

Software Engineering ENGR5510G
Faculty of Engineering – Ontario Tech University – Graduate Studies
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**Project Proposal – Research Track
Submission [1]**



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1. Overview

1.1 Human Centric Software Engineering and Health Tracking

Human centric software engineering takes the form of developing software with the sole intention of focusing on user experience, interaction, behavior, and human focused functionality. This branch of software engineering is concerned with the marriage of software engineering into the day-to-day lives of humans, as we progress into an increasingly digitally advanced world. [1] In this branch of software engineering, an agile methodology is often used. This is to develop iterative versions of the project and test frequently and gain rapid feedback to see what works and what doesn't. In addition to this, human needs and behaviors are dynamically changing so the software must rapidly adapt to the current state of human characteristics. The iterative SDLC style of agile methodology compliments this [2]. For this project, we will focus on human centric software engineering combined with health tracking. As previously stated, this will tie into software engineering being more involved in humans' lives at an ever increasing rate in today's society. Moreover, agile methodology will be studied in great detail by using published software engineering works, to validate if it would be ideal.

1.2 Different Cases of Software Engineering in Human Health

Health tracking software has long been implemented for human health, but it varies case by case. In some cases, it is a highly safety critical system, such as an insulin pump. In cases like this, a more planned approach is taken and there is a negligible customer feedback loop. However, in most cases, it is a more iterative approach where human feedback is regularly taken in to account. For the case of a health tracking software, it may make more sense to take an agile iterative approach. This is based off many health apps such as "Samsung Health" or "Health" on Apple iOS implementing updates frequently based off customer feedback and experience.

1.3 Research Objective

Ultimately, the goal of this proposal will be to find research gaps, solutions, and methodologies on how a potential health tracking product may maximize it's human centric functionality and work for the benefit of humans dynamically. The goal of this product would be to maximize its compatibility, ensuring that many demographics are taken into account and humans with different disabilities and issues can benefit from the product. At the end of this research (or in parallel), it should provide a means to implement a product or at least an initial sample code to demonstrate basic functionality.

2. Current Research Gaps

2.1 Health Tracking Systems and Personalization

After reviewing the current state of the market, it is quite clear that many famous health tracking software do not include many forms of personalization. Basic data fields are present, such as age and sex, however more advanced user data is simply not present. Areas such as past medical history, current diagnoses, surgical history, family medical history, and vaccination history (to

name a few) are not found. The reason why this exists as a research gap is that it demonstrates that many of our leading technology companies focused on healthcare (fitbit, Apple, Samsung) are not developing the human centric aspect of health tracking. The aim of this research project will be to discuss the feasibility of implementing more of these characteristics. For expanded research, user studies will be conducted and online publications will be looked at side by side.

2.2 AI in Health Tracking

Currently, there is a lack of AI implementation in healthcare. While this may seem like a necessity in today's day and age, AI is still very much a new topic and in its early stages, so it is difficult to implement for safety critical systems. That being said, for more simple use cases, such as health tracking, it is feasible to use AI in a broad sense. The amount of data available for use from today's technology is ever increasing, with smart rings, smart watches, and other various health monitoring products that may allow us to propel the use of AI in health tracking and ultimately create a product that utilizes AI to increase its human centric nature. [3]

2.3 Lack of Safety Critical Features in Health Apps

Due to the lack of personalization, health apps are also not able to recommend exercise targets for users due to the lack of personalization and user history. Ideally, the software should be able to build a model for each user and tie it to limitations for each condition. For example, a user with asthma should only be able to run until a certain threshold before it becomes dangerous. Because of this, a large research focus for this project would actually be on the various different limitations of different diseases and medical problems that users would face. This will later be discussed in the proposed solution for this research project.

2.4 Security Concerns and User Privacy

With software engineering targeting human health more and more, it is important to remember that a lot of private information is being shared between the software product and human. Many humans are frequently seen expressing concerns either through social media or popular media, expressing their reluctance to offer up their data to AI services of any kind. In fact, it is commonly noted that public opinion typically assumed that their data will be misused during the handover process [4]. Due to the nature of this, it is vital to research different means and methodologies that human health data can be protected.

3. Proposed Solution

3.1 End Goal of Research

As previously stated, the goal of this research project is to devise potential strategies to increase the human centric nature of health tracking software. To accomplish this, we will target research gaps, explore artificial intelligence methodologies, and decide what are the different areas that are more important than others to explore. Furthermore, this research should serve as a framework to explore an implementation aspect of this topic as well, using the various topics covered as a way to outline and eventually implement a practical project in this area.

3.2 Solution

The solution to the lack of human centric focus in health tracking would be as follows:

- Increased data availability for software, such as medical history, surgical records, family medical history, and current diagnoses. This will allow the AI aspect of the software to have a larger dataset to make informed decision for the user
- Exploring safety limits based on user data, in order to implement safety critical features
- Suggest different forms of physical activity based on user limitations and past health history
- Exploring best user experience strategies for health tracking software based on what is currently available in the market
- Create an all-encompassing product that does not only target physical health, but also mental health, and speech. Explore areas of NLP and journaling such that the AI can target all aspects of human well-being.
- Review the surface level research of this topic and devise an implementation plan
- Allow the AI to calculate physical limits, suggest improvement plans, and create diet plans based off user data available and live monitoring of human health statistics.
- Create a secure end-to-end platform that will protect all user data and guarantee user privacy.

4. Methodology

4.1 Data Collection

Data collection will be done through various methods. The first of which will be through user input itself, where users will have the opportunity input their own medical data and begin their charting in the software so that the platform can begin to categorize them in their own category (high risk, diabetic, asthmatic). Secondly, users may also connect other devices such as wearable devices for live monitoring as well as building their history within the software.

4.2 Software Engineering Tools and Methodologies

Researching software engineering strategies and tools will be important if this project is to transform from the research phase to the implementation phase. LLMs can be implemented to assess user needs based on health history and live health readouts. NLP models can be used to assess and score speech of users struggling with speech.

5. Evaluation Plan

The best way to evaluate the results of this research study would be to see how strong of a foundation there is for a potential implementation of this topic. Therefore, when the project is completed, it will be evaluated based on how feasible implementation is.

References

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