Human Centric Design in Health Tracking Software

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***Abstract*— Human Centric Software Engineering (HCSE) plays a key role in many industries to improve user retention, compliment human behavior and psychology, and improve user trust. This paper will delve into the importance of integrating HCSE to target the aforementioned factors as well as explore methods to implement HCSE in health software. The paper will discuss artificial intelligence as it bridges the gap between HCSE and human health software, and the degree of confidence to that which AI can play a role in health software. In the context of implementation, but the software engineering tools that can be used to implement the proposed model of HCSE will be explored. Agile and waterfall development strategies and their relationship with such a goal in health software will also be discussed, outlining which phases of the SDLC they will fall under and when they will be used. Several present day topics will be incorporated in to the study, such as Natural Language Processing (NLP), Large Language Models (LLMs), and neural networks. As this topic is the marriage of two widely different industries, the collaborative aspect will also have to be reviewed, where health journals will be cited in order to extend the literature of the HCSE integration in to a feasible health-oriented approach. After assessing the requirements, implementation, and process of this approach, limitations and and future work will be discussed in the conclusion of the paper. (*Abstract*)**

Keywords—Human Centric Software Engineering, human behavior, health software, SDLC

I. INTRODUCTION

Technology has become a day-to-day tool of every human alive today. As physical and cyber environments are coming together, they are encouraging people to make choices based on non-functional metrics, such as how something might nake you feel, how it affects your mood, and how satisfied it makes you with your day. That being said, most businesses are driven by software engineering today. Most operations that are run by businesses are reliant on the interaction between humans and software technologies. For example, the journey of the customer purchasing a product, from the act of purchasing the product to actually using it and engaging with it, that experience can not occur without the use of software. There are many different factors that come in to play when we discuss Human Centric Software Engineering (HCSE). Notably, functionality, behavior modeling, service dependability, and user experience (UX) are all key components of the HCSE lifecycle. Functionality is the act of ensuring that the requirements set out by the software successfully fulfilled, with the user in mind. In other words, the software's input must meet the desired output. UX, a broad term used in software design, in this context, means that the physical appearance and aesthetics of the software system must appeal to human psychology. The interaction the user has with the software, the behavior the user exhibits when using

the software, and the feedback the user provides are all tangible and intangible metrics that demonstrate the capability of a software systems user experience. Service dependability, much like how a business must be available during its operating hours, and fulfill a customer's needs to the customer's satisfaction, we can extend this to a software system. Software must be available at all times to the user. That being said, reliability is also a component of human centric design, meaning that the software's functionality must function as is designed at all times. Lastly, and perhaps an often overlooked component of HCSE, is user trust and privacy. While user trust and privacy is often categorized under the umbrella of security, many engineers and researchers fail to comprehend that security, privacy, and regulations play a big role in being a major factor in HCSE. [1]

II. SCOPE

A. *Types of Human Health Software*

There are many types of different health software, mostly on the clinical side.

- Electronic health record keeping systems utilize medical history and usually an enterprise style platform to provide end to end access of and manage records of patients. These systems are highly useful as they allow hospitals and clinics to have a full electronically maintained database of their patients' records.
- Telemedicine platforms give way to remote consultations giving patients the ability to meet with doctors virtually. This can allow patients to do appointment scheduling, share medical information, and get a diagnoses, all from the comfort of their home.
- Medical imaging software allows healthcare professionals such as radiologists to analyze, process and understand the results of medical imaging like CT scans, MRIs, and X-rays.

Fig 1. Dashboard in a typical health tracking application

- Switching to focus to a more "casual" form of health software, there also health monitoring applications (the most similar case to the type of software this paper will discuss).
- Lastly, pharmacy management software allows the process of prescription processing and medication dispensing and licensing.

The purpose of providing information regarding all these different kinds of software is to pivot the focus to not just casual health tracking software, but show the broader scope of health software and how it can interconnect to create a overall grand human focused version. As mentioned, while the focus will be to improve the human centric design on more casual software, the integration of all these different forms of healthcare software can create an ultimate human centric solution.

B. *Different Cases of Software Engineering in Human Health*

In the context of the previously mentioned types of health software, there also many different types of software engineering in human health. More safety critical scenarios, like a pacemaker functioning

properly or an insulin pump administering insulin at the set time. In these cases, rigorous testing is required, and dependability and accuracy is critical. In contrast, there are more casual applications of health software that track basic metrics such as exercise heart rate, menstrual cycle, and step count. The goal of this study will be to see if both safety critical features and more user enriching features can be merged in to a single software system to provide that extra degree of human functionality.

C. *Primary Focus of This Study*

There are many applications provided that are readily available to the average consumer today. Major tech companies such as Apple, Google, and Samsung have all deployed their version of "health tracking" software. While these applications are powerful and have come very far since their conception, it is quite easy to see they lack that extra degree of human centric engineering. Emotional engagement, real-time adaptability and user personalization are mostly non-existent in these applications. Rather than incorporating the previously mentioned aspects of healthcare, these apps features and functionality has been fairly limited for the past decade; focused plainly on basic observational and measurement functionality (e.g. displaying heart rate, steps for the day, calories burned, etc.). This study will aim to bridge the gap in many health softwares found today, and even propose a means to implement that human centric software engineering. The literature will be studied in detail to identify gaps and limitations. Then, existing tools available to software engineers will be considered when focusing on a means for implementation.

III. GAPS IN CURRENT MARKET PRODUCTS

A. *Current Products' Review*

As previously mentioned, current health tracking software lacks a true human centric software engienering approach. For the purposes of this study, we will focus on Samsung Health, Apple Health, and Google Fit. A common dashboard displayed in these sorts of applications is displayed in Figure 1 below.

As shown above, these applications lack a HCSE appraoch and result in limitations to appealing to human nature. Common features are placed out amongst these applications, such as basic metrics shown. In the figure above, walked distance, heart rate, sleep, weight, elevation, and calories burned is shown. While this is certainly beneficial, this sort of information is only a mere measurement and does not provide any form of measurable functional output to the user, they are able to use this information only if they are an expert at health metrics themselves. The aim here is the provide actionable results. Mixing health metrics to provide users with more information and actual actionable functionality. For example, providing a user with safety limits based on their recent diagnosis of diabetes, or suggesting safe exercises based on their recent surgery that they have had. Furthermore, AI processing of their data such as how fast they completed their previous run and then providing them with a new safe target based on analyzed data. These applications lack the user functionality to upload health records, health information and perhaps even family medical history. That being said, one of the biggest hurdles with even implementing this sort of functionality may be gaining user trust.

IV. CONTEXT OF THIS STUDY

Many different tools and methodologies will be discussed in this paper and how they can be applied to increase the human centric nature of a possible health platform. Most often, when researchers or engineers hear about human centric design they immediately consider human psychology, soft features of software (color, design, etc.), and otherwise non-technical semantics. That being said, many of the robust and present day tools we see today can and should be used to develop the human centric aspect of software platforms. This is why over the next section, these will be discussed in depth to establish relevance.

- Artificial Intelligence: The most important tool we will discuss in this paper is Artificial intelligence (AI). This will be discussed the most extensively as it is an umbrella term that encompasses all the tools we will be discussing. AI is a branch of software engineering a very prevalent topic discussed today. It is dedicated to creating software systems capable of many different "human" tasks. It is involved in many different areas of computer science, such as data analytics, hardware, statistics, modeling, and imaging. AI functions off of extremely large amounts of data, using complex algorithms and poattern recognition to establish data

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relationships and trends. The scope of AI today is often categorized in different buckets, with companies employing it to create virtual assistans, object recognition, or data analysis tools. Artificial General Intelligence is the main focus of AI today, where it is able to perform tasks with abilities similar to human cognitive ability, but not quite at the level a human would be. Artificial super intellgence, alternatively, is when AI would surpass human abilities but is still a highly theorized branch of artificial intelligence in 2024. [3]

- Natural Language Processing: Natural Language Processing, or commonly referred to as NLP, is a branch of Artificial Intellgience that enables machines to understand and interact with human language in a manner that makes sense. By utilizing machine learning and linguistics, NLP givers computers the ability to process analyze, and generate text, speech, and text to speech. Today, it can even be used to discern between different emotions and moods, and has been used as such [4]
- Image recognition: Computer vision and its derivatives termed "image recognition" is a branch that enables software to identify objects, places, and actions with digital recognition technology. Using advanced AI algorithms computers are able to analyze visual data and then use that detect and categorize elements in images. Through the use of structured training, computers can begin to understand images and understand patterns in these images. Data collection is a phase of image recognition that involving compiling a large dataset of images within a certain category to train the model on a recognizing a particular image (e.g tractors). Then, the model is fed these images and put in to a neural network, where it learns to dientify patterns using multiplate layers termed convolutional and pooling layers. The model is then able analyze new, unseen images and generate accruate predictions based off the training data and neural network. There are many applications of image recognition, but of course, the one we will be focusing on is medical diagnoses, which usually involves (but is not limited to) analyzing medical images from CT scans, MRIs, and X-rays to detect abnormalities and possible threats to human health. The term "object detection" is also used interchangeably, however it should be noted that this term should *not* be used interchangeably and is most commonly used to detect objects, their location, and size, whereas image recognition is used to categorize and just understand what the computer is seeing. [5]
- Predictive Modeling: Predictive modeling is a technique that takes existing data to build statistical models capable of predicting and forecasting future outcomes. Often deemed a subset of predictive analytics, it focuses on picking up on patterns and historical data to understand behaviors and trends. This process uses machine learning and computational tools to understand analyze extremely large amounts of data that would be otherwise impossible for humans to do themselves. Predictive modeling is extremely important across many industries allowing businesses to forecast operational ability, predict customer behavior, and prepare for potential risks or failures that may be overlooked by the human eye. In mechanical engineering, it can predict when maintenance may be required or the reliability score of a system. Data preparation, training and testing, and model deployment are all phases of predictive modeling that allow it to be successful. In data preparation, this involves data collection, cleaning, and organization to prepare it for analysis. In the training and testing phase, the data is divided into various dets and then used to teach the model, and then tested to evaluate the predictive accuracy. Finally, model deployment includes refining the model to enhance its performance based on algorithms that analyze the data and perform continuous updates over time. There are many benefits of predictive modeling, especially for our use case. It can improve decision making, not just for businesses but for the average casual user as well. It can perform risk mitigation tasks, and the role of this would be quite obvious in

health management. Still, there are many challenges in predictive modeling. These include data quality, assumptions of stability, model drift, and resource requirements, to name a few. [6]

- Data analytics: The systematic process of examining data to uncover unseen patterns and generate insights to ultimately make informed decisions is referred to as data analytics. Many techniques and tools are used in data analytics, which are often automated through advanced algorithms. These allow businesses and organizations to analyze massive datasets efficiently. For the purposes of healthcare, data analytics could be largely beneficial as it could allow users to gain insights from their health metrics. A typical software system that is used for data analytics usually takes raw, unprocessed data and turns it in to meaningful information that the user can choose to do with whatever they like. There are many different kinds of data analytics . Descriptive analytics describes an event that occurred and why it may have occurred. Diagnostic analytics explores why something occurred by analyzing diverse datasets to identify relationships. Predictive analytics means to antiicpate future trends and outcomes by examining historical data and identifying patterns (similar to predictive modeling). Lastly, and perhaps most importantly for our case, prescriptive analytics means to recommend actionable steps for the user based on outcomes and findings form the data. In health care, this can be incredibly powerful to aid in patient diagnosis, treatment planning, and operational efficiencies in hospitals. There are numerous steps in the data analytics process, such as data collection, data organization, data cleaning, data analysis, and data presentation. More importantly, however, is the actual techniques and tools that can be used in data analytics. Regression analysis is the act of identifying relationships between variables to understand how changes in one affect the other. Factor analysis reduces complex datasets to uncover hidden trends or underlying patterns that may be otherwise difficult to track. Cohort analysis segments data into groups for more targeted analysis, such as customer demographics. Monte Carlo Simulations predicts outcomes by modeling various scenarios, often used for risk management. Lastly, there are various tools that can be employed to present data analytic models, such as Power BI or Tableau, which make an appealing dashboard for users to visualize their data. Overall, all these tools and strategies can be used to process user data and extract valuable health insights, which will be discussed further in this paper. [7]
- Cybersecurity: in the context of this paper, cybersecurity, or AI for cybersecurity, will be of the utmost importance. An often overlooked component of HCSE is the privacy and security aspect. This is key in developing a trusting relationship with the users of a software system. “AI for cybersecurity” utilizes AI to assess cyber threat data from many sources, and through processing turn that into actionable insights. Technology such as this enables security teams to investigate and respond to cyberattacks before they even arise. AI can automate responses such as isolating certain parts of a system to contain damage or a malicious entity. There are many use cases of artificial intelligence in cybersecurity that can be beneficial for the purposes of this study. Of these, identity and access management, which detects abnormal login pattersn and enforces 2 factor authentication protocols. Automated incident response can reduce response times by correlating and prioritizing relevant security events, and also speed up the time for a software system to respond to threats. Data protection which can allow the AI to help find sensitive data, preventing unauthorized data transferring and raising alerts for suspicious activities. Solutions like Extended Detection and Response and Security Information and Event Management rely on cybersecutiy AI to identify and respond to threats across enterprise systems. [8]
- Internet of Things (IoT): Internet of Things refers to a system of interconnected physical devices ranging from things like advanced industrial tools to common appliances that we

as everyday citizens might interact with. Sensors, software, and other technologies all work cohesively to facilitate data exchange over the internet and send this data for processing or analysis, enabling continuous data flow between physical and digital worlds. There are many technologies that enable IoT, namely, wearable devices, low cost sensors, machine learning, enhanced connectivity during the 21st century, and more powerful energy storage density. In healthcare, wearable devices and connected sensors allow the ability to do remote patient monitoring, as well as real-time health metrics tracking [9].\

V. Literature review

A. Reference to Project Scope

Before delving into the literature review, it is worth discussing the project scope; this project is dealing with human centric design in health tracking software, and methods to increase the degree of human centric behavior found in this software. To be more specific, the research project will discuss the current degree of human centric design found in health tracking software available to users today, how this could increase, which software tools and methodologies we could use to further develop this, and which sorts of software engineering approach would be best for developing this further. The project takes an in-depth look at the current state of health tracking software, such as those provided by major tech conglomerates like Apple or Samsung, and to which extent they incorporate a human centric aspect into their software design and development. In addition, if possible, it would be worthwhile to evaluate what sort of SDLC these companies are using for their development of health software (i.e. Waterfall or Agile). The project will also review whether Artificial Intelligence for human health is at a state that would be beneficial to actually use in a practical environment and if it would be worthwhile to increase the human centric aspect of health software.

B. Purpose of the Literature Review

When merging a field such as Software Engineering and Human Health, there are many critical topics to cover such as privacy, safety, and user behavior. Some may even argue that software and human health should maintain very separate boundaries, in that the invasion of artificial intelligence and data collection strategies should stay far from entering the bounds of the day-today aspects of human health. This literature review will cover topics such as these, but also explore what other topics need to be studied, because as mentioned this is a very sensitive topic with reaches into privacy, safety, and user behavior. In addition, the current state of artificial intelligence is rapidly changing every day, so the literature review will focus on new findings in this field in the context of human health, and how this can be a powerful tool to propel our human centric nature forward. Furthermore, other areas such as which sorts of data are vital will also be discussed, as smart rings, watches, and other health monitoring devices become more frequently used. One of the most important topics that should be discussed is the actual medicinal topics. As a student of software engineering, I may not be familiar with what sorts of key human indicators are vital to developing a daily health tracking system. This may include furthering my knowledge in human health like diving into the importance of ECGs, blood oxygen levels, and irregular heartbeat patterns. It may also be worthwhile collaborating with professionals in the field and getting an expert-user focused feedback on the topic and what someone in this field would actually want to see implemented. However, this will not be included in this literature review as the focus of this is more on the medicine side and does not belong in this literature review, which will discuss purely the mix of software engineering and human health, or just purely software engineering. The user behavior and psychology of how humans feel and interact with software gearing itself to be more human centric will also be studied. Whether or not this is something excites human or creates an extra layer of skepticism is a topic that will have to be explored as this is a very controversial topic in today's society. Lastly, another important topic will be user privacy and security. As expected, a health tracking software product will contain a plethora of sensitive health information. Methods and concerns with storing this information will also be studied in this literature review.

C. Article 1: The Potential for Artificial Intelligence in Healthcare

Article Purpose, Findings and Scope: The review therefore discusses artificial intelligence generically

to include the application of the technology to clinical decision-making and the management of electronic health records.

Relevance to Project Topics: Machine Learning Neural Networks and Deep Learning Machine learning is one of the most common ways of training large models with data and it is also one of the main forms of AI. In health tracking it can find the treatment plans that match a person's condition and health signals [10]. Precision medicine - the particular class of machine learning - predicts which treatment might best benefit a user. Those who first used neural networks, one of those terms coined in the 1960s, say it is a tool that could classify patients into various classes-for example, by judging the probability of the patients to have certain diseases. Another subset of machine learning, deep learning, takes this power from graphic processing units to process millions of images that identify diseases, such as those showing whether tumors are cancerous on an X-ray. Besides image analysis, deep learning extends to speech recognition and natural language processing, providing accuracy in converting audible speech into data models, which is a very exciting concept and directly relates to the goals of the project [10].

Relevance to Project Topics - Natural Language Processing: Apart from interpretation, other ambitious efforts since the 1950s to understand human speech led to the creation of state-of-the-art health-related software. Statistical NLP these days uses a machine learning approach by training the models on vast datasets of language to better recognize the language. Current healthcare applications, as mentioned in the article, include categorizing clinical documents and analyzing published research using NLP [10].

Relevance to Project Topics - Physical Robots: Robots have increasingly been engaged in health care to undertake some of the physical activities, such as welding and repetitive lifting, among other high-risk activities. This, it is mentioned within the last ten years, results in more symmetrical and shared spaces of collaboration between humans and robots. This is fairly mentioned in the article, which goes ahead not to mention how the robots could be used in supporting speech therapy, psychological health, and general emotional well-being.

Relevance to Project Topics - Future of AI in Healthcare: The article brings out the fact that AI has been finding an important place in modern healthcare. AI will likely improve on all levels of medical services, starting with prognosis, then diagnosis, going on through treatment, and finally prevention. Image recognition and analysis will enable the machines to do all radiological work independently in the years to come [10].

Article Review – Gaps and Opportunities for Application: The paper provides deep insight into the research on human-centered advances in health tracking it covers key topics relevant to the use of artificial intelligence, ethics in healthcare software engineering, the future of AI, and the use of NLP tools within healthcare. Most of the topics always tend to clinically be applied with less relevance to informal user experience. This is highly relevant content for this research use case.

D. Article 2 – Human-centric software engineering – Approaches, technologies, and applications

Article Purpose, Findings, and Scope: This paper reviews and closely investigates the research conducted in the area of human-centered software, along with the tools and methodologies applied to enhance the human-centered attributes of software systems. The main goal is to collect and outline the research relevant to approaches in the field of SDE that consider human needs, functionality, logical consistency, and privacy standards. It does so by discussing both the theoretical underpinning and practical methods in software engineering, putting together insights from 10 selected research articles out of 25 submissions. The article has highlighted theoretical developments concerning HCSE and has underlined that emotions drive human reactions in very subjective ways. It also discussed the manifold uses of HCSE in healthcare, manufacturing, mobile applications, agriculture, gambling, and the accessing of the visually impaired. It examines the critical issue of privacy and the confidence required for the relationship between humans and technology, further to proposing methods to increase that trust [11].

Relevance to Project Topics – Current State of Human Centric Design in Software: The article also emphasizes how technology has pervaded people's

lives. It goes to the extent to say that billions today work with technology in some form or other, be it mobile devices, work-place tools, or any other device. People's quality of life depends more and more upon the software services available to them such as infotainment, health care, which is of interest to the project being proposed, banking, and transportation amongst others. Artists, programmers, engineers, and educators alike describe human beings as the linchpin in the generation of software in cyber-physical-social systems, ending with a reflection on the effects of software development on their own lives. However, the article underlines a fundamental flaw: the deficiency of human-centeredness in software design. It emphasizes that the lack of consideration of some fundamental human aspects, such as feelings, personality traits, age, gender, and cultural background, results in a lack of appropriate experiences and creates barriers to effective relationships between humans and software [11].

Relevance to Project Topics – Privacy in HCSE and Healthcare

The article has underlined the importance of privacy in HCSE by referring to the paper entitled "People want reassurance when making privacy-related decisions — Not technicalities." In this respect, it is underlined that average users, and especially those who lack technical knowledge, are not interested in the complicated technical details that lie behind ensuring the safety of their data but instead are looking for emotional reassurance that their data will not be misused. It involves dependence on trust and assurances rather than on technical elucidations alone, hence an essentially human issue in privacy-related matters [11].

Article Review – Gaps and Opportunities for Application

This paper represents a milestone for those interested in the instruments and methodologies developed for the improvement of human-centric software engineering. It also cites more than 20 other studies on HCSE, and these will be a great asset in the final submission of this research project. In any case, the paper has not concentrated its efforts on use in a healthcare perspective, nor does the document extensively discuss the role of AI.

VI. METHODOLOGY & RESULTS

A. Overview

As discussed in the previous sections of the paper, the methodology to increase the human centric aspect of the health tracking applications available today will be to study the gaps in the market, review the literature, utilize powerful software engineering techniques and tools, take advantage of data collection strategies, to ultimately create an extremely personalized healthcare application. The goal of the application is to be all-encompassing; it should be able to cater to almost every aspect of health from fitness, mental well-being, surgical, pharmaceutical, and safety critical features as well (such as insulin reminders, physical exercise limits, etc.).

B. Data collection - IoT

To serve as the foundation of increasing human centric design, rigorous data collection will be used. Today, we have many tools to collect health information from users. Smart watches, smart rings, pacemakers (often not used), blood glucose sensors (not commonly used either), are all examples of physical devices that can be used to extract useful health information. As discussed in section IV, IoT serves as a powerful technique in software engineering for a continuous flow of data from wearable devices. As shown in fig. 2, pacemaker is almost hardly ever used in a casual user environment. That being said, if an application were able to utilize the continuous stream of data from a pacemaker graph, it could provide personalized insights in to dangerous events, or provide insights on the history of the events.

C. Encryption – AI for Cybersecurity

As mentioned in the literature review, privacy is of the utmost importance when implementing for human centric software engineering. Users need to be able to trust their software, as this will critical to form a relationship between human and software. For this, AI for Cybersecurity principles will be incorporated, utilizing artificial intelligence algorithms to do preventative checks on the software

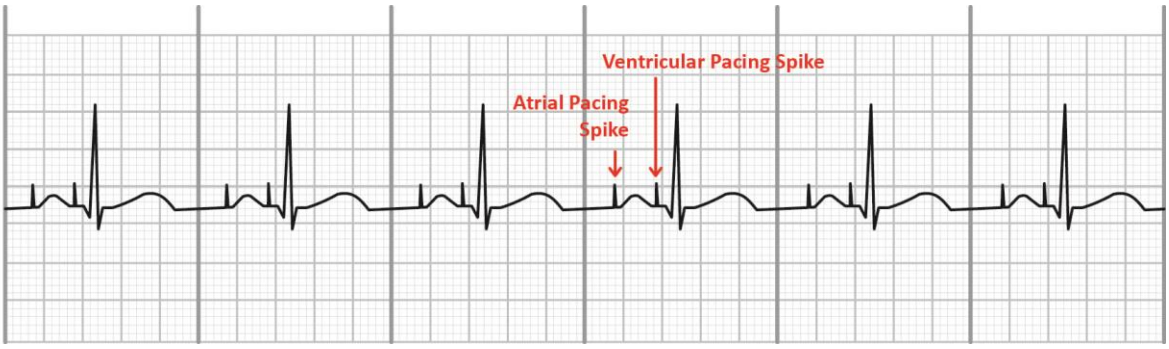

Fig 2. Pacemaker graph showing different events in the pacing cycle

system and detect threats prematurely. As the system will contain a lot of sensitive user information, methods like 2 factor authentication will also be required. In a case study by New America, it was found that while 2FA successfully prevented and reduced the threat of cyberattacks, it also produced annoyance by end-users. So while this may be powerful, it is also a potential limitation to implementing 2FA. [12]

D. *Processing – Software Engineering tools and methodologies*

The most important aspect of implementation, the various software engineering tools and methodologies discussed in this paper will play the biggest role in implementation. To discuss the breakdown of the various tools and methods, please reference Table 1 below.

VII. EVALUATION, DISCUSSION AND CONCLUSION

A. *Evaluating the Human Centric Aspect*

Human centered design, when executed effectively, boosts user experience, and ultimately reduces something referred to as "churn" [13]. Customer churn, or customer attrition, happens when a customer decides to stop using your products or services, meaning they are no longer your customer. The churn rate measures this by calculating how many customers stopped during a specific time frame, like a month, a quarter, or a year [14]. Therefore, it would be beneficial to track the effects of our human centric implementation through customer churn, as we should see a dramatic decrease in customer churn upon successful integration of human centric design elements. The formula for calculating customer is shown below:

$$\left(\frac{Lost\ Customers}{Total\ Customers\ at\ the\ Start\ of\ Time\ Period}\right) X\ 100 \quad (1)$$

Thus, as shown by the formula, it would be possible to implement sprints of human centric design and then calculate the churn percentage drop or increase with each implementation cycle.

B. *Limitations*

This will be quite a complex development in terms of health software, involving a highly skilled and varied development team. The other significant barrier would be the issue of earning the trust of users: normally, people are quite careful regarding their sensitive health information, at least for aspects that are material to them. This is where, on the medical field, it adds a whole other level of complexity, requiring proficiency in topics other than software engineering, such as cardiology, psychology, and mechanisms of human diseases. Real-time data processing further requires a system that can handle huge computational load with increased energy consumption and other sustainability concerns. Safety-critical features are also intrinsically hazardous; even minor flaws in the software can lead to disastrous consequences, and so extreme levels of testing and validation are called for.

Method/Technique	**Tool**	**Implication of Results (Human Centric Outcome)**
Natural Language Processing	NLTK with Python	Many different use cases, such as speech therapy and language prediction for less verbal-abled individuals. Can also enhance the therapy aspect of artificial intelligence, giving users a potential means to communicate with software in the same way that they would humans
Image Recognition	TensorFlow	Would give the means for the health software to recognize different kinds of movement or exercises being performed, and then give feedback to the user on how well they are performing. In addition, would give users the ability to upload their medical imaging results for faster feedback and understanding of results as well.
Predictive Modeling	Python Machine Learning / Tableau	Provide users with predicted metrics such as weight loss at their current eating/exercising rate, predict strength increase from exercise, or heart rate in next exercise session.
Data Analytics	Python with NumPy or Pandas	Data analytics fosters improved decision-making by providing clear insights into trends, enabling users to make data-driven choices. It supports personalized experiences by tailoring products and services to individual needs, while presenting data in an accessible way, even for non-technical users. By identifying inefficiencies, it optimizes processes and enhances user trust through transparent and ethical data handling. In healthcare, analytics promotes health awareness by revealing patterns in metrics, empowering proactive management. Businesses benefit from better customer engagement through predictive insights, and real-time problem-solving ensures swift issue resolution. Overall, data analytics democratizes access to actionable information, empowering users at all levels.

Table 1: Implementation Means for Human Centric Design

C. Conclusion

This project represents the holistic investigation of human-centric health tracking software development: an ambitious initiative in a bid to bridge the gap between technology and personalized health care. The entire process of work, from the proposal to this final paper, highlighted the deficiency of the contemporary health applications, such as Apple Health, Samsung Health, and Google Fit, in meeting the subtle and individual needs of the users. We investigated emotional response weakness among individuals, privacy trusts, and integration of various healthcare data. After that, we spotted some important opportunities for innovation. In our research, we found that the healthcare process can be revolutionized with an advanced approach through prediction modeling, machine learning, and IoT. Each tool has been analyzed regarding its contribution to personalized care by early detection of the warning signs of chronic diseases and the provision of real-time information that will be beneficial for both the end-users and the healthcare professionals. These approaches, along with an

emphasis on privacy, trust, and safety concerns, give way to the next generation in health software development. Notwithstanding all these promising options, enormous hurdles must be overcome. Such sophisticated software requires the collaboration of several streams of learning: software engineering, psychology, and medical knowledge. Real-time data handling and safety also require meticulous work over technology, while gaining the users' trust is yet a big challenge due to data privacy concerns. This journey of the project corresponds to how cognizant one should be while designing technologies for human use. It would be able, by focusing on human needs, feelings, and on other cultures, too, to attempt to secure a future in which health software can do more than check numbers: improve lives. The result of this project is an action plan for new ideas but an appeal for joining developers, researchers, and care workers with the new way technology helps people.

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