

Future development

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Isak Johansson	2020-11-27	Create document and added a skeleton for the structure. Also wrote the introduction.	0.1

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Chapter 1

Introduction

Treet, the self-monitoring system developed by Company 4, has been developed in order to show the customer business value by including gamification in order to raise the motivation for end-users to keep self-monitoring. Though, in order for Treet to be commercialised and efficiently used, future development is needed. This includes scalability, support, and more which is to be presented in this document.

1.1 Purpose

The purpose of the document is to give a clear idea of future development needed to be done in order to commercialise the system, as well as describing suggestions on where the development may continue.

1.2 Scope

The document focuses on functionality and technical aspects needed to be developed as well as suggestions for future directions. Therefore, it does not go into detail on UX-Design, usability and similarly for the current system.

In order to efficiently cover the purpose, the document has been divided into three sections. First, a rest list of functionalities that was specified in the SRS, but is yet to be developed is presented. Secondly, ideas for development to complement the current system needed in order for the customer to use it in its everyday is described. Finally, suggestions on directions for future development of Treet is presented with motivations of what values this could bring.

1.3 Recommended reading

We recommend to read this document after looking through the Software Requirement Specification in order to see where the development is at the moment.

Chapter 2

Rest list

The following things were not implemented, as originally planned. This was due to a time scope to slim to permit everything to be developed. The following things were considered as having the lowest value creation in relation to effort of implementation. Thus, these were regarded as having lower priority, and were not implemented. They would, however, provide potential benefits if implemented, as described below.

- Notifications. The original intent was to use notifications as a means of reminding the patient of entering measurements, when not having done so, and provide information on what measurements to take. Specifically, the plan was to send out a notification during the morning to inform on what measurements the patient should take that day. Additionally, a notification was planned to be sent out during the evening if all measurements had not yet been registered, to remind the patient to rectify this. The notification would also emphasize that the streak will be lost if the patient does not comply, thus, instilling a sense of urgency. This would likely contribute to higher compliance.
- Emailing dependants at missed measurements. This possibility would enable dependents to give support and remind the patient of taking their measurements. This may be especially useful for elderly patients with potentially poor memory or awareness. The result could potentially be higher compliance.
- Initial guide/tutorial when first entering the app. This would give the user information on how to use the application as well as information about the different concepts in the app (e.g. streaks). There may be user that are not very familiar with gamification solutions, and this introduction would be especially useful for these individuals. The UX-tests of the product have shown that the users have trouble understanding the concept of streaks and some of the menu icons (star-goals, clock-history). This could be resolved with this initial guide. Without sufficient understanding of the

gamification functionality of the application, the risk is that users are not effectively incentivized by these elements, as intended. An application that users find hard to use, may also result in them using the app less, because of its perceived complexity.

- Depressed state for the trees. When the streak is lost the trees should get sick and get into depressed state, a state where the trees will not grow. The trees then need a streak of 5 days in order to recover and start to grow again. The thought with this functionality is that the users should not lose the progress after just one missed measurement. As of now we have implemented a state for the trees which can be used to see if the tree is depressed or not, but we have not implemented the functionality in the product with images and animations.
- Graphs. The graphs do not fetch data from OpenEHR, instead they use mocked data. The graphs should be seen as examples on how to show the patient's progress over time. Due to limited medical knowledge the content of the graphs can be wrong and because of that the content should be reviewed so that the graphs show important information from a medical point of view.
- Under the settings page, aside from the page concerning gamification level, all subpages remain to be implemented. These are:
 - Personal information. Displays the patients personal information, such as name, social security number, email and phone number. Appropriate fields should be editable, like email.
 - Authorized relatives. This page is related to the item about emailing dependants. At this page the user should be able to add relatives and decide which information (Goals, achievements, measurements) they are going to receive
 - Change password. The user should here be able to change the password in the application.
 - Help. If the user have questions about the application they can find information under this page. This page should include the information given in the initial guide and other important information.

Chapter 3

Development needed for commercialisation

The following chapter will include development needed to be done in order for commercialisation. The chapter will be structured upon area and will be concluded with a section with a tip for how the development should be done.

3.1 Support for end-user notifications

The current version of the application does not support notifications to be sent out to the end-users. A few key components are missing depending on what type of notification the customer want to use.

- Back-end support for notifications. As the back-end functionality of this project is out of scope, no logic for handling events not triggered by the user is implemented
- As this project is missing a third-party service for handling SMS-notifications to end-users. For further commercialisation such a service would need to be aquired and implemented.
- As with the SMS-notifications, access to a SMTP-server for e-mail-integration is missing. To improve the notification functionality further using this technology, the customer using this product would need their own e-mail infrastructure to integrate with this application, support for such integration would also be needed to be implemented in the application.

3.2 Authentication

This application uses the third-party service auth0.com (<https://auth0.com/>) for IAM-management. As this product is intended for Region Östergötland,

which have their own on-premise solution for IAM-management, auth0.com would need to be changed to their service. It is this service and not our application that is responsible for user authentication, therefore no further development to implement technologies such as SITHS-support or BankID-support is required for the application, as it is provided by their own service for this purpose.

3.3 Error handling for user input

Further development with implementation of input control is necessary. The control of bad input by the users can be divided into two parts.

- Hard limits. By hard limits we mean pre-defined limits of what is a normal range or type of values registered by the user. This would be universal limitations not intended for change that would cover all use-cases.
- Soft limits. By soft limits we mean user-defined limits of what is a healthy and/or expected range of values for the patient to register, set by the Health Care Pro while creating a care plan for the patient.

3.4 Population register integration

There is no integration to Region Östergötlands population register (Master befolkningsregister) implemented in our solution. As there are no APIs available for test and development this data is mocked. However, the mocked data is structured according to the specifications of a response from Region Östergötlands production environment to mimic the behaviour as much as possible and to make the integration to Master easier.

3.5 Database development

The information needed for non-medical functionality, i.e game settings is stored in the openEHR-platform. This is to avoid developing a separate back-end and there by putting more effort into the development of the front-end. In a scenario where Region Östergötland wishes to use this product in a production like scenario. The non-medical elements stored in openEHR needs to be split into a separate database solution with its corresponding back-end.

3.6 Health Care Pro support in the front-end

This products focuses on the patients point of view, there is no functionality built for the health care professionals, this must be created in a later stage by Region Östergötland or with supervision of Region Östergötland.

3.7 Dependant support in the front-end

There is no functionality developed with the aim of integrating a patients relatives or dependants into the system. This must be created in a later stage by Region Östergötland or with the supervision of Region Östergötland.

3.8 Secure information transmissions

This project have not put any focus on security, in the event of using this product with real patient information HTTPS needs to be implemented as well as oauth2 in the api-communications. The platform used, openEHR, to store information does only support basic authentication when communicating with its API:s.

3.9 Integrate with HSA Catalogue

To be able to use the same role based authorization model as the rest of the medical systems in Region Östergötlands IT-environment an integration with their personel system called The HSA Catalogue needs to be implemented.

3.10 Tip for future development

The current application has been developed with the mindset to keep each component as small as possible where each component generates a small amount of code. Then, each page uses multiple components to build the functionality instead of building all of the functionality on each page. This has been done in order to improve the maintainability and flexibility as you simply need to change one component if you wish to update the behaviour, instead of the whole page. The mindset of having small components is therefore something we recommend to continue using in order to keep maintenance shorter, as well as improve scalability as the same component may be used on multiple pages.

Chapter 4

Ideas for the future

This chapter provides more conceptual ideas of where the application may be developed in the future. This includes how the gamification may be extended, which additional 3rd party apps that may be worth including, rewards and improved communication between medical staff and patients.

4.1 Extended Gamification

- Make a more sophisticated view of the tree collection. More specifically, it could be represented as an actual forest. The forest could just start out as a field of grass, that is then successively filled with trees as they are finished growing. To increase scalability of this idea, one could implement the option of having multiple forests that the user can switch between so they never run out of space. Overall, this could enhance gamification and contribute to a more satisfying user experience. This could potentially result in a higher degree of compliance.
- Introduce more content in terms of a larger variety of plants, for example flowers. One could use this to expand on the previous idea, and have separate collections for different categories, for example a garden for flowers. This could keep patients interested for a longer period of time, which ultimately could result in more successful self-monitoring.
- Introduce seasons that effect the animations of the trees and the forest to further connect to the season in the real world. For example introduce decorations and ornaments for Halloween, Christmas, Easter and other holidays (and several religions). Introduce weather into the app, either by season, or by the actual weather data from your location. This could make the patient connect easier to the app and it would bring variety to keep the patient intrigued over time.

4.2 Additional 3rd party apps

- Make it possible for patients to integrate additional applications that can contribute to their measurements in some way. Obvious choices are apps like Apple health, that directly relates to measuring health data. Include apps with a less clear-cut health connection but that stimulates desirable behavior, such as Pokemon Go and Geocaching. These are apps that in themselves incentive users to activity, primarily through gamification. Thus, integrating apps like these into the application implies that one could harbor indirect benefits from the incentivizing attributes of these apps, by stimulating patients to achieve a better health and more consistent measurement taking.
- Make it possible to integrate with apps to gain nutrition advice adapted to the condition the patient has, and based on goal the patient want to reach. This could give benefits in terms of better health for patients with certain diseases where dietary needs are crucial. This could make it easier for patients to choose the right food for their conditions. An API that could be used are MealiQ, that provides recipes based on a lot of different criteria.

4.3 Rewards

- The main idea is to make it possible for patients to gain real world benefits as a result of good performance in the app. This could additionally enhance the incentivization and result in improved compliance. In the current state that could be to "sell" fully grown trees, in exchange for some type of reward. The patient would keep the actual tree, but marked with like a little "Sold" sign under it. The reward could be structured in different ways. The user could gain funds in an in-game currency, that can later be exchanged for various rewards. One could also structure it so that the user directly receives or gets to choose some type of reward. Ideas for rewards that the user could receive directly or buy for acquired in-game currency are the following:
 - Aesthetic in-game items or similar to place in the forest.
 - A small donation of money to research/charity. Either one can provide the user with a single choice or give the user a set of choices. These choices could directly relate to investments you already consider undertaking, thus not necessarily requiring a larger investment to achieve the positive effects this could have on patients.
 - Seed bags sent home so that the patient can plant real trees or plants at home.
 - Discounts in stores or other establishments.

4.4 Integrated communication between medical staff and patients

- Make it possible for care-givers to contact patients through the app, either through chat messages or phone calls. This could be used update the patient about their health and their care-plan, remind and ask questions about their status. This could be done in the app it self, or through integration of other secure communication apps like WhatsApp.