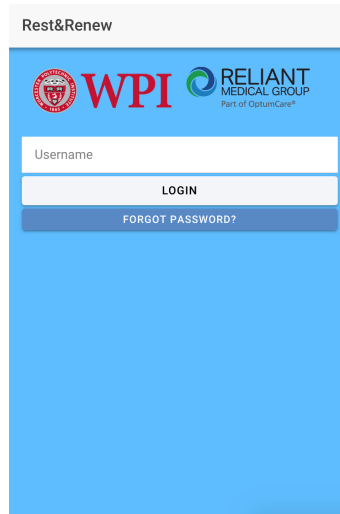


Figure 13: Login Screen

A fully functioning prototype has been developed and was used in our Field Usability Study. The system architecture, features implemented, and results of our Field Usability Study can be found below. The Login Screen of the fully functioning prototype can be seen in Figure 13.

4.3.1 System Architecture

In order to turn our application into a functioning prototype we had to think about it as a whole. This included choices regarding external access, hosting, storage, technology, and database design.

As mentioned in Section 3.4.3, our prototype is hosted using Firebase Hosting accessible at <http://www.rest-and-renew.firebaseio.com/>. Data is stored using Cloud Firestore. This was chosen because it was easy to integrate with our application. Figure 14 shows a basic outline of our designed vs. implemented system architecture. It shows that our team initially planned on developing a native application hosted on a virtual machine, but ended up developing a web application hosted using Firebase Hosting.

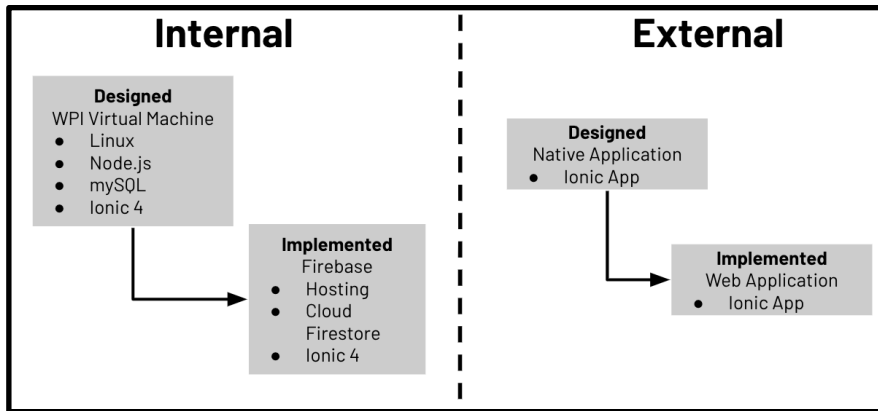


Figure 14: Designed vs. Implemented System Architecture

4.3.1.1 Database Design

We developed an entity relationship diagram (ERD) to design our database. Our intended database design can be seen in Figure 15.

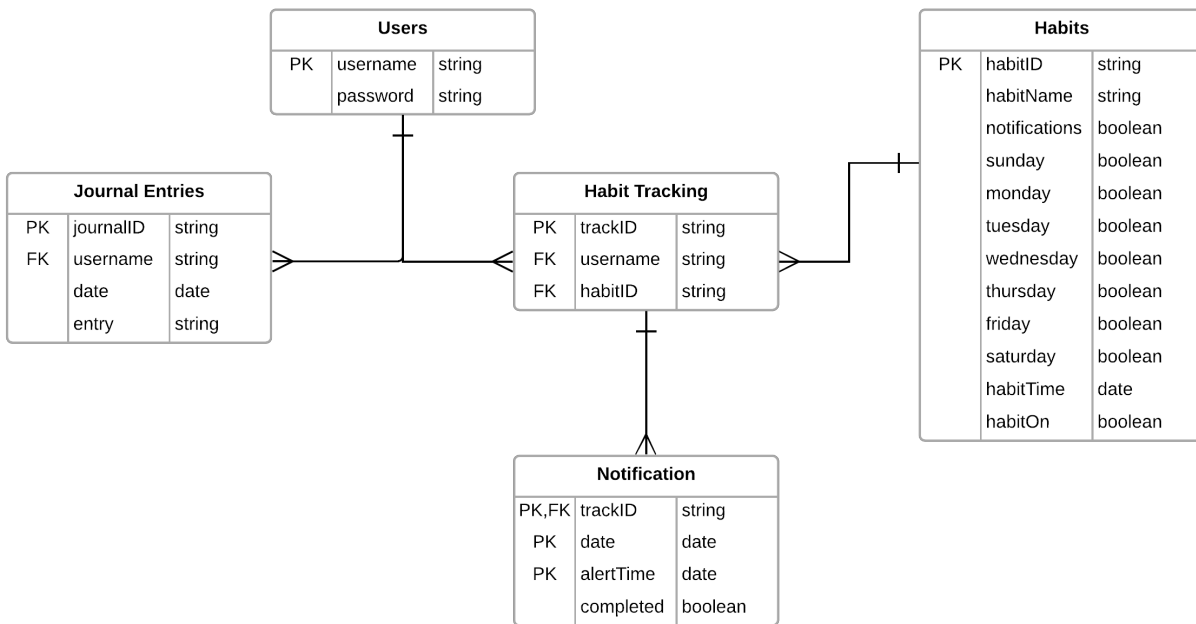


Figure 15: Intended Database Design

4.3.2 Features Implemented

An outline of the features implemented in our final product can be seen in Table 4. This table provides the features, implementation statuses, and reasoning behind why certain features were not implemented.

Table 4: Application Features Implemented

Feature
User ID/Security: Habits and Journal Entries are associated with your specific User ID (FR 3b-c)
User ID: login with user id (no password) (NFR3a)
Habit Tracking: Ability to add, edit, delete, turn on/off, and complete habits (FR3a) (FR 3h-j)
Habit Tracking: Each habit can have only one 'alert' (FR 3b)
Habit Tracking: In-app alert when you complete a habit (FR3h)
Habit Tracking: days of the week color coded (habit can be completed) (FR3c)
Journal Entries: Ability to add, edit, and delete entries associated with the day they are made (FR 1a, 1e)
The application's operational requirements align with what we outlined (NFR 1a-c)
The application's performance requirements align with what we outlined (NFR 2a-b)
Cultural and Political Requirements (NFR 4a)

Table 5: Application Features Not Implemented

Feature	Reasoning (if not implemented)
User ID: login with user id (password) (NFR3a)	Full authentication was not finished in the building of the application
Habit Tracking: Each habit can have multiple 'alerts' (FR 3b)	Currently each habit has one alert time associated with it, to have multiple alerts the user has to create multiple habits.
Habit Tracking: out of app alert when you complete a habit	Push notifications were not implemented fully
Habit Tracking: allow users to visually see their tracked habits in the form of a pie chart (FR 3d)	Removed from scope as a result of user preferences
Habit Tracking: Allow users to view habits from prior, present and upcoming weeks (FR 3f)	Removed from scope due to limited resources (the way habits are associated with days of the week we were limited to showing one week at a time)
Habit Tracking: Weekly Summary (FR 3g)	Removed from scope (implemented analysis but not in the form of a summary page)
Journal Entries: The application will trigger push notifications to remind users to use their gratitude journal. (FR 1b)	Push notifications were not implemented fully due to time constraints
Positive Psychology (FR 2)	Removed from scope due to limited time and resources
The application can run on a native platform (NRF1d)	Removed from scope due to limited time

4.4 Exit Interview Results

Upon completion of our week-long Field Usability Study, our team completed six exit interviews on February 20, 2019. Of the six participants, four were involved in the prototyping phase and were, therefore, familiar with the application. The two remaining participants were new and had not seen the application before. Our team received feedback in relation to the design of the application, the potential impact the application could have

on the workflow and the lives of Reliant Medical Group staff, the usability of the current application, as well as application integration.

4.4.1 Application Usability

Many interviewees claimed that after initially using the application, they encountered problems. However, upon further discussion, it was determined they had not read the instructional documentation we provided along with the application. This informed our team that the application itself was not intuitive. One participant stated “On Home page under today’s habits, sliding the habit to complete it wasn’t intuitive enough”. This resulted in the staff member refraining from using the application throughout the remainder of the study period. Additionally, many of the participants stated the application could have been more user-friendly and that there were too many steps involved in navigating through the application.

4.4.2 Application Integration

Participants felt the prototype would be useful to integrate in their daily schedules and work life. However, the prototype in its current form was difficult to use daily. Users felt that without some type of reminder (e.g. push notifications), it was tough to remember to open the application and complete their scheduled habits throughout their busy days. Participants also felt that having the application created a sense of self-awareness. One interviewee stated that it was purely “guilt” that motivated him/her to complete the habits they had scheduled. Another participant felt that the testing period was not long enough for him/her to see whether or not the use of the application would impact his/her daily life. Overall, the participants expressed that the application as it currently stands would not easily integrate into their lives.

4.4.3 Application Integration with Notifications

As mentioned, in-app and push notifications were not implemented due to time constraints. A main takeaway from the exit interview session was how participants would

have integrated the application into their work lives if notifications were implemented. Participants felt that if the application had a notification feature, it would be much easier to integrate into their daily schedules. One participant claimed that “a reminder would be awesome because it would still remind me even if I forgot about it”. Having busy schedules, the users would benefit from customized reminders and participation would increase as a result.

Chapter 5: Discussion and Recommendations

To gain a better understanding of the application's impact as a whole, below we discuss the interdisciplinary nature of the project, the product as it currently stands, the limitations we faced, and general recommendations for the future of the application. The discussions and recommendations are based primarily on the feedback received during the field usability testing period (Section 4.4).

5.1 Interdisciplinary Nature

During the creation of *Rest & Renew*, our team incorporated a variety of disciplines to ensure we were designing an effective intervention application. This includes principles of psychology, systems analysis and design process, and application development approaches. Each discipline covered was necessary in the overall creation of the application.

Since the main goal of the project was to develop a technology-based intervention to reduce provider and staff burnout within Reliant Medical Group, our team conducted research to understand burnout and its impact on providers and staff. It was pertinent for our team to understand the psychological elements behind burnout and the measures that can be taken to prevent it. Through our research, we identified possible ways to reduce burnout and the features a mobile application should contain in an attempt to do so.

Having proper understanding of the systems analysis and design process was crucial for our team to clearly understand the needs of Reliant Medical Group and how those needs could best be met. This led our team to create a project scope that would fit sponsor needs and expectations and would be feasible given our project timeframe. Our team also performed a thorough market analysis in which we researched the applications relevant to our intended product. This was necessary in understanding what is currently available and what our team could potentially implement in our application. Using these business practices allowed our team to understand our sponsors needs and, in return, provide an application that delivered solutions to those needs.

Rapid Application Development methodology was used for the application development approach, in order to create the application in the time frame given for our project. We used Ionic 4 as the application development framework. It was necessary for

our team to understand the development aspect of this project in order to build the application itself.

5.2 Existing Product

We developed a prototype Ionic application that is accessible from any device with internet connection through a web browser, available at <https://rest-and-renew.firebaseio.com/>. The user will be prompted to either create a new account or log into an existing profile. The current implementation of the application allows users to view their personalized profiles which contains their habit progress, notification settings, and gratitude journal entries. Individual user information is tracked and stored in the backend of the application.

The user has the ability to edit and log an unlimited amount of habits within the app. Once the habit is completed, the user has the ability to swipe the scheduled habit to the left and mark it as completed. This action can be seen in Figure 16 below. After all habits have been completed by the user for a given day, that particular day of the week will turn from gray to green in color. This serves as a visual aid to track habit completion.

The application automatically logs the user out of the application after an amount of idle time. The user is able to manually log themselves out of their profile from any page in the application aside from the Edit Habit page. The “time out” function will be an important precautionary authentication feature once fully implemented as this takes into consideration the protection of user information.

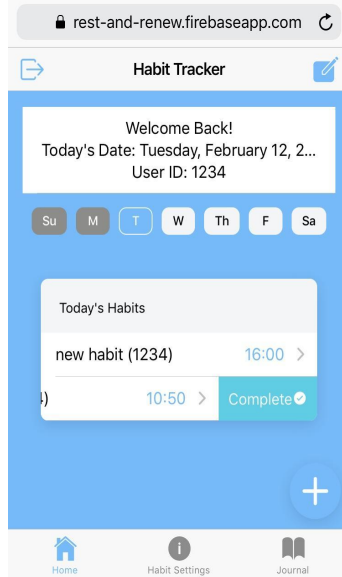


Figure 16: Habit Completed

The screenshots of all functioning application features can be found in Appendix F.

5.2.1 Habit Viewability Limitations

Due to time constraints in the development process, prior and future weeks are not viewable by users. Additionally, habits from past and upcoming days are also not viewable within the current, displayed week (deviation from original FR 3f). The inclusion of this function would be a valuable consideration for future implementations as users may have an interest in viewing and reviewing the habits they have and have not completed in days past. They can, then, use that information to alter their habit settings for days to come.

5.2.2 Authentication Limitations

The current implementation of the Rest and Renew application does not require any password/pin authentications for users to access their profile. The only authentication measure in the existing product is a User ID. If the User ID input does not match any records in the system, the login attempt will fail and prompt the user to create an account.

5.2.3 Notification Limitations

In-app notifications, as well as push notifications, are not available for the current version of the application. This is a function that may be deployed after the application has

been moved to a native platform. Notifications will be an important feature in that it reminds the user what times of the day have been designated for habit completion. Without push notifications, the user needs to keep the application window open in order to view their habit schedule.

5.2.4 Development Platform Constraints

The team used Ionic 4, a beta release version of Ionic, to build the application. Because Ionic 4 was not an official release at the time of development, the team had to work with limited documentation. This limitation impacted our team's ability to implement some Ionic features as originally planned.

5.3 Recommendations

Our team came up with four recommendations. They include recommendations for future development, deployment, and implementation. These suggestions originate from reviewing feedback and experiences through user testing, development, and sponsor interactions.

Recommendation 1: Move the development to a native platform. Feedback from our exit interviews showed us that notifications would greatly improve the user's experience with habit tracking. We recommend moving to a native platform as it is easier to implement notifications on a native platform compared with a web platform. The successful implementation of push notifications is an integral part of building a successful habit tracking application. Our prototype was developed in Ionic and notifications are not implemented; however, we believe it is still a valuable product that can be used as a guide for future development of the application.

Recommendation 2: Enhance the application by implementing additional features that have been verified by feedback from testing. This list of features can be found in Appendix H. Our team took into consideration all the suggestions we received from our sponsor discussions, user testing, and interviews, and used them to identify features to bring the application to the next level. Some examples include implementing notifications, authentication, and a weekly summary. As mentioned in section 4.4.3, notifications are an

integral part of improving the impact and experience of the application, so we highly recommend it be implemented in the future. Authentication is another important feature to implement. It is important that user profile's are protected and others should not have access to it. The habits and journal entries are private information that should be kept secure.

Recommendation 3: Conduct a longer field usability study. Our team recommends extending the test period to at least one month. Feedback from our exit interviews showed that users were not able to fully integrate the application into their schedules in a one week period. One reason users were more aware of their habits was that they felt guilty for not using the application during the test period. An extended trial period would give the users more time to get used to the application and integrate it more naturally into their schedule. Using the application for a longer period of time also means it has more time to make an impact on the user.

Recommendation 4: Carry out an in-person application launch for testing. Our team found that most users did not review any of the instructional materials and therefore found the application hard to use. A kick-off instructional meeting could help ensure all users have an understanding of how to use the application and can have a more meaningful experience testing.

Chapter 6: Conclusion

Partnering with the Reliant Medical Group gave our project the opportunity to address problems that were affecting them on a daily basis. Through our iterative application development process we were able to gain constant feedback about our application in order to make it as customized to Reliant Medical Group as possible. This design process would not have been possible without the guidance and encouragement of our sponsors as well as our advisors. At the end of this MQP, we had a functioning application prototype with many paths of future development. The current application is a strong base for future development.

6.1 Reflections

Throughout the MQP process of creating of Rest & Renew, our team has learned from our experiences of working with sponsors, developing an application, testing with potential users, and more.

One of the first things we learned was it is extremely important to have a deep understanding of the problem at hand, which in our case was provider and staff burnout. This understanding helped us take on a different point of view when trying to frame our project and in discussions with our sponsors and Reliant staff.

In addition, application development was new to most of our members; however, we were able to see this as a challenge we wanted to overcome. We were able to learn a significant amount about application development through help from our advisors, sponsors, self teaching, and simply trial and error. It was definitely a rewarding experience.

We also learned of the many obstacles that exist with working on a project of this scale. We had to learn how to balance sponsor expectations and user needs with the project schedule and our resources, such as our technology platform and skill set, all while still completing an impactful and meaningful project.

Lastly, working with our sponsor to develop and test our project has been a valuable experience. We were able to gain an understanding of the struggles they faced that our project was trying to address. It provided us with a user-centered perspective, where we learned to always try to view things in the point of view of the user, and not just ourselves.

The combination of all these experiences has given us an expanded skill set that we hope to utilize in our future endeavors.

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Appendix A: Project Plan

Our team will work to complete this project over the course of three terms. Each term will have a specific focus. A-term focused on formulating the project, defining the scope, and research and writing the project proposal. B-term will focus on application development, testing and documentation, and gathering feedback. Finally, C-term will focus on making adjustments according to feedback and wrapping up the project report.

Our team utilized When2meet to identify weekly meeting times. We found times we could meet each day and decided to use those times when necessary. We also used it to schedule weekly meetings with our advisors, Professor Kordzadeh and Professor Tulu. Agendas were prepared and used for each meeting and helped keep the meeting focused.

Here is our outlined Project Plan:

Phase	Task Name	Duration (days)	Start	Finish	Resource Name(s)	Task Category
Phase 1	Establish Business Needs, Requirements, and Constraints	0	8/22/2018	8/22/2018	Drs Bourne & Garber	Req. Gathering
Phase 1	Research Burnout on a Broad Scale	12	8/29/2018	9/10/2018	Rocky	Research
Phase 1	Research Physician Burnout Causes and Symptoms	12	8/29/2018	9/10/2018	Tasharah	Research
Phase 1	Research Physician Burnout Effects and Reduction Methods	12	8/29/2018	9/10/2018	Pawan	Research
Phase 1	Research Application Development Practices	12	8/29/2018	9/10/2018	Meghan	Research
Phase 1	Advisor Meeting	0	9/5/2018	9/5/2018	Profs Tulu & K	Advising
Phase 2	Sponsor Meeting	0	9/12/2018	9/12/2018	Drs Bourne & Garber	Req. Gathering
Phase 2	Advisor Meeting	0	9/12/2018	9/12/2018	Prof. K	Advising
Phase 2	Write Up Findings on General Burnout	4	9/12/2018	9/16/2018	Rocky	Background

Phase 2	Write Up Findings on Physician Burnout	4	9/12/2018	9/16/2018	Tasharah & Pawan	Background
Phase 2	Create Application Matrix	4	9/12/2018	9/16/2018	Pawan & Meghan	Background
Phase 2	Rate Current Burnout Reducing Apps	4	9/12/2018	9/16/2018	Pawan & Meghan	Background
Phase 2	Write Up Findings on User Interface & Design	4	9/12/2018	9/16/2018	Tasharah & Meghan	Background
Phase 2	Write Up Conclusions Drawn From App Matrix	4	9/12/2018	9/16/2018	Meghan	Background
Phase 2	Advisor Meeting	0	9/19/2018	9/19/2018	Profs Tulu & K	Advising
Phase 2	Complete Second Iteration of Background	4	9/19/2018	9/23/2018	Collaborative	Background
Phase 3	Establish Team Mission & Objectives	0	9/22/2018	9/22/2018	Collaborative	Methodology
Phase 3	Write Up Literature Review Process	4	9/19/2018	9/23/2018	Tasharah	Methodology
Phase 3	Write Up Marketplace Review Process	4	9/19/2018	9/23/2018	Pawan	Methodology
Phase 3	Write Up Requirement Gathering Process	4	9/19/2018	9/23/2018	Meghan	Methodology
Phase 3	List and Describe Each Requirement Gathered	4	9/19/2018	9/23/2018	Pawan	Methodology
Phase 3	Write Up Interview Purpose	4	9/19/2018	9/23/2018	Tasharah	Methodology
Phase 4	Draft Introduction	7	9/23/2018	9/30/2018	Collaborative	Introduction
Phase 2/3	Advisor Meeting	0	9/26/2018	9/26/2018	Profs Tulu & K	Advising
Phase 3	Design Interview Questions	4	9/27/2018	10/1/2018	Meghan	Methodology
Phase 3	Submit IRB Form	4	9/27/2018	10/1/2018	Meghan	Methodology

Phase 3	Establish Application Development Approach	4	9/27/2018	10/1/2018	Collaborative	Methodology
Phase 3	Write Up Findings on Rapid Application Development	4	9/27/2018	10/1/2018	Meghan	Methodology
Phase 3	Write Up Findings on Ionic Framework	4	9/27/2018	10/1/2018	Tasharah	Methodology
Phase 3	Write Up Findings on Node.js Development Environment	4	9/27/2018	10/1/2018	Meghan	Methodology
Phase 3	Receive Feedback From Sponsors	0	10/3/2018	10/3/2018	Dr. Garber	Methodology
Phase 3/4	Advisor Meeting	0	10/3/2018	10/3/2018	Profs Tulu & K	Advising
Phase 3	Establish Interview Protocol	3	10/3/2018	10/6/2018	Rocky	Methodology
Phase 4	Introduction - Second Draft	1	10/3/2018	10/4/2018	Meghan	Introduction
Phase 3	Establish Prototyping Schedule	5	10/3/2018	10/8/2018	Meghan	Methodology
Phase 3	Establish Field Usability Testing Trial Period Schedule	5	10/3/2018	10/8/2018	Meghan	Methodology
Phase 3	Write Up Implementation Plan	5	10/3/2018	10/8/2018	Rocky	Methodology
Phase 5	Sponsor Meeting	0	10/10/2018	10/10/2018	Drs Bourne & Garber	Req. Gathering
Phase 5	Advisor Meeting	0	10/10/2018	10/10/2018	Profs Tulu & K	Advising
Phase 5	Presentation 1 - Application Proposal	0	10/24/2018	10/24/2018	Collaborative	Proposal
Phase 5	Prototype 1 - Wireframes of Habit Tracking Flow	15	10/29/2018	11/13/2018	Collaborative	Prototyping
Phase 5	Conduct Prototype Interview 1	0	11/14/2018	11/14/2018	Collaborative	Prototyping
Phase 5	Prototype 2 - Tracking Day-to-Day Habit Progression	13	11/14/2018	11/27/2018	Collaborative	Prototyping

Phase						
5	Conduct Prototype Interview 2	0	11/28/2018	11/28/2018	Collaborative	Prototyping
Phase	Prototype 3 - Push Notification Options and App Settings Design	6	11/28/2018	12/4/2018	Collaborative	Prototyping
5	Conduct Prototype Interview 3	0	12/5/2018	12/5/2018	Collaborative	Prototyping
Phase	Prototype 4 - Weekly Summary Settings and Design	6	12/5/2018	12/11/2018	Collaborative	Prototyping
5	Conduct Prototype Interview 4	0	12/12/2018	12/12/2018	Collaborative	Prototyping
Phase	Research backend	18	12/1/2018	12/19/2018	Collaborative	Development
6	Implement firebase	7	12/12/2018	12/19/2018	Meghan & Rocky	Development
Phase	Develop schema	21	12/19/2018	1/9/2019	Meghan & Rocky	Development
6	Implement app changes based on interview results	21	12/19/2018	1/9/2019	Meghan & Rocky	Development
Phase	Resolve comments from A-term	7	12/17/2018	12/24/2018	Tasharah & Pawan	Editing
7	Update methodology with B-term work	7	12/24/2018	12/31/2018	Pawan	Methodology
Phase	Add interviews/prototyping to methodology	7	12/31/2018	1/7/2019	Tasharah & Pawan	Methodology
7	Initial Results Section Write-Up	7	12/24/2018	12/31/2018	Tasharah	Results
Phase	Implement Positive Psych. Feature	14	1/9/2019	1/23/2019	Tasharah	Development
7	Implement Gratitude Journal Feature	14	1/9/2019	1/23/2019	Pawan	Development
Phase	Start Abstract and Executive Summary	1	1/16/2019	1/17/2019	Tasharah	Finalization
7	Create Third Presentation for Advisors	7	1/9/2019	1/16/2019	Tasharah & Pawan	Advising
8						

Phase 9	Present Break Review and C-Term Plan	0	1/17/2019	1/17/2019	Collaborative	Advising
Phase 8	Distribute Application to Staff	0	1/21/2019	1/21/2019	Collaborative	Field Usability Testing
Phase 9	Final Presentation/Poster - Draft 1	8	1/21/2019	1/29/2019	Tasharah	Finalization
Phase 9	Final Presentation/Poster - Draft 2	6	1/30/2019	2/5/2019	Collaborative	Finalization
Phase 8	Undergo Field Usability Testing Period	18	1/21/2019	2/8/2019	RMG Staff	Field Usability Testing
Phase 9	Complete Final Tweaks to App	18	1/21/2019	2/8/2019	Meghan & Rocky	Finalization
Phase 8	Prepare for Exit Interviews	9	1/29/2019	2/7/2019	Collaborative	Field Usability Testing
Phase 9	Final Presentation/Poster - Draft 3	6	2/6/2019	2/12/2019	Collaborative	Finalization
Phase 8	Perform Exit Interviews	5	2/8/2019	2/13/2019	Collaborative	Field Usability Testing
Phase 9	Complete Abstract and Executive Summary (w/ Recomm.)	4	2/9/2019	2/13/2019	Tasharah	Finalization
Phase 9	Finalize Project Report Content (sections & subsections)	11	2/13/2019	2/24/2019	Collaborative	Finalization
Phase 9	Finalize and Print Poster	6	2/13/2019	2/19/2019	Tasharah & Pawan	Finalization
Phase 9	Complete Final Presentation Draft	6	2/13/2019	2/19/2019	Collaborative	Finalization
Phase 9	Revise Results and Findings	7	2/13/2019	2/20/2019	Tasharah	Finalization
Phase 9	Edit and Finalize Report Flow	11	2/13/2019	2/24/2019	Tasharah	Finalization

Phase 9	Complete citations/ in-text appendix and figure references	5	2/24/2019	3/1/2019	Collaborative	Finalization
Phase 9	Final Advisor Meeting	0	2/28/2019	2/28/2019	Profs Tulu & K	Advising
Phase 9	Final Sponsor Presentation		TBD	TBD	Collaborative	Finalization
Phase 9	Submit Final Paper	0	3/1/2019	3/1/2019	Collaborative	Finalization
Phase 10	Fill out eCDR	3	3/11/2019	3/14/2019	Each Student	Post-Project
Phase 10	Present to FBS Department	0	4/19/2019	4/19/2019	Collaborative	Post-Project

Appendix B: Interviews

Prototype Interview Protocol

This interview will take place after the development of each application prototype and after the interviewee has tested the prototype. The questions asked depends on what features have been implemented in the current prototype.

Interview Details:

- Interviewer:
- Role of Interviewee:
- Date & Time:
- Location:

Introduction of Ourselves:

Good morning/afternoon, we are a project team from Worcester Polytechnic Institute sponsored by Reliant Medical Group that is working to develop a technology-based intervention to reduce provider and staff burnout within Reliant Medical Group.

Purpose:

The purpose of this interview is to receive feedback on the functionality of the various features implemented in the application prototype. Additionally, we want to understand the user's stress levels and phone usage. We will be asking a series of questions regarding stress levels, phone usage, and prototype functionality.

Information Usage:

The information from this interview will be used to help our team understand the usability and functionality of our application. This information will help us identify any changes we need to make for the next round of development. Your identity will not be linked to your responses. Your identity will remain anonymous and confidential.

Do you have any questions before we begin?

Interview Type 1 Questions:

1. *On a daily basis, how often would you call yourself stressed?*
2. *On a daily basis, how often do you feel extremely tired?*
3. *On a daily basis, how often do you check your phone?*
4. *Based on meditation tools*
 - a. *On a scale of 1-7, how easy was it to find meditation tools? 1 being, extremely difficult to navigate, 7 being extremely intuitive.*
 - b. *What did you like about the meditation tools?*
 - c. *What did you like about the placement of meditation tools?*

- d. *If you had to change one thing about the mediation tools, what would you change and why?*
 - e. *Would using a tool like this fit into your schedule?*
5. *Based on happiness tools*
- a. *On a scale of 1-7, how easy was it to find happiness tools (ex. Jokes, pictures of family, etc.)? 1 being, extremely difficult to navigate, 7 being extremely intuitive.*
 - b. *What did you like about the happiness tools?*
 - c. *What did you like about the placement of the happiness tools?*
 - d. *If you had to change one thing about the happiness tools, what would you change and why?*
 - e. *Would using a tool like this fit into your schedule?*
6. *Based on reminders*
- a. *On a scale of 1-7, how easy was it find reminders (ex. To drink water, to take a walk etc.)? 1 being, extremely difficult to navigate, 7 being extremely intuitive.*
 - b. *What did you like about the reminders?*
 - c. *What did you like about the placement of the reminders?*
 - d. *If you had to change one thing about reminders, what would you change and why?*
 - e. *Would using a tool like this fit into your schedule?*
7. *Based on customized notifications*
- a. *On a scale of 1-7, how easy was it to customize features? 1 being, extremely difficult to navigate, 7 being extremely intuitive.*
 - b. *What did you like about customized notifications?*
 - c. *What did you like about the placement of the customization tool?*
 - d. *If you had to change one thing about the customization tool, what would you change and why?*
 - e. *Would using a tool like this fit into your schedule?*

Exit Interviews

This interview will take place after the field usability study

Interview Details:

- Interviewer:
- Role of Interviewee:
- Date & Time:
- Location:

Introduction of Ourselves:

Good morning/afternoon, just to remind you, we are a project team from Worcester Polytechnic Institute sponsored by Reliant Medical Group that is working to develop a technology-based intervention to reduce provider and staff burnout within Reliant Medical Group. Once again, thank you for taking the time to walk through our beta application.

Purpose:

The purpose of this interview is to talk about your experiences using our application and receive feedback on the current functionality as well as how to improve and implement it in the future. If you have not had time to test the application over the course of this past week, we can walk through the application together.

Information Usage:

The information from this interview will be used to help our team understand the usability and functionality of our application. This information will help us identify any changes we need to make for the next round of development. Your identity will not be linked to your responses. Your identity will remain anonymous and confidential.

Do you have any questions before we begin?

1. Did you use the application during the testing period?

Post Week Long Testing (if they used it):

1. Based on the features that are currently implemented
 - a. What do you like most about the application?
 - b. What do you like least about the application?
 - c. What would you change?
 - d. How do you think you would you integrate the application into your weekly routine?
2. Based on the features we discussed previously
 - a. What would you like to see implemented by a future team?
3. Was the application useful to you?
4. How did using the application affect your awareness of the habits you would like to integrate into your workday or life?

5. How did using the journal entry feature affect your awareness about your own thoughts throughout the day?
6. Although you did not receive notifications through the app, were you able to keep track of your habits? Please explain.
7. How would having push notifications in the app impact your experience?

Usability Testing (if they didn't use it):

1. Could you please explain the reasons that resulted in you not using the application?
2. Go through the application with them
 - a. Log in using this ID (ex. 4321)
 - b. Create a habit
 - i. Set the habit for multiple days of the week
 - ii. Set a time
 - iii. Move the habit to an active habit
 - iv. Show habit on the home screen(?)
 - v. Complete a habit
 - c. Navigate to the journal page
 - i. Create a journal entry
 - ii. Edit a journal entry
 - iii. Delete a journal entry
3. Based on the features that are currently implemented
 - a. What do you like most about the application?
 - b. What do you like least about the application?
 - c. What would you change?
 - d. How do you think you would you integrate the application into your weekly routine?

For all the participants:

1. Is there anything else you would like to add, anything we missed or did not mention in the interview so far?
2. Thank you again for your time. We appreciate your commitment to this project. Enjoy the rest of your day.

Appendix C: IRB Approval

WORCESTER POLYTECHNIC INSTITUTE

100 INSTITUTE ROAD, WORCESTER MA 01609 USA

Institutional Review Board

FWA #00015024 - HHS #00007374

Notification of IRB Approval

Date: 21-Nov-2018

PI: Tulu, Bengisu

Protocol Number: IRB-19-0135

Protocol Title: Preventing Physician Burnout Through Technology Support Tools

Sponsor*:

The WPI Institutional Review Board (IRB) approves the modification submitted on 10-Nov-2018 to the above-referenced protocol.

This modification does not extend the expiration date of your approval. The previous approval remains in effect from 21-Nov-2018 until 04-Oct-2019 unless terminated sooner (in writing) by yourself or the WPI IRB. If the research is to continue past 04-Oct-2019, you must submit a Study Renewal form to the IRB via InfoEd, at least 30 days prior to expiration.

Please contact the IRB at irb@wpi.edu if you have any questions.

*if blank, the IRB has not reviewed any funding proposal for this protocol

Appendix D: Initial Application Analysis and Application Reviews

Before developing an application, it is important to understand what solutions already exist and the features these solutions offer.

Application Comparison Matrix

Many applications on the market as of October 2018 specialize in treatment for burnout. In order to gain a better understanding of relevant applications, our team created an application assessment tool. Our team looked specifically for certain properties such as an intuitive user interface, accurate advertisement, and features that could improve the application using a 1-5 scale, 1 being it does not meet the requirement, and 5 being it completely met the requirement, and the weight of the numbers in between differed based on the certain criteria. The table below shows the rubric that the team used to analyze the applications. The application analysis can be found in background section 2.3.1.2.

Original Application Matrix Rubric

Cri teria	1	2	3	4	5
Navigation	Could not find what we were looking for, was confusing, there was not a flow between the screens.	After some looking we found what we were looking for, there was not a flow between screens.	After some looking we found what we were looking for, there was a flow between screens.	Easy to find what we were looking for, no flow between screens.	Easy to find what we were looking for, a clear flow between screens.
Feature -- Meditation	Does not contain any meditation features. Is not sold as a meditation application.	Contains meditation features but is not the focus of the application.	Contains meditation features but is not the focus of the application. Sold as a relaxation application.	Contains meditation features. Sold as a fully functioning meditation application.	Contains meditation audio, video, and written descriptions. Above and beyond a fully functioning meditation application.
Feature -- Notificatio	Does not allow for		Has the option for turning notifications		Has the option for turning

n	notifications.		on and off. Some features are notifications.		notifications on and off. Reminders are notifications.
Feature -- Documented Help	There is no documented help within the application.	There is documented help but it lacks details and is confusing.	There is documented help, but it lacks details.	The documented help within the application has a large amount of details.	The documented help within the application has a large amount of details and includes a tutorial feature explaining how to use the application.
Feature -- Jokes	Has no joke feature.				Has a joke feature.
Feature -- Pictures	Pictures are not used as a form of media.	A few (1-3) pictures are used as a form of media.	Some (4-6) pictures are used as a form of media for additional explanation.	Pictures are a common form of media for additional explanation.	Pictures are the primary form of media for additional explanation.
Feature -- Profile + Progress + Customization	Has no profile feature.	Each individual has a personal profile.	Each individual has a profile that gets updated as they use the application.	Each individual has a profile that tracks progress and reminds the user to continue progressing.	Each individual has a profile that tracks progress and compares with other individuals. Initial set of questions asked to create tailored profile
Accessibility -- Audio	Has no audio within the application		The application has the ability to have audio but it is not used as an accessibility tool.		Audio is used as a way to vocalize what is on the screen as a tool for increased accessibility.
Accessibility -- multi-lingual	Application is written in one language.		Application has the option to change text languages throughout the application.		Application has the option to change all languages throughout the application (including any audio and video).

This matrix was created to assist our team in understanding how well each application used the criteria mentioned above. Since not all of the applications we downloaded were of the same theme, some had features which others did not. The matrix allowed us to carefully evaluate each application based solely on the criteria the team were looking for. Some of the criteria contained within the matrix was based off of initial requirements we felt necessary to be in the application, such as features from our requirements gathering, accessibility of the application, and navigation. This gave our team a better understanding of how the criteria should be implemented into our application.

Application Analysis

Meditation is a powerful tool in reducing burnout because this relaxation technique makes physical changes to the individual's auditory, sensory, and frontal cortex and provides "the skills called upon to focus and be present during meditation can assist providers in focusing on and being present with their patients despite the abundant distractions" (SBH, 2017).

Due to the effectiveness of this relaxation tool, the Apple store was looked at closely due to feedback that we had received from our sponsor saying that most providers and staff members had iphones. In further research, we plan on also exploring applications in the Google play store. The process of our application search was:

1. We narrowed our search down by filtering through the health and fitness category of the app store and looked through the top 100 free applications that were advertised as, positivity, meditation, and health & wellness applications.
2. From the top 100 of the health and fitness category, our team downloaded seven applications all which contained meditation features. Prior to downloading the applications, we reviewed the description, customer reviews, intended target users and ensured they were highly rated applications. We downloaded a majority of meditation focused applications to understand what is needed to make a valuable application with meditation features, because the meditation intervention feature was highly emphasized during our requirements gathering sessions.
3. Then based off of one of our requirements being a jokes intervention, we searched the app store for "joke applications", and had decided to a single jokes application.

4. The last application our team had taken a look at was Burnout Proof an application developed by Dr. Drummond advertised to treat and prevent burnout, we felt this was necessary to download as it related directly to our project.

We used our application matrix to assess the applications we have chosen. We saw how some applications had efficiently implemented some features, and others had not. Features that scored well in our application matrix implemented the specific feature well (e.g. receiving a score of 5 in a particular category), if an application scored low, (a score of 1 in any individual category) it was not used as inspiration for our application. With this information our team will be able to have a better idea of how to utilize these features in our to be application.

We hope that this will give us a more broad idea of the full spectrum of applications currently on the market in an attempt to lessen provider and staff burnout.

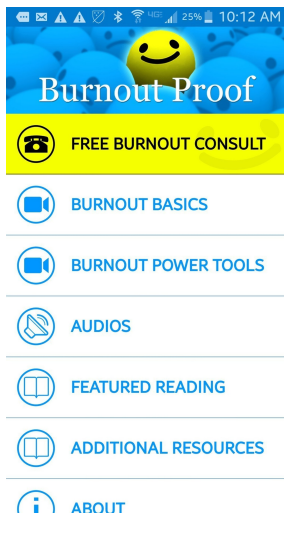
The applications were chosen because of a specific feature they provide that we are looking to add to our application. This included features like a daily joke and relaxation techniques. Features that were specific requests from our sponsor were used as the baseline for the applications that we looked into. If an app was rated well in the Apple store, and claimed to successfully implement a feature we were looking into, it was analyzed. In Table 2, you can see the matrix scores for five applications that we analyzed. This gives you the scale of features that we looked into. In further research, we will add to our matrix based on applications that we analyze from the Google play store. In Appendix C, there are brief descriptions of the applications and why they were important for us to look at.

Original Application Matrix Scores

	Navigation	Space	Meditation	Notification	Documented Help	Joke	Pictures	Profile	Audio	Multi-lingual
BurnoutProof	3	5	3	1	3	1	1	1	3	1
Breathe2Relax	2	1	2	1	5	1	4	4	3	1
Insight Timer	4	3	4	1	1	1	2	5	3	1
Jokes!	5	1	1	1	1	5	1	1	1	1
Calm	5	4	4	1	1	1	4	4	3	1
Happify	4	4	4	5	4	1	4	5	3	1
Headspace	5	4	4	5	3	1	4	5	3	1
Happy	4	2	1	2	1	1	1	2	1	1
Simply habit	5	3	4	5	1	1	3	5	3	1

Burnout Proof:

Prevent Physician Burnout Proof is the first mobile application designed to prevent physician burnout, nurse burnout and burnout in all other healthcare workers by, lowering your stress levels, create more work life balance and a more ideal practice. The application offers video on understanding what burnout is, meditation audios, and pamphlets on daily measures one can take to cope with burnout, for the price of \$10. Our team chose to review Burnout Proof as it is the only application within the Google play and iOS app store that was developed to prevent and treat physician burnout. Even though the application has many useful audio and written tools, there is no specific plan laid out for the user to follow.



Breathe2Relax:

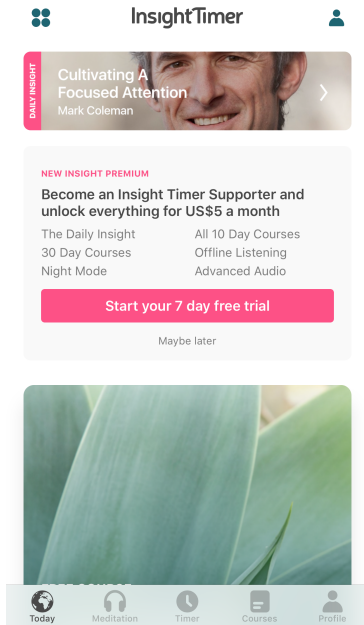
Breathe 2 Relax designed by the National Center for Telehealth & Technology is a portable stress management tool which provides detailed information on the effects of stress on the body and instructions and practice exercises to help users learn stress management skills. Breathe2Relax accomplishes the main purpose of teaching users how to breathe very well. It accomplishes this with detailed instructions on how to use the application and allowing for portfolio customization that gives suggestions on how each breathing session should be used. The application also tracks each breathing session and gives suggestions based off each session. However, the interface of the application is very

dull, and has quite a bit of unused space. The application showed our team a good example of profile tracking for a stress relieving intervention.



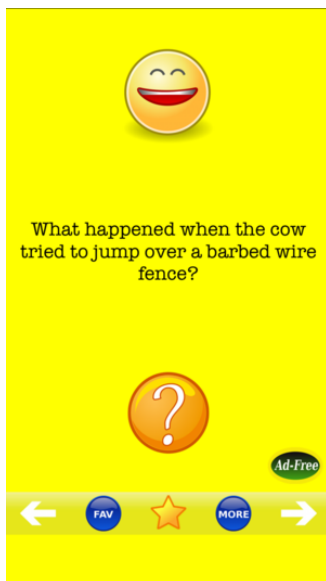
Insight Timer - Meditation App:

Insight Timer is the #1 meditation application available on the Apple app store and Google play. Its purpose is to help calm the mind, reduce anxiety, manage stress, and improve happiness. It features guided meditations and talks by mindfulness experts, neuroscientists, psychologists, and meditation teachers from Stanford, Harvard, Dartmouth, and the University of Oxford. This application offers over 12,000 meditations; however, only a few are available to users who don't pay the annual fee of \$49.99. Each meditation featured in the application has a specific purpose or suggested activity you can be doing while listening to the audio track. Additionally, you can create a customizable profile that allows you to be a part of a community, where you can see meditations that others have listened to. This application allowed us to determine how we should incorporate meditation audio, such as audio length and number of tracks.



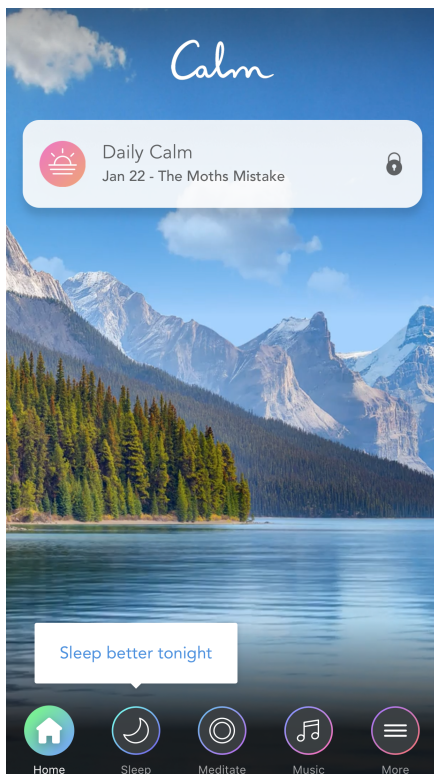
Jokes! LOL Best Funny Jokes:

Jokes! LOL Best Funny Jokes is a jokes application our team looked at as jokes is a feature our team wants to implement. Our team looked at this application to understand how to present the jokes in our application. This application is very easy to navigate. A joke is placed on the screen, with left and right arrows to swipe between jokes. This application was chosen over others due to the price and reviews.



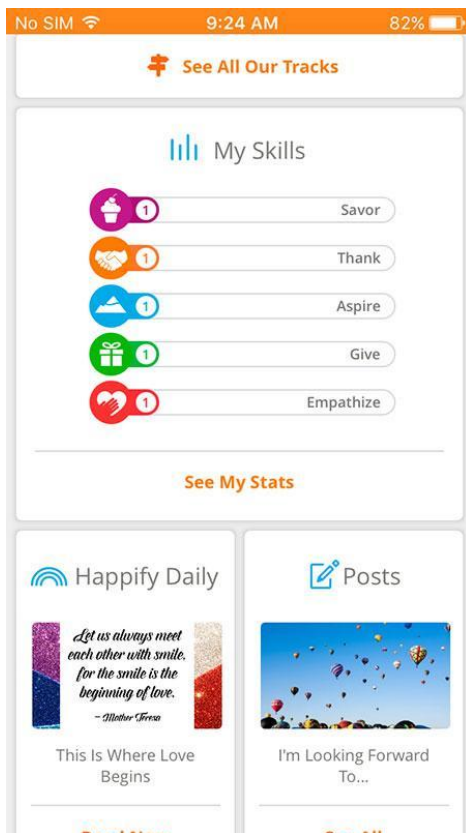
Calm:

Calm is a meditation and sleep application with features such as sleep stories, breathing programs,, and relaxing music. Calm features different meditation programs for beginners who are just starting out, to programs for advanced users. This application features a variety of different lengths of meditation audios, which is essential for our application. We must find various lengths of meditation audios so the user can choose one based on their free time. This application also features de-stress breathing exercises and has many soothing pictures. In comparison with other meditation applications we assessed, Calm allowed the user to stop a meditation and resume it at any time. It also gave suggested activities to be doing while listening to the audio..



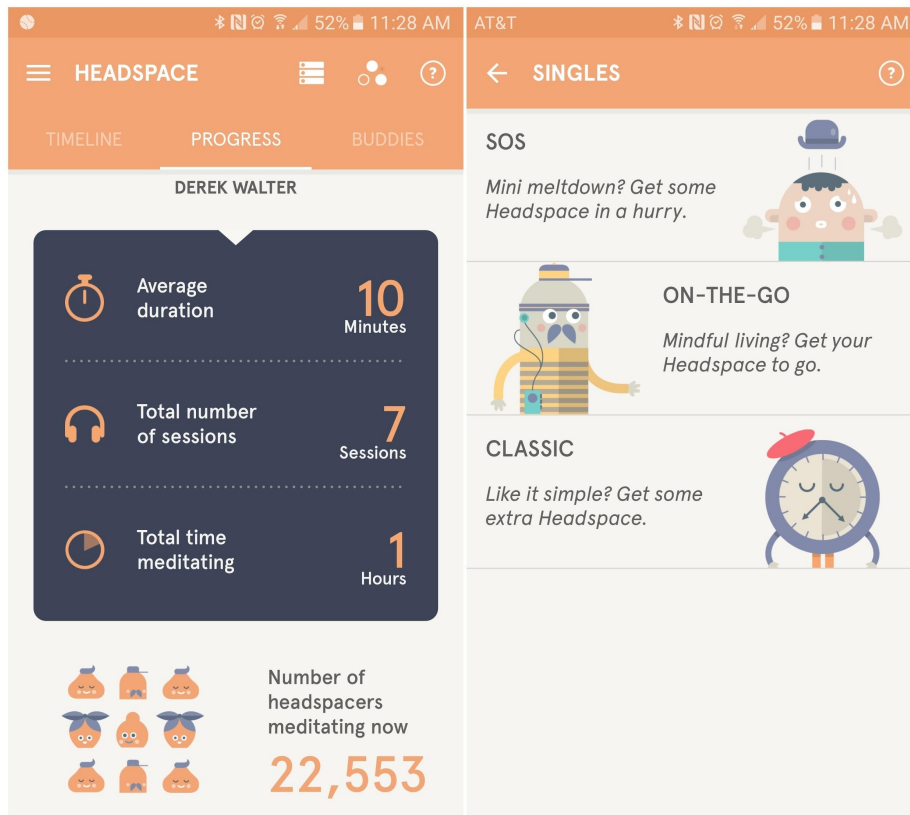
Happify:

Happify is a mobile application that decreases stress and worry through science-based activities in an attempt to lower stress. Currently rated at a 4.5 in the Apple store, this application has a strong following of individuals who claim great success from this product. The application claims that you will feel better in as little as two months. This application was well designed, beginning with a detailed profile that tracked an individual's progress. It rewards small successes, which claim to help the individual feel that progress is being made. The profile aspect of the application is especially effective because you can see your progress when lined up against other people that you know. The biggest negative to the Happify application is the subscription fee, currently set at \$15 per month. They do provide discounts for the purchase of large packages, but that is the standard rate.



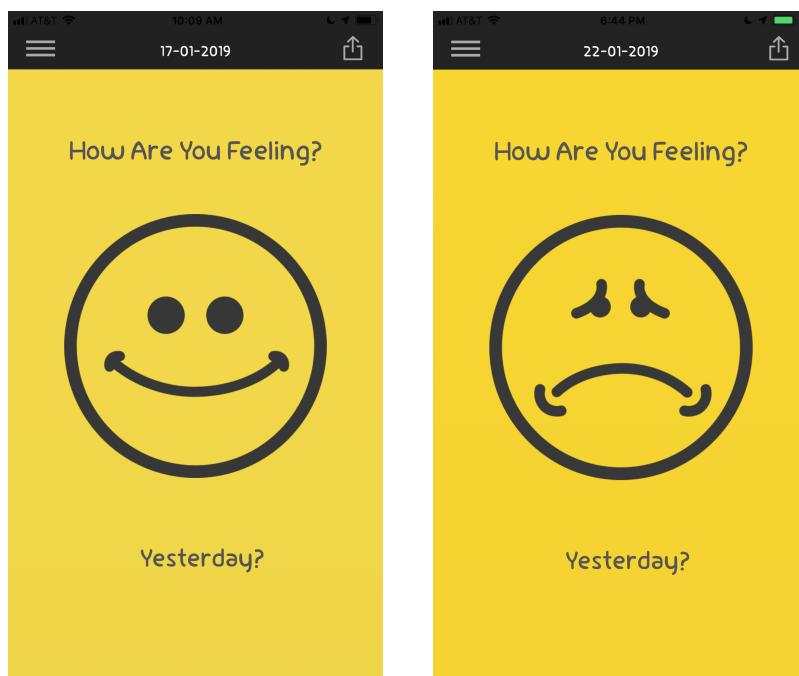
Headspace:

Headspace is a relaxation tool that is based in guided meditation. Currently, with a 4.9 rating on iTunes, Headspace is one of the most praised health and wellness applications in the Apple store. The application has meditations that vary in length from extremely short (2 minutes) to preparing for bed (15 minutes). With hundreds of preloaded guided meditations, it really does a great job of tailoring the meditation to exactly what the individual needs at the moment. Headspace also creates a detailed profile that allows the user to track their progress, as well as compare with their friends. The biggest drawback to the application is a subscription fee set at \$13 per month. This is lower than some other meditation applications, but it is still not free.



Happy:

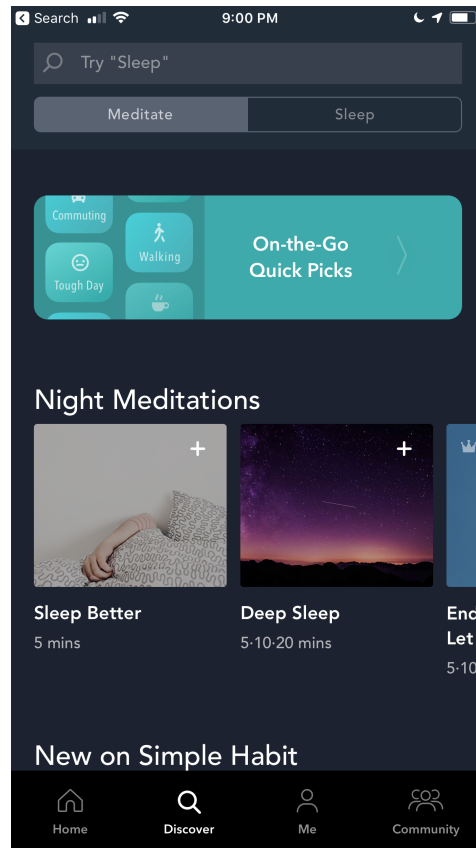
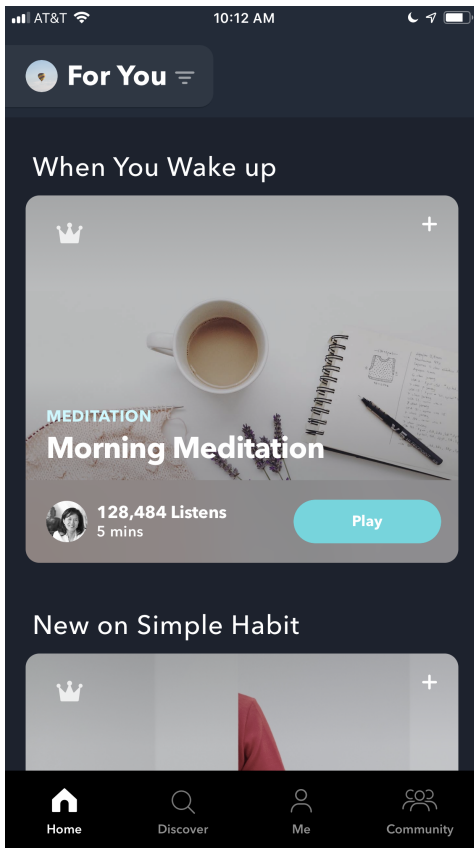
Happy is a free application designed to help people remember their good and bad moments. Happy is a very simple application where you choose “today's date” and click on a mood, ranging from happy, neutral, sad, and angry. Each day the mood chosen is logged and stored in a calendar, the application can also remind you to set your mood for that day. Through analysis of this application, our team was able to see how people can input their moods and have it tracked. Understanding the use of notifications to remind users to track their mood is important for our team. This is because habit tracking is a functionality we plan to implement in our application.




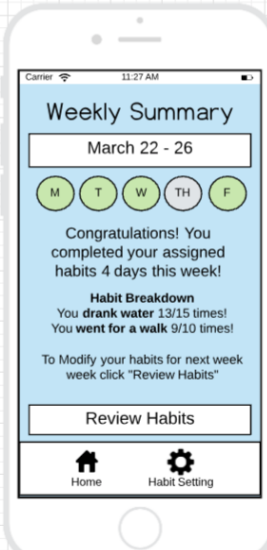
Simple Habit-Meditation:

Simple Habit is a free iOS meditation application designed for busy people. It includes features to reduce stress, improve focus, sleep better, and breathe easier. Created with the intention for their target users being busy people, our team decided to take a look at this application. This is because our application will be designed for the busy staff at

Reliant. This application has an in-depth profile creating experience where your recommendations are customized based off your preferences, your options are saved, and your progressed is tracked. The application also features a community feature where you can encourage members of your community and view which meditations they have been using. After analyzing this app, the easy to navigate layout and short meditation videos are ideal for a person with little time on their hands. This is something we can learn from when developing our application. The application can also notify and encourage you to keep up with the meditation, another feature we will be incorporating for habit building. The application is free to use; however, the app has premium features that can be unlocked for \$8.99 per month.

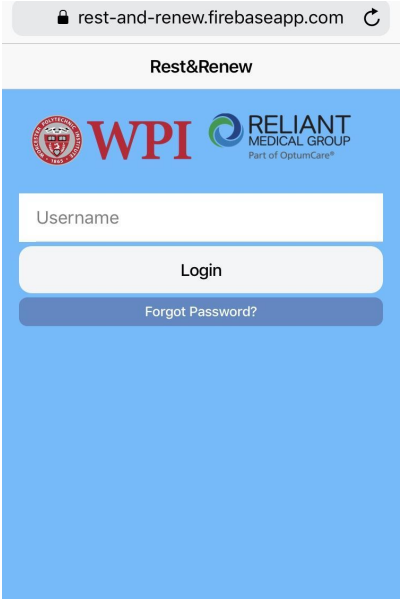
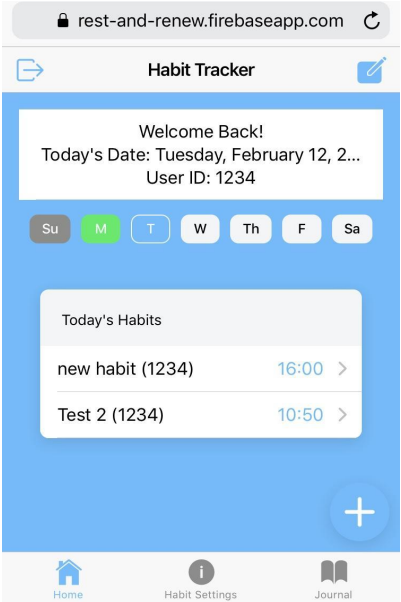
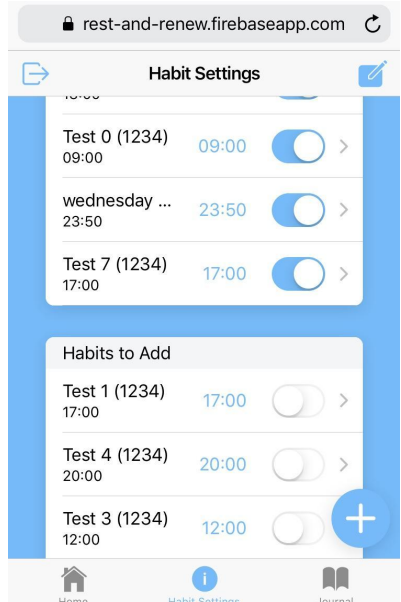
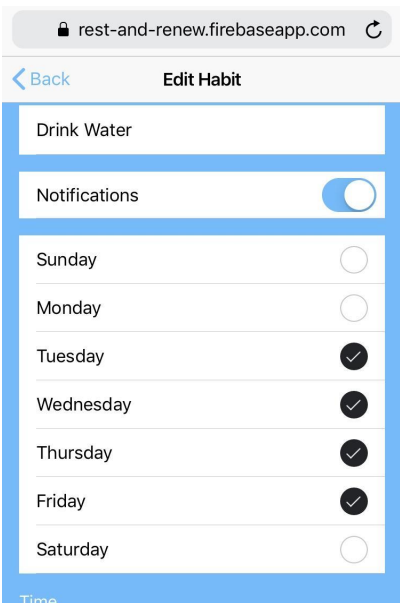
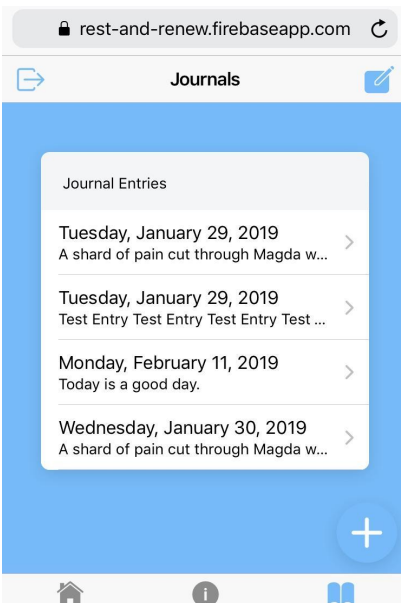
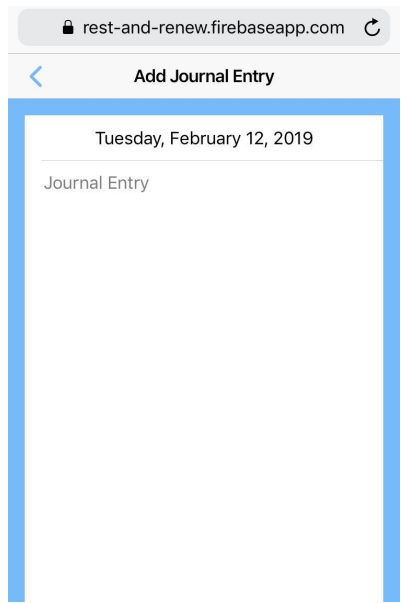


Appendix E: Wireframes

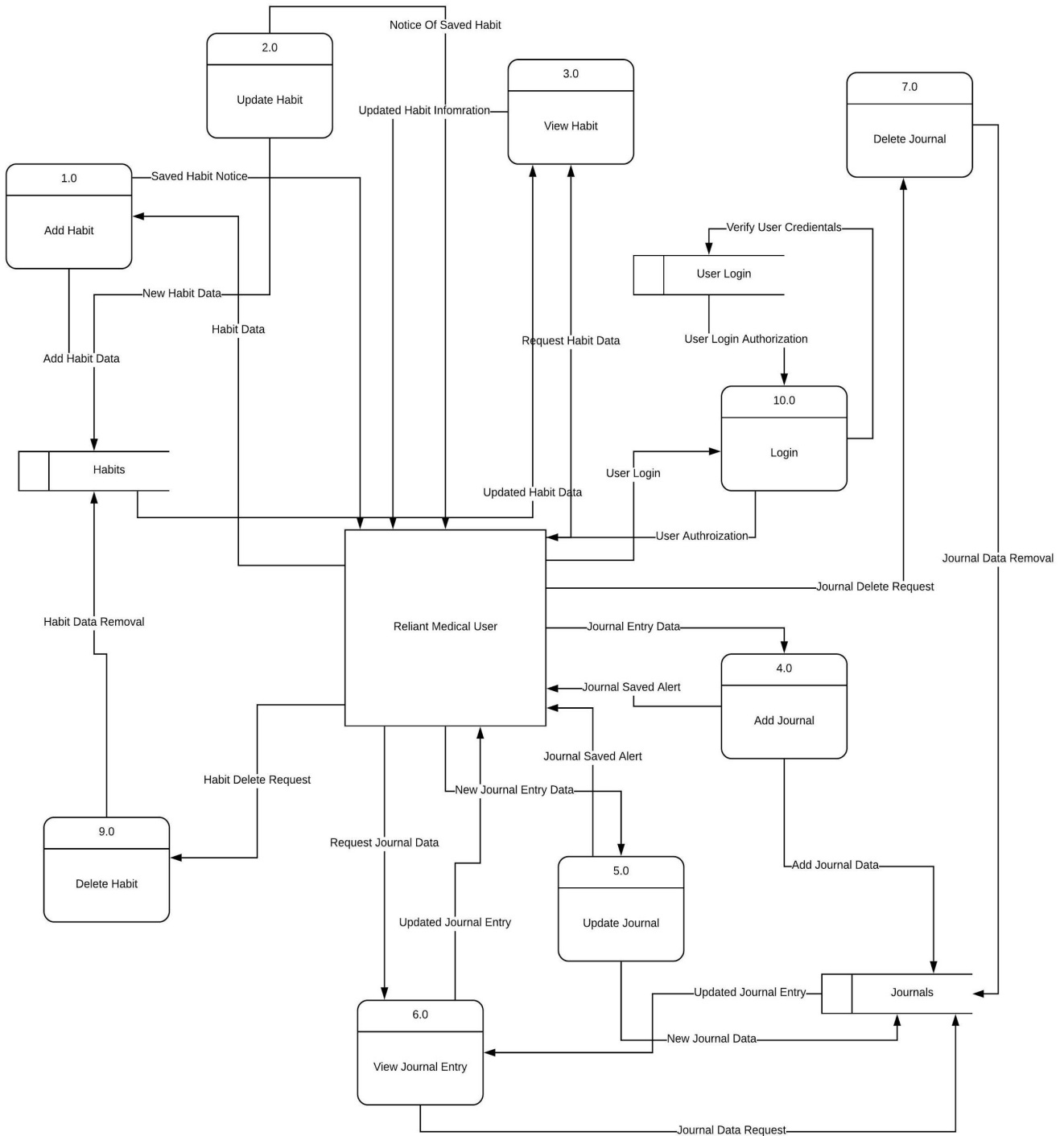
 <p>The Home Page wireframe shows a mobile app interface. At the top, it says "Habit Tracker" and "Welcome Back". Below that, it displays "Today's Date is: Dec 11, 2018" and a week view with days of the week (S, M, T, W, TH, F, S). Underneath, there's a section titled "Habits" with three listed habits: "Drink Water", "Meditate at Lunch", and "Take 3 deep breaths". A plus sign icon is at the bottom right. The bottom navigation bar has "Home" and "Habit Setting" icons.</p>	 <p>The Habit Settings wireframe shows a screen titled "Habit Settings". It starts with the text "You are currently not tracking any habits". Below this, there's a list of habits with toggle switches: "Meditate at lunchtime", "Take 3 deep breaths", "Take a walk", "Drink Water", and "Add custom habit". The bottom navigation bar has "Home" and "Habit Setting" icons.</p>	 <p>The Habit Settings w/ habit wireframe shows the "Habit Settings" screen with one habit, "Drink Water", which is turned on (toggle is green). Below it, there are three more habits: "Meditate at lunchtime", "Take 3 deep breaths", and "Take a walk", all with their toggles off. There is also an "Add custom habit" option. The bottom navigation bar has "Home" and "Habit Setting" icons.</p>
<p>Home Page</p>	<p>Habit Settings</p>	<p>Habit Settings w/ habit</p>
 <p>The Weekly Summary wireframe shows a screen titled "Weekly Summary" for the dates "March 22 - 26". It features a week view with days of the week (M, T, W, TH, F). The text says "Congratulations! You completed your assigned habits 4 days this week!". Below that, it provides a "Habit Breakdown": "You drank water 13/15 times!" and "You went for a walk 9/10 times!". At the bottom, it says "To Modify your habits for next week click 'Review Habits'" and has a "Review Habits" button. The bottom navigation bar has "Home" and "Habit Setting" icons.</p>	 <p>The Push Notifications wireframe shows a notification card for "Rest & Renew" with a "now" indicator. The notification content includes "Drink Water!" and a list of app icons: Messages, Calendar, Photos, Camera, Weather, Clock, Maps, Videos, Wallet, Notes, Reminders, Stocks, iTunes Store, App Store, iBooks, News, Health, and Settings. The bottom dock shows Phone, Safari, Mail, and Music icons.</p>	 <p>The Edit Habit wireframe shows a screen titled "Edit Habit". It has a text field containing "Drink Water" with an edit icon. Below that, there are settings for "Notifications" (toggle), "Repeat" (set to "Daily"), "Alerts Per Day" (set to "2"), and "Time" (set to "8:00 AM" to "9:00 AM"). A "Save" button is at the bottom. The bottom navigation bar has "Home" and "Habit Setting" icons.</p>
<p>Weekly Summary</p>	<p>Push Notifications</p>	<p>Edit Habit</p>

Appendix F: Application Screens

These are screenshots of the application on an iOS device.

		
<p>Login Screen</p>	<p>Habit Tracker</p>	<p>Habit Settings</p>
		
<p>Edit Habit</p>	<p>Journal Entries</p>	<p>New Entry</p>

Appendix G: Data Flow Diagrams



Level 0 Data Flow Diagram

Appendix H: Additional Features

Feature	Description
Notifications	A type of message that pops up on a mobile device, that doesn't require a user to be within a certain application to receive them
Weekly Summary	A weekly summary that summarizes users completed versus non completed habits of that week. Indicating which days habits were completed, and missed
Calendar	A functioning calendar that allows clickable dates, and habits to be shown on each day of calendar
Habit Tracking: Habit can have multiple instances	If a user would like to be able to have a certain habit occur multiple times throughout the day
User ID: login with user id and password (authentication)	Upon logging in to the application users authentication should be verified by their user ID and password
Habit Tracking: Each habit can have multiple 'alerts'	When it is time to complete a habit, and a notification shows. The habits should be able to notify a user multiple times
Habit Tracking: Allow users to view habits from prior, present and upcoming weeks	Weeks can be changed and a habit that is occurring in an upcoming week should be viewable. Also current and previous habits that have occurred will be viewable
Habit Tracking: Allow users to view habits from prior, present and upcoming days	Different days should be viewable and a habit that is occurring in an upcoming day should be viewable. Also current and previous habits that have occurred on different days will be viewable
Habit Tracking: allow users to visually see their tracked habits in the form of a pie chart	Habits that have been completed should be presented in a pie chart format. So a user can visually see how they have been completing their habits.
Journal Entries: The application will trigger push notifications to remind users to use their gratitude journal.	Push notifications will be used as reminders to complete gratitude journal on a set time on days.
The application can run on a native platform	Application can run as a native mobile app, whether that be IOS or android.