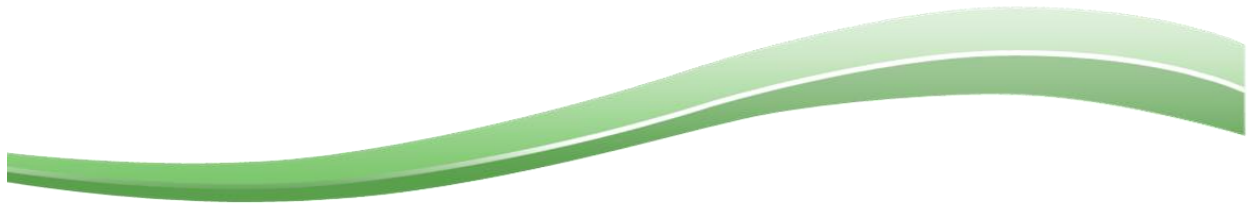


ToothGloss



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HDCE 518b

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ToothGloss Specifications

ToothGloss is an advanced interdental cleaning system, to be used as a replacement, or supplement to traditional flossing. ToothGloss includes advanced technology gum-like Gloss sticks within a SmartBox, whose interactive digital screen empowers the users to set goals and schedules that work for their lives.

The goal of this product is to make the activity of interdental cleaning fit better within people's lives, allowing them to use the product regularly to improve their dental health.

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1 Overview

1.1 Introduction

This document is intended to serve as the detailed specification for the development of the ToothGloss system. It describes the design needs of the SmartBox and integrated digital screen's software program. Description will include the interaction between the different portions of the system; the Gloss, SmartBox, and digital screen software.

While the resulting material property needs of the Gloss will be described, the chemical and material ingredients of the Gloss will not be detailed. This portion of the system requires a separate development team.

There will be some discussion of rationale behind design decisions, based on the user research background covered in section 2.

1.2 Audience

The development of the ToothGloss system will require a project manager, industrial designer, electrical engineer, and software developers. This document is not intended for end users, or medical professionals in study or distribution of the product.

The project manager will need to interface with the Gloss development team, which may include chemical and materials engineers, food and drug specialists, and medical experts. This document, while not explicitly for them, may be of interest to that team as well.

1.3 Scope

The ToothGloss system includes

- Gloss
- the SmartBox
- the interactive digital screen's software
- basic use recommendations

The system does not

- automatically account for travel between different time zones and daylight savings, as the clock (section 5.2.2) is set manually by the user.
- update the health risks (section 5.5) displayed over time or based on user habits, but the feature has been considered for future versions.
- include web-based competitive or long-term recordkeeping features, but these have been considered for future versions.

This document does not

- define the ingredients of Gloss.
- define the user instructions.
- detail the text entry and clock setting interfaces.

1.4 Key Terms

Floss, a.k.a. Dental Floss

A soft, strong, waxed or unwaxed thread, usually made of nylon, for drawing between the teeth to remove food particles and prevent the buildup of plaque. [dictionary.com]

Flossing

To use dental floss on the teeth. To clean the teeth with dental floss. [dictionary.com]

Gloss (in context of ToothGloss)

An advanced technology medical material that is operated like chewing gum, but performs the action of interdental cleaning in the place of floss.

Glossing

To perform interdental cleaning using Gloss.

Interdental Cleaning

The act of cleaning between the teeth, the removal of food and plaque. Can be performed by a variety of tools, including, but not limited to, interdental brushes, the Waterpik®, and most commonly, dental floss.

→ Colloquially, this is often referred to as “flossing,” however this should be differentiated in the use of the ToothGloss system.

SmartBox

The hardware portion of the ToothGloss system, which contains the Gloss and interactive digital screen.

ToothGloss

A system that includes Gloss, the SmartBox and the digital screen’s motivational software.

2 Background

2.1 Problem Statement

The modern day medical system has learned what it takes to maintain healthy teeth throughout one's lifetime, and created technology to enable users to act towards this endeavor. Yet, the rate of preventable oral disease remains high, even among highly educated populations with access to medical tools and expertise. What can be done to decrease these disease rates?

2.2 Research and Findings

Three types of investigational research were performed, beginning with Secondary Research to better understand the problem. Results review were limited to information on working-age adults, as this is the bulk of people's medially independent time, because seniors have different health needs, and because access to children for user research and testing was beyond the scope. It was found that 40 percent [Barker, WebMD Feature "Oral Health...Connection"] of westernized adults have dental health problems, and that gum disease and tooth decay is the largest. The best treatment for both gum disease and tooth decay is preventative; via the use of fluorinated water, twice-daily brushing, daily interdental cleaning, and regular visits to dental professionals. It was determined that the most impact could be levied on increasing the missing behavior of interdental cleaning.

Secondly, a questionnaire was created to gather information about users including demographic information; interdental cleaning technique, location, and frequency; and any reasons interdental cleaning is not performed per medical recommendations. Results from 37 respondents showed that the most common reasons for not performing interdental cleaning are the lack (or perception) of time, the thought that brushing alone is sufficient, and forgetting to do so. Data also indicated that those who interdental clean in a variety of locations are more likely to do so more frequently.

Finally, two Semi-Structured interviews were performed by running the interviewing through the Questionnaire to indicate their location in the larger data set, followed by open-ended questions focusing on motivational factors when it comes to their health. These conversations confirmed that lack of time is the largest obstacle in the way of regular interdental cleaning, and revealed the importance of product taste, interface with oral hardware, and the effect of relationships with dental professionals.

2.3 Design requirements

Based on the questionnaire results of the multi-location flossers it was determined that the ToothGloss system must **be portable**. To address the issue of fitting within users' busy schedules, ToothGloss must **be quick to use and/or hands-free to allow multitasking**. To educate users who believe that brushing alone is sufficient for dental health, ToothGloss must **show before and after results or provide other immediate feedback**, and **inform the user of**

[the] **health risks** of not performing regular interdental cleaning. For users who may forget, ToothGloss will **remind** [them] **to perform interdental cleaning**. And in the interest of creating a product that is acceptable to use by all, it will **have neutral taste and be pain free**.

In summary, ToothGloss will:

- be portable
- be quick to use and/or hands-free to allow multitasking
- show before and after results or provide other immediate feedback
- inform the user of health risks
- remind the user to perform interdental cleaning
- have neutral taste and be pain free

2.4 Design question

*How can we improve the **frequency** and **quality** of **user-performed** interdental cleaning among **working-age** adults?*

Critical points are defined as follows:

Frequency and quality – many people do currently perform interdental cleaning, however irregularly, and often poorly.

User-performed – research indicated the state of daily care of the teeth had more long term effect on oral health than the care that occurs at biannual visits to dental health professionals.

Working-age – for the purposes of this study, this was defined as ages 16 through 60, encompassing the time when the mouth has fully matured up to the health changes of later life.

3 Gloss

3.1 Presentation

Gloss appears to the user as traditional chewing gum in shape, texture, color, smell, and flavor variety. Each piece is wrapped in foil or coated paper, per decision of the materials specialists in the Gloss development team. Each wrapper is stamped with a best-if-used by date.

The pieces are placed in the SmartBox arranged side-by-side as in traditional chewing gum packaging, however, the ToothGloss system is intended for a 12-week period of use before refill is necessary, so the SmartBox will contain more pieces than a traditional chewing gum package.

3.2 Material Properties

Upon contact with mouth saliva, Gloss becomes more fluid than traditional chewing gum. This decreased viscosity allows it to flow into the tight spaces between teeth when the user chews it.

Its material properties make Gloss extremely attractive to food particles and plaque, bonding to it as the Gloss is moved through the mouth. However, like traditional chewing gum, Gloss is non-adherent to the enamel and dentine that make up teeth. Nor will it stick to gums, the tongue, and other mouth surfaces. This makes it hassle free to remove from the mouth when glossing is complete.

Gloss is shelf stable for a minimum of one year, after which time the product may become less effective but will do no harm to the user.

4 Hardware Design

4.1 SmartBox

As defined above the SmartBox is the hardware portion of the ToothGloss system, which contains the Gloss and interactive digital screen and dispenses the Gloss.

4.1.1 Dimensions

The SmartBox is wide as the thickness of 84 pieces (12 week supply) of Gloss, with additional provision for the speaker and dispensing hardware. For more information about Dispensing and the Speaker, see sections 4.2 and 4.4 respectively.

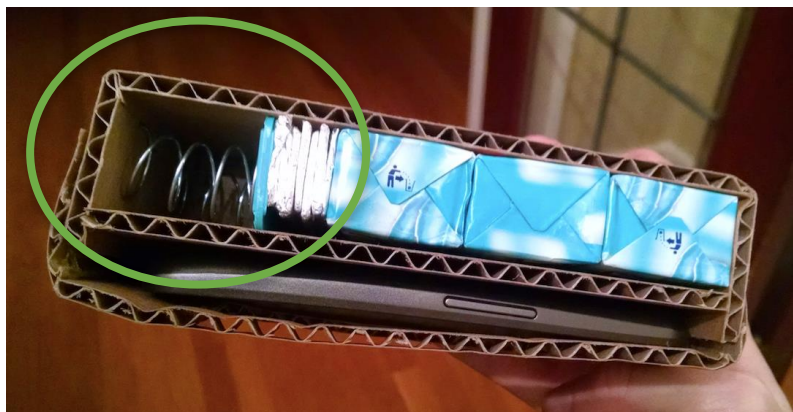
The width of the SmartBox is enough to include the width of a Gloss stick and the electronics and battery for the digital screen and speaker. Its height is such that standard SmartPhone aspect ratio is maintained (when in landscape) with the width dictated as described above.

4.1.2 Materials

The SmartBox is made out of relatively light weight and durable materials, but not such that the system becomes cost prohibitive. It is stiff and waterproof enough so as to protect the digital screen from the rigors of travel and the bathroom environment.

4.2 Dispensing

The SmartBox includes method of dispensing the Gloss quickly and easily for each use. Prototypes included a spring-loaded pusher, as seen on retail shelving. This design enabled the Gloss sticks to remain vertical for easy individual removal, and for viewing relative to Tickmarks (see section 4.3.2) A spring-loaded pusher dispensing method is not required, but a light and low-tech system, with simple and straight-forward Gloss stick removal must be maintained.



4.3 Labeling

The SmartBox is labeled in a manner similar to other food and medicinal products currently on the market. The color scheme is neutral and text easy to read.

4.3.1 Titles

Titles are important to name and describe the product to the user, especially during early introduction and adoption. The term “ToothGloss” is displayed in a simple and professional font, in a prominent location on the SmartBox’s front, the same side of the as the digital display’s interactive surface.

4.3.2 Tickmarks

Along the upper surface of the SmartBox there are 84 individual tickmarks corresponding to each piece of Gloss in the box. (Note: The prototype pictured displays 56 tickmarks.) Each seventh tickmark is more prominent – longer, more bold, and optionally a different color.



Beginning with the first, these seventh tickmarks are labeled with numbers one through 12, corresponding to which week of Gloss supply the user is currently beginning. (Note: The prototype pictured labels the end of each week instead of the beginning.)

4.3.3 Instructions

Text on the back and sides of the SmartBox provide basic usage instructions to the user. This text is not a full user manual, but a “cliff-notes” style reminder, as location and contact information as to where a full user manual and further information can be obtained.

4.4 Speaker

As detailed in section 5.6, the user may choose to set a reminder alarm to sound when they would like to gloss. This speaker is controlled by the software in the digital screen, and will sound per user selection in the interactive interface.

4.5 Sensors

Electronic sensors in the SmartBox enable it to respond to user actions. If an alarm (section 5.6) is sounding, it stops making noise upon the user's removal of a piece of gloss. This removal indicates to the system that glossing is occurring for the day, and the user no longer requires a reminder.

4.6 Interaction with Software

When an alarm (section 5.6) is sounding, the digital screen will indicate that the alarm has been triggered, causing the speaker to make sound. When a stick of gloss is removed from the SmartBox this on-screen indication will discontinue.

4.7 Charging

The speaker and digital screen in the SmartBox require power, which is provided by a rechargeable internal battery. With typical usage this battery has a life of eight days, at which point it must be charged. This is performed via induction charging, and can use any standard induction-charging mat.

5 Digital Interface

5.1 Overview

Use of the ToothGloss system's digital interface is optional. The user may choose to use the interactive features or, for a more low-tech experience, use the Gloss on its own.

5.1.1 Stylesheet

All screens follow the same color scheme and font style so that users will not face any problems navigating the interface. The background color is #282828 and the main font is Myriad Pro in #808080. The links and buttons are in #2CC1C1 and the save button on the Edit Reminder screen (section 5.3.2) is #6FBB60.

5.1.2 Sleep Mode

The screen will always be in sleep mode and wakes when the user touches the screen, displaying the home screen (section 5.2).

5.1.3 Header

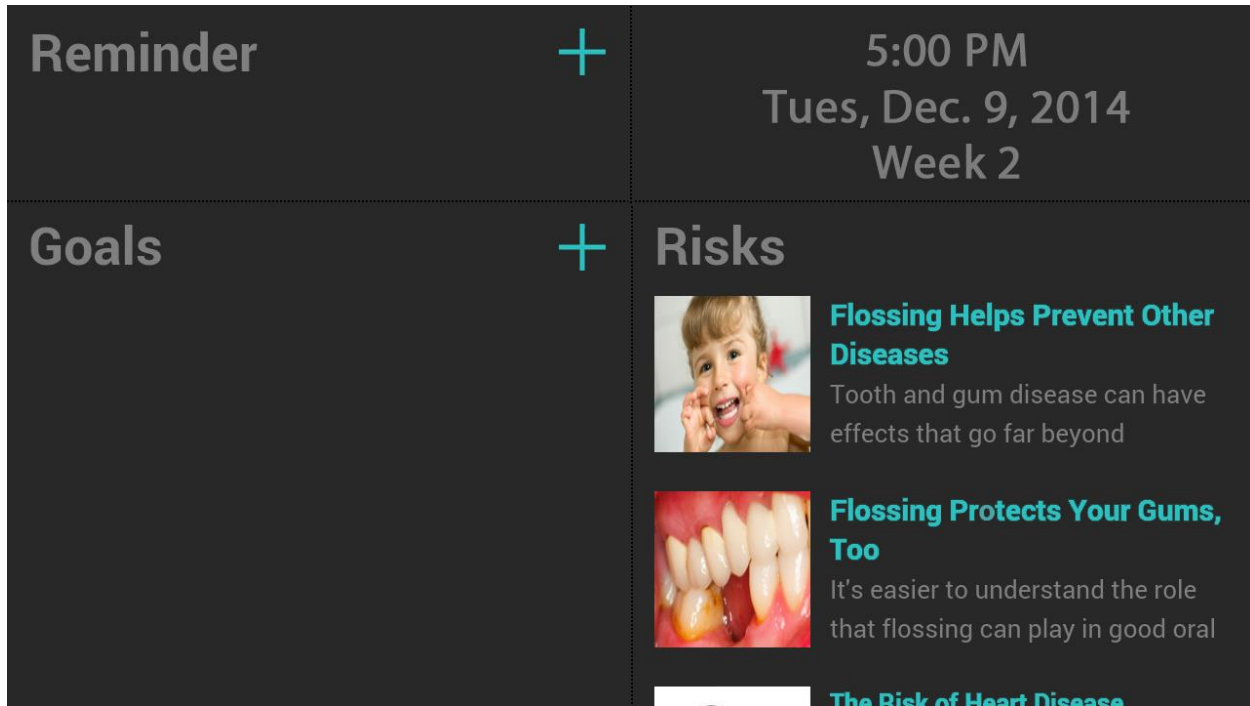
Every screen other than the home screen has a header with the title for the current screen.

5.1.4 Back Button

All pages other than the home screen have a back button on the left side on the title bar. The back button brings the user to the previous screen in the hierarchy and will not remove any changes made by the user.

5.2 Home screen

The home screen will be the first that is displayed by default on the device screen when it comes out of the sleep mode. It is divided into four sections:



5.2.1 Reminder

This section shows the user the time and day of the next glossing reminder. It also allows users to tap on it, which will display the Reminders screen (section 5.3).

5.2.2 Clock

This section of the home screen shows the current time, day, date, and week since Gloss refill. Tapping on this section will open up a new screen where the user can manually set the time.

5.2.3 Goals

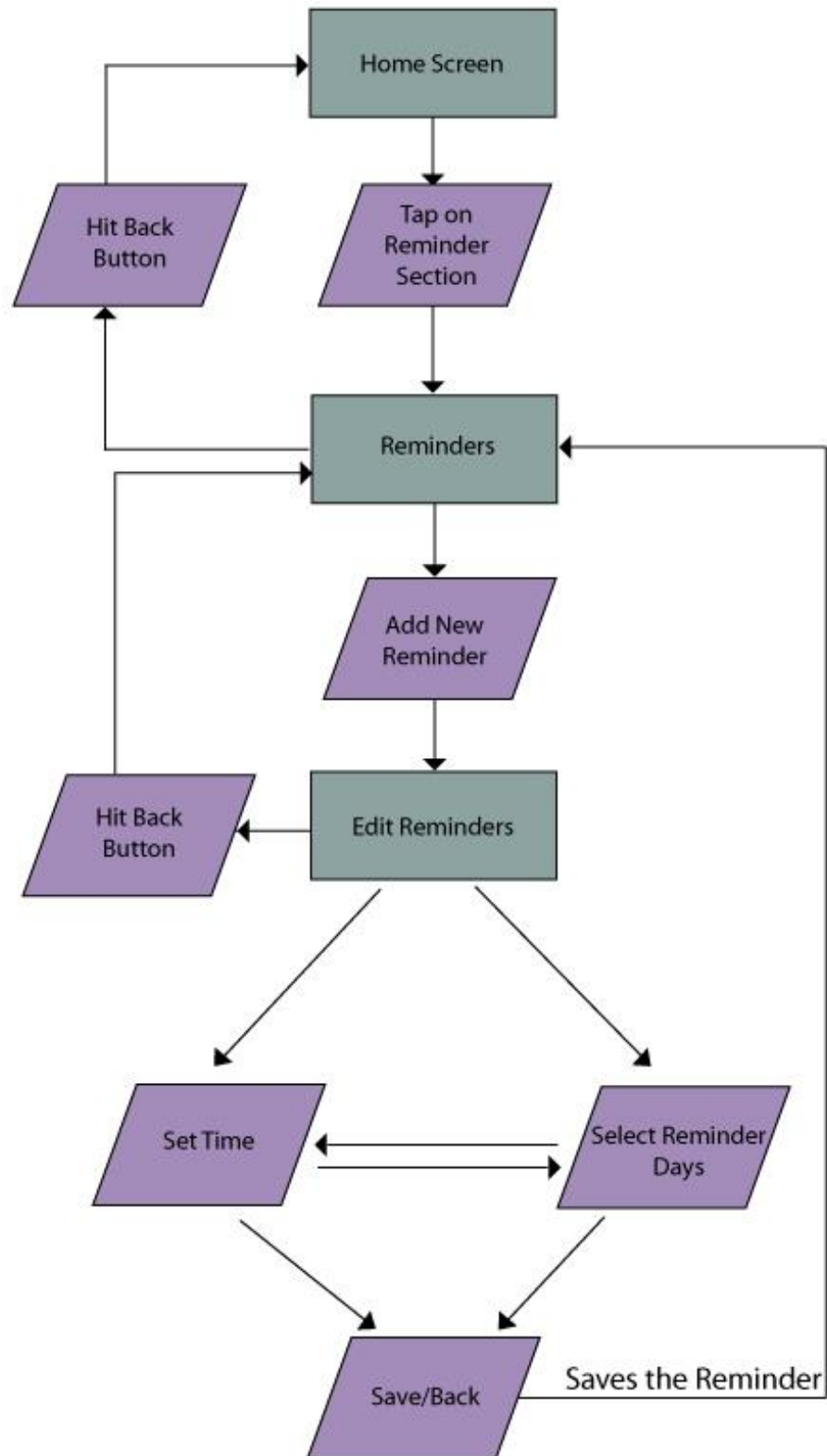
This section lists all the goals added by the user; a checkmark indicates completion.




- Checkboxes allows user to change the state of a goals from complete to incomplete or vice versa by tapping on the goal's list item.
- The plus button in the title bar of allows user to add new goals without navigating to another screen. Clicking on the plus button will add another blank list item. Tapping in the blank line brings up an onscreen keyboard for the user to input the text of their goal.
- The delete button aligned with the right edge of the list item will delete the goal from the list.

5.2.4 Risks

The risks section allows users to view the risks of not flossing. Each list item contains a title with a picture of the risk hardcoded in the application and a short trimmed description. Clicking on an individual risk will open a new screen with the detailed description of that risk.

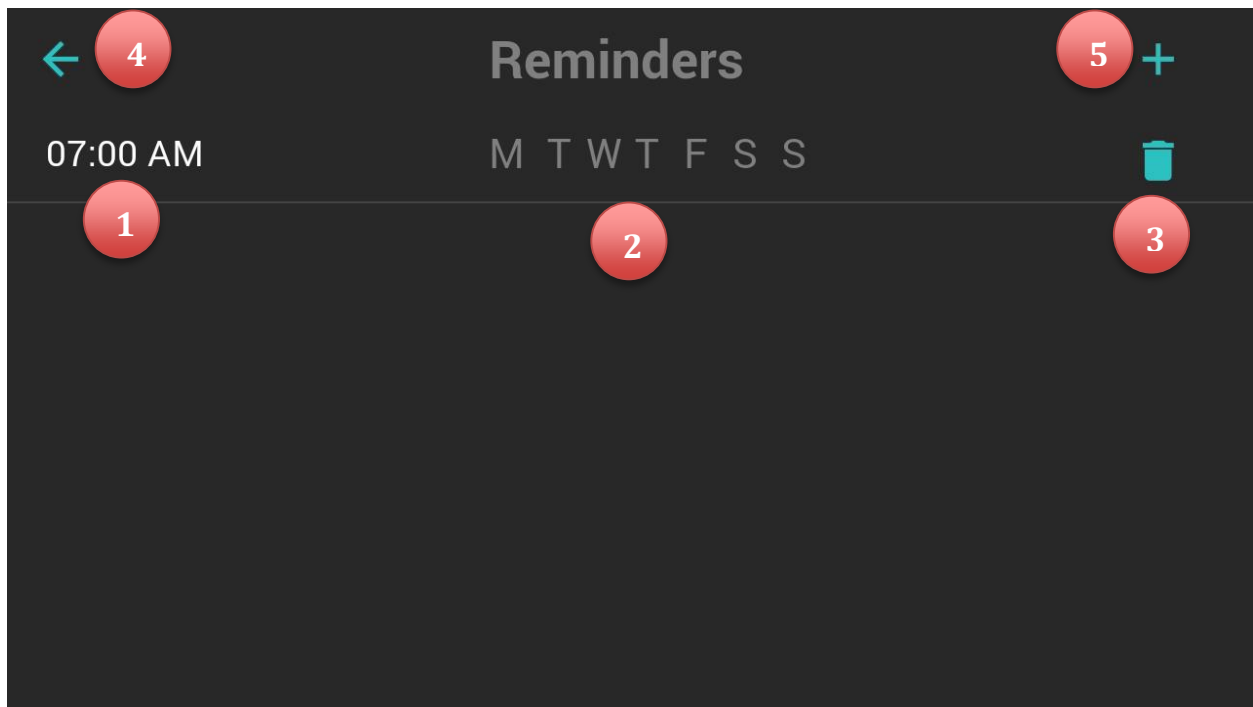
5.3 Reminder



<p>Reminder</p>	<p>5:00 PM Tues, Dec. 9, 2014 Week 2</p>
<p>Goals</p>	<p>Risks</p> <div>  </div> <p>Flossing Helps Prevent Other Diseases Tooth and gum disease can have effects that go far beyond</p> <div>  </div> <p>Flossing Protects Your Gums, Too It's easier to understand the role that flossing can play in good oral</p> <div>  </div> <p>The Risk of Heart Disease</p>

As described in the flow-chart, the process of adding, editing or deleting a reminder requires the user to first go to the Reminders screen by tapping on the upper left section of the homescreen.

5.3.1 Reminders

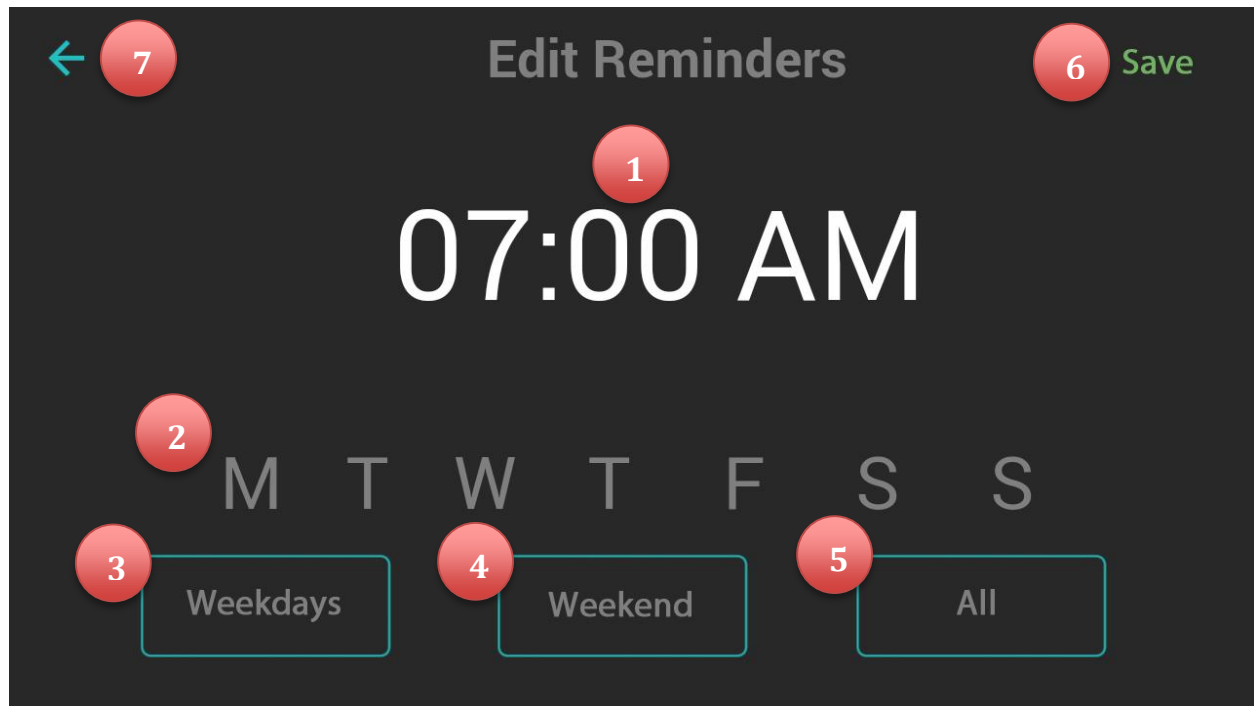


This screen allows the user to view the list of reminders. A reminder includes:

- ① Time, when the reminder should be triggered on the set day(s) of the week.
- ② List of days that the reminder will be triggered.
- ③ The delete button on the right side of each reminder in the list will delete the reminder.
- ④ The back button will take the user back to the home screen.
- ⑤ The plus button on the top right corner of the screen will add a new reminder in the list and automatically opens the edit reminder screen to allow user to set the time and select days for the reminder.

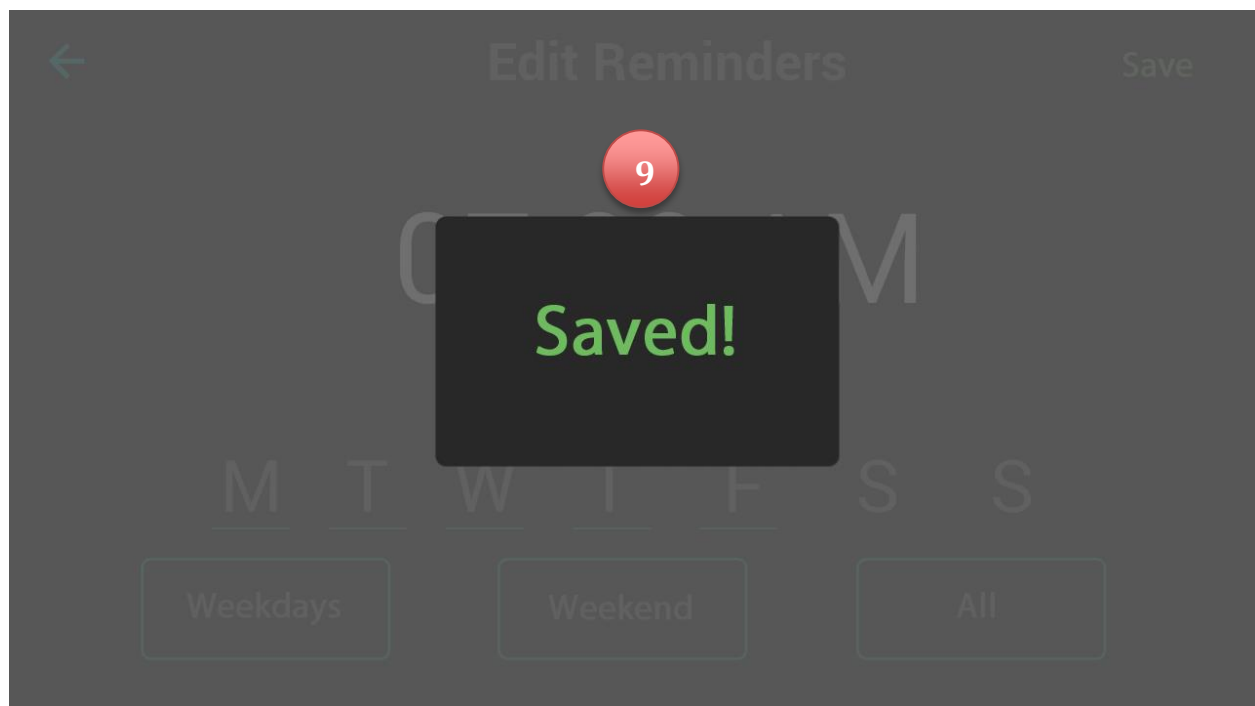
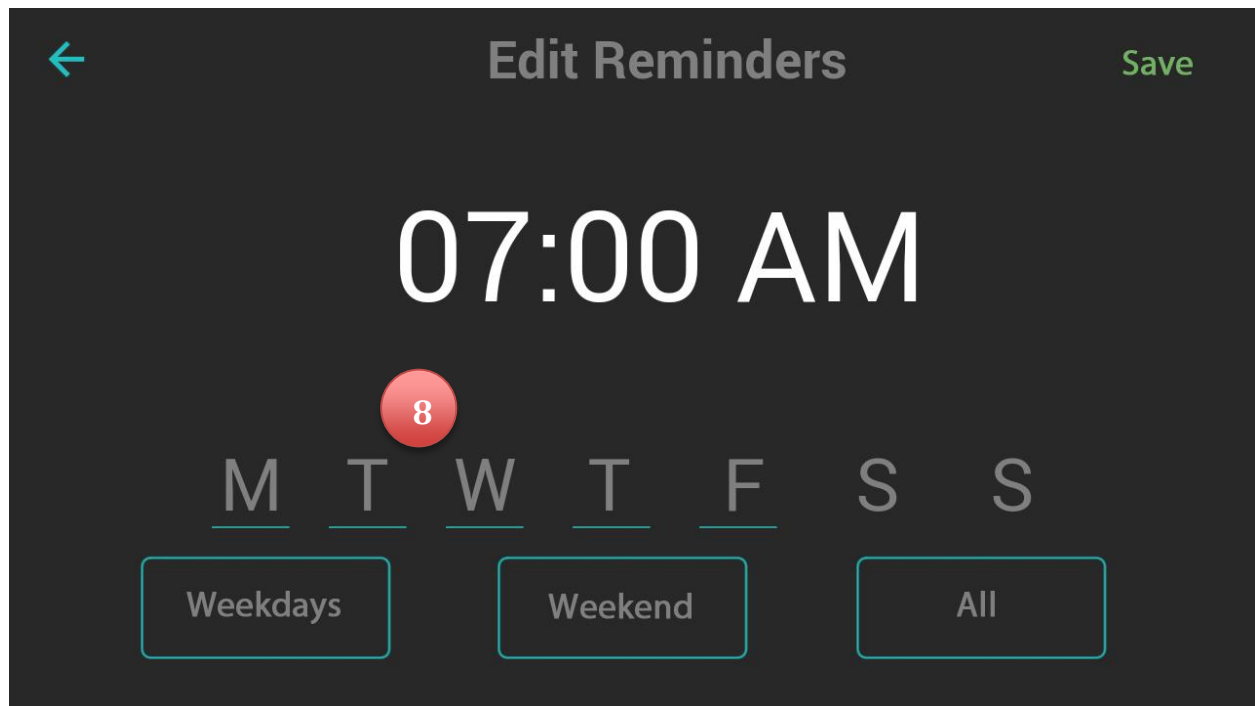
Tapping on a particular reminder will take the user to the Edit Reminder screen where they can edit the time and day selection of the reminder (section 5.3.2).

5.3.2 Edit Reminder

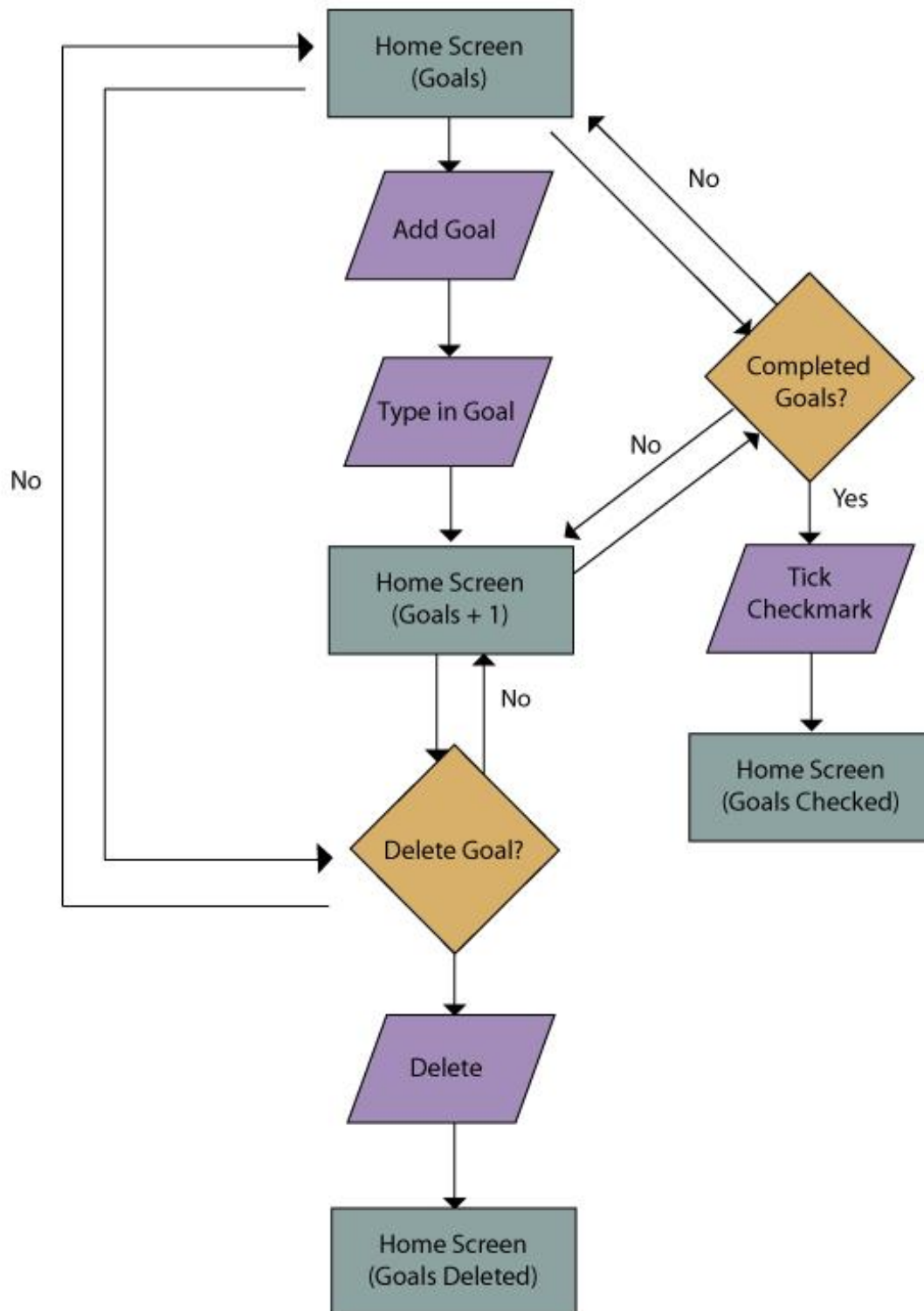


The edit reminder screen allows the user to select and change the time and day(s) of the week the reminder will trigger.

- ① Sliding up and down each section will change the time: hours, minutes and AM/PM.
- ② By default the days of the weeks will not be enabled. Tapping on them will enable them for that particular day and the change will be indicated by an underscore.
- ③ "Select Weekdays" button will select all the weekdays: M, T, W, T, and F.
- ④ "Select Weekend" button will select all the weekends: S and S.
- ⑤ "All" button will select weekdays as well as weekends.
- ⑥ The save button will save the changes made to current reminder and will display the "Saved" message ⑨ for 2 sec with fade-in/fade-out effect. Afterwards, it will take the user back to the Reminders screen.
- ⑦ The back button will save the changes made to current reminder and takes the user back to the Reminders screen.
- ⑧ All weekdays selected. Selection of a day is represented by an underscore.

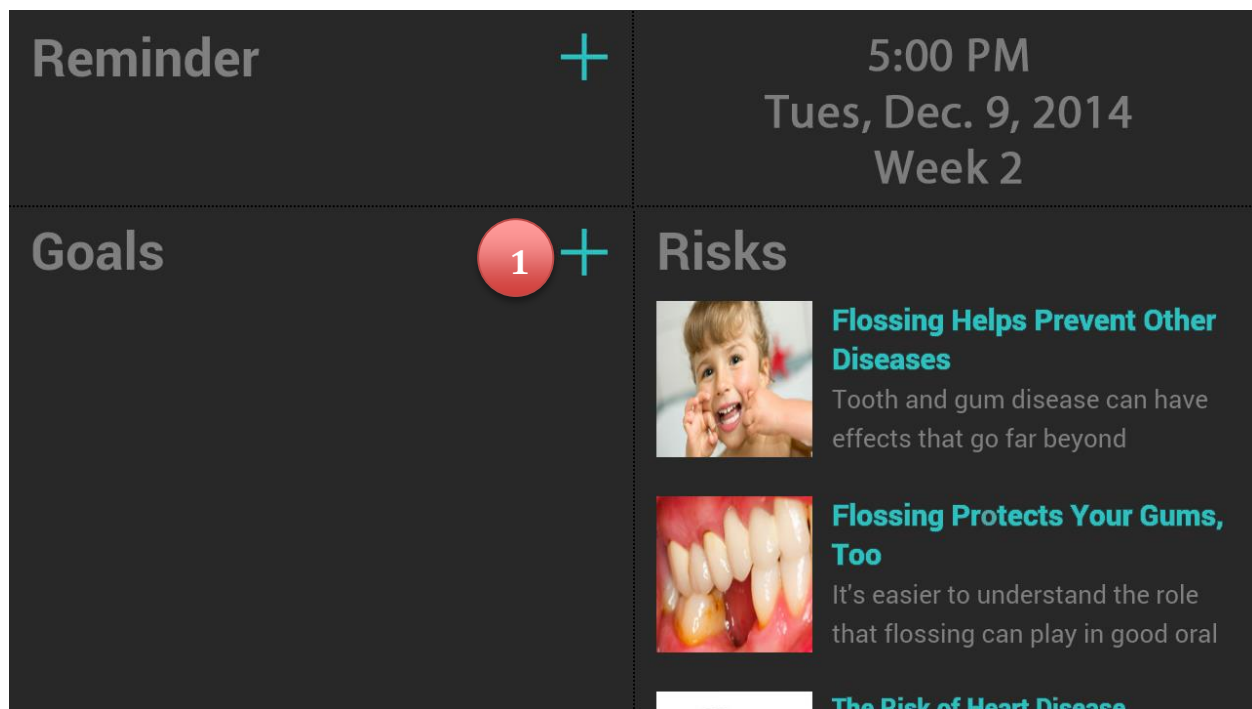


5.4 Goals



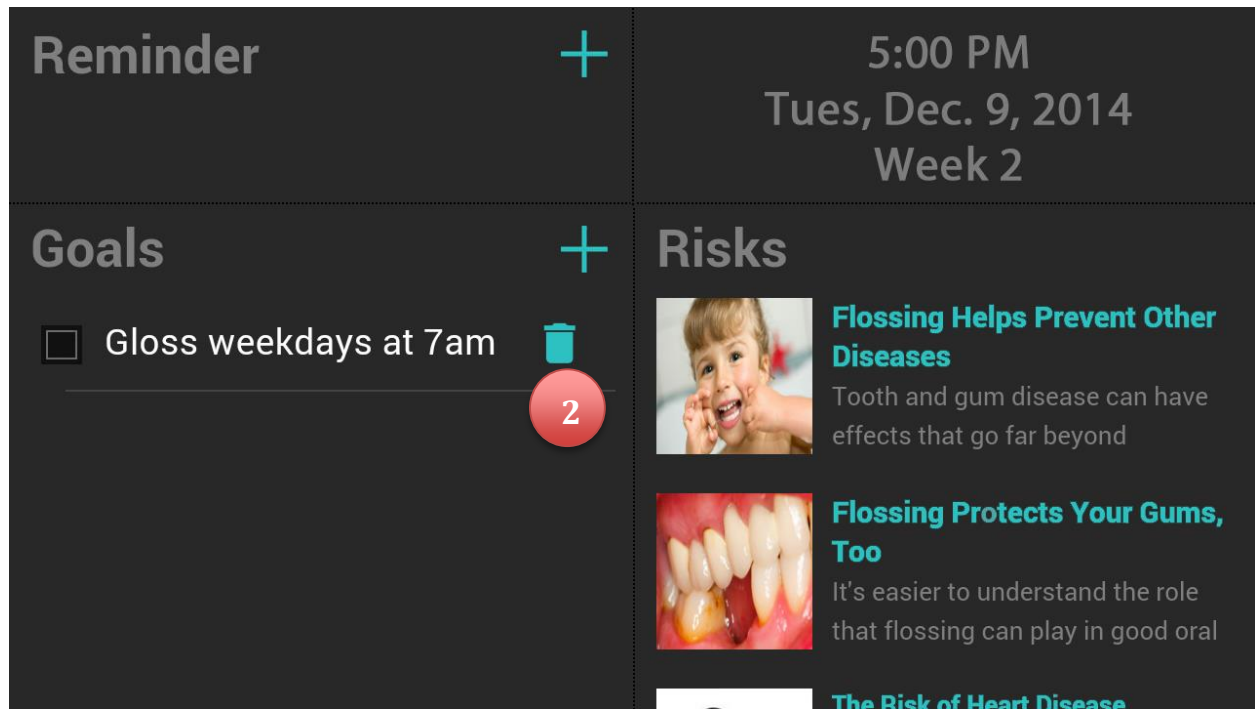
There is no separate screen for goals; the entire interaction with the Goals happens on the home screen. The process begins with the user adding a goal in the list. Afterwards he can either delete that goal or can mark it as completed by checking the checkbox. The possible interactions with the goals are detailed below.

5.4.1 Add Goal



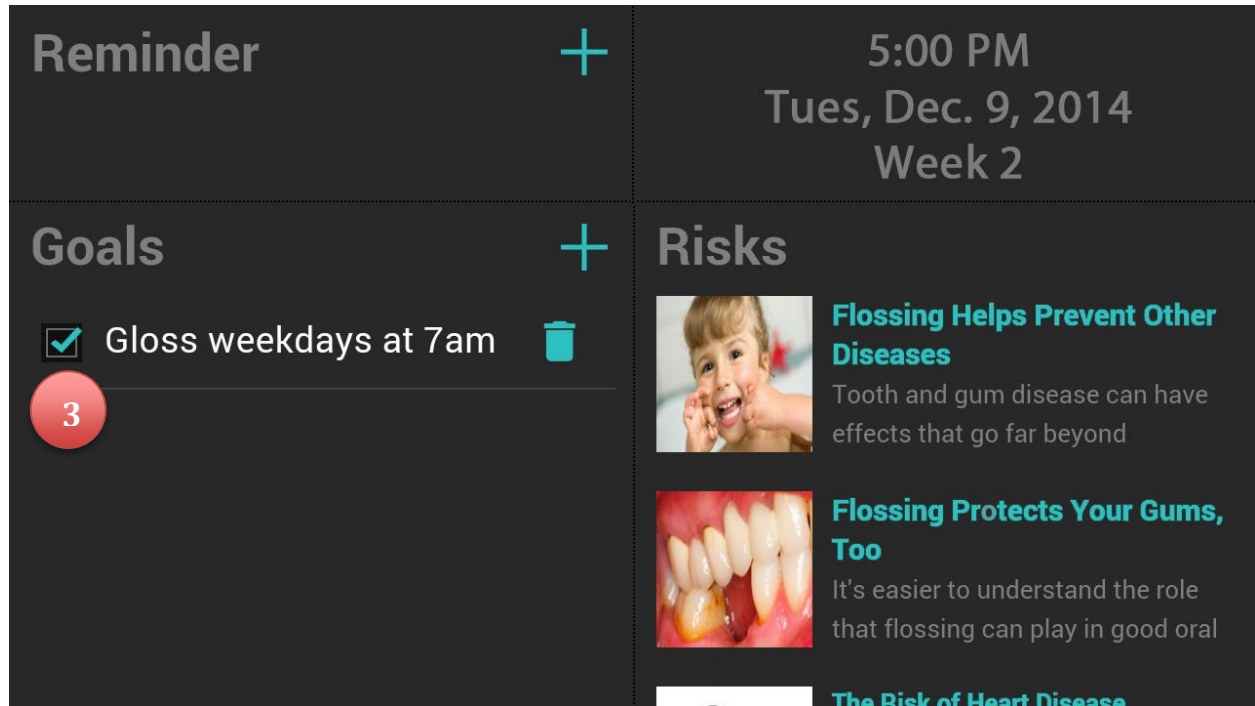
① The plus button will add a new blank goal in the list. A cursor will be displayed with an empty text box where the user can write the text of the goal using an onscreen keyboard.

5.4.2 Delete Goal



The goal can be deleted from the list by tapping on the delete icon ② on the right side of the goal. Once deleted the user will not be able to undo the action.

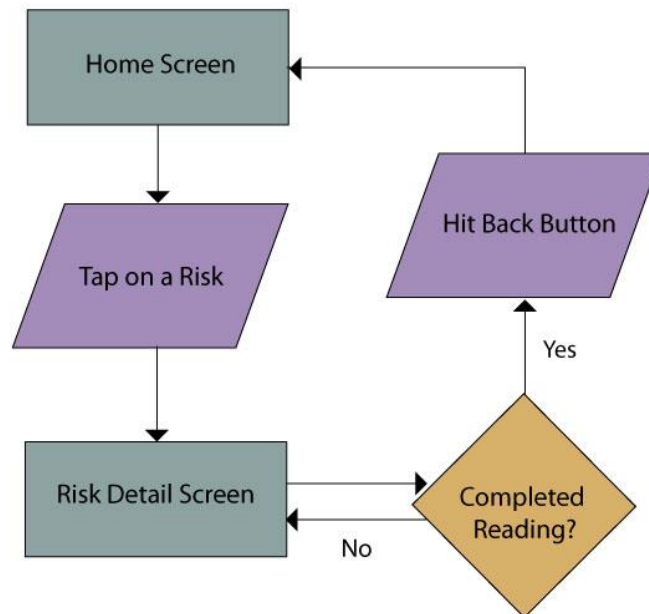
5.4.3 Complete Goal



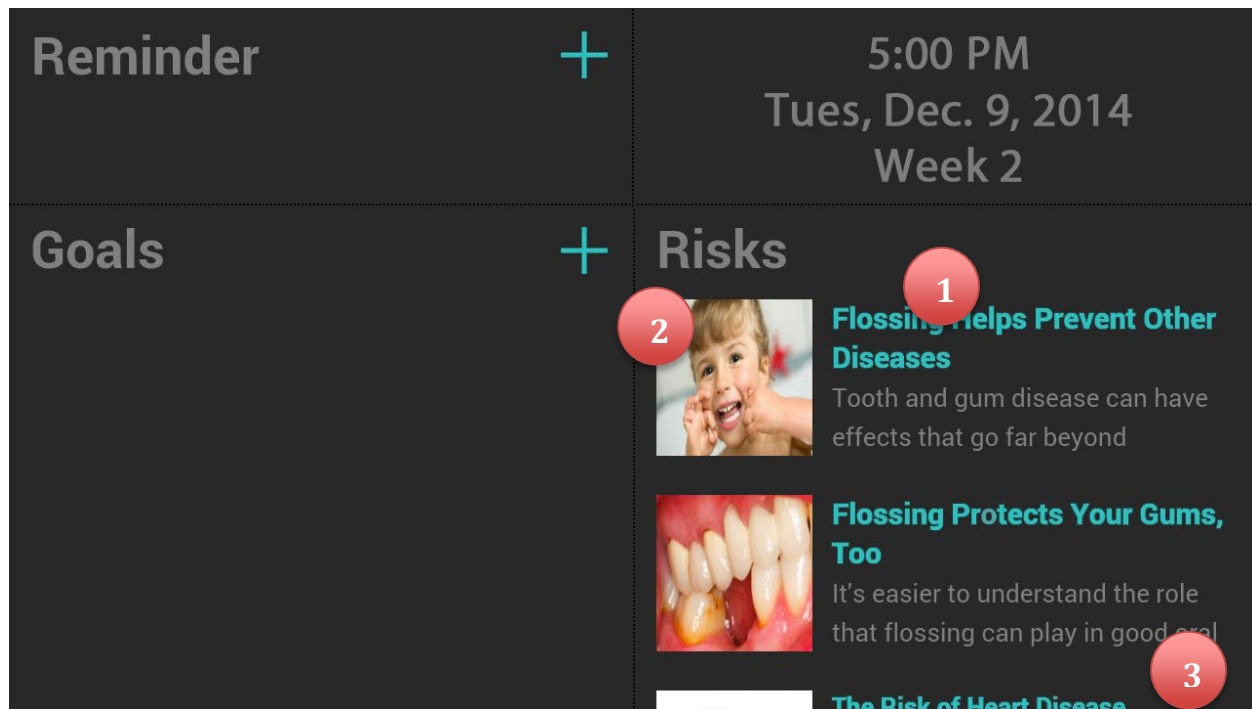
When user believes that he has completed his goal he will check the checkbox ③ of that goal by either tapping on the checkbox of the goal or on the goal itself.

Tapping again on the goal will uncheck the goal marking it as incomplete.

5.5 Health Risks

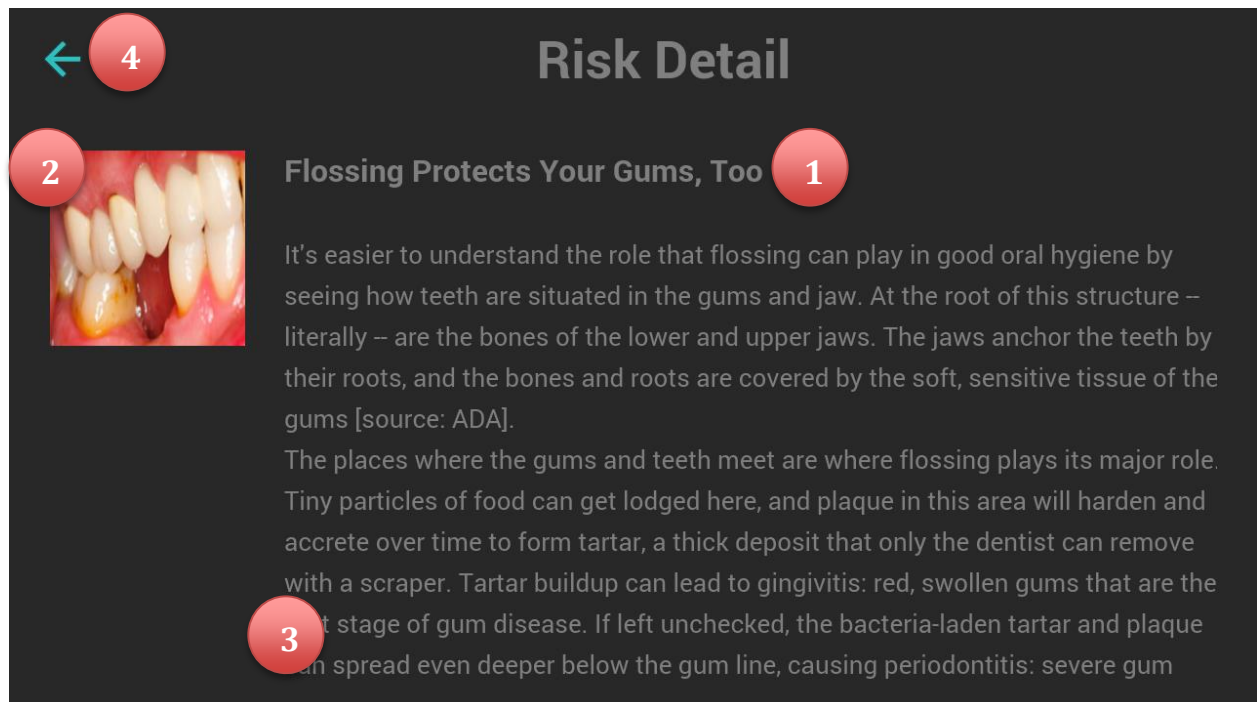


Viewing the health risks consists of two steps, the brief description on the home screen and the detailed description on a separate screen.



This screen shows the selected risk in details with an image and a title.

- ① The title of the risk.
- ② The image showing the consequences of not glossing.
- ③ Also, the user can scroll through the content area if the content exceeds the screen display.
- ④ The back button will take the user back to the home screen.



5.6 Alarm

The alarm is triggered when the reminder time matches the clock time. To notify the user that the alarm has been triggered, the screen will start flickering, and the speaker (section 4.4) in the SmartBox will make noise.

The alarm will only stop when a Gloss stick is removed from the SmartBox. On removal of a Gloss stick the SmartBox will notify the software via a sensor embedded in the hardware (section 4.5).