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Potential of User Experience in non-invasive Glucose Monitoring system

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Abstract: ***User experience is about the experiences people have with the designed world, this research focuses on giving a better experience for diabetic patients who constantly have to prick themselves to check their blood glucose levels. With the help of new and emerging technology, near-infrared spectroscopy (NIR) is a promising option that can be incorporated with a better design to provide usability, accessibility, and pleasure for diabetic patients.***
Keywords: NIR: Near-infrared spectroscopy, UX: User Experience, UI: User Interface, HCI: Human-Computer Interaction, SWOT: Strength, Weakness, Opportunity, Threats, IA: Information Architecture.

I. INTRODUCTION

The Healthcare industry in UX is people's experiences with healthcare technology and services. There is a huge potential globally and in developing countries like India, people still face poor experiences even when things have been better than before, it is seen that there is always room for improvement.

Diabetes refers to a physiological metabolic disorder in which elevated blood sugar levels prevail in an uncontrolled manner. Millions of people worldwide have been suffering from a metabolic disorder. With the advent of invasive glucometers, individuals can monitor their respective blood glucose levels at home, which is costly and painful. Tight blood glucose regulation is needed for effective blood sugar management thus the painful and cost-related factors often hinder continuous blood glucose monitoring. The noninvasive pain-free approach would come up with clinically effective blood glucose monitoring. [1]

The glucose concentration in the body may soon be measured noninvasively, without puncturing the finger to obtain a drop of blood. Current prototype devices for this purpose require greater accuracy and miniaturization to be commercially available. No such device has been approved by the U.S. Food and Drug Administration yet. New technology leads to a revolutionary advance in the treatment of diabetes. The most promising technologies in the noninvasive glucose monitoring systems are near-infrared light spectroscopy (NIR), and far-infrared radiation spectroscopy.[2]

When a light ray is passed through, it reflects/refracts and gives different wavelengths, thus whenever we use NIR we can measure the frequency of the blood glucose level and match it with a reading sensor, with a few calculations it is possible to produce an output of a non-invasive glucose monitoring system given the readings directly on your device android or ios.

II. METHOD

- Discover
  - Discover the design problem and the scope of the product that needs correction through design.
- Dream
  - Define the design problem using mental models
- Define
  - Create design differentiators that can be used as a user retention strategy.
- Design
  - Create usefulness, effectiveness, and learnability of the digital product
- Develop
  - Create visual designs that are clear, concise, and consistent.
- Deliver
  - Create design documentation for the engineers and product managers to code the digital product

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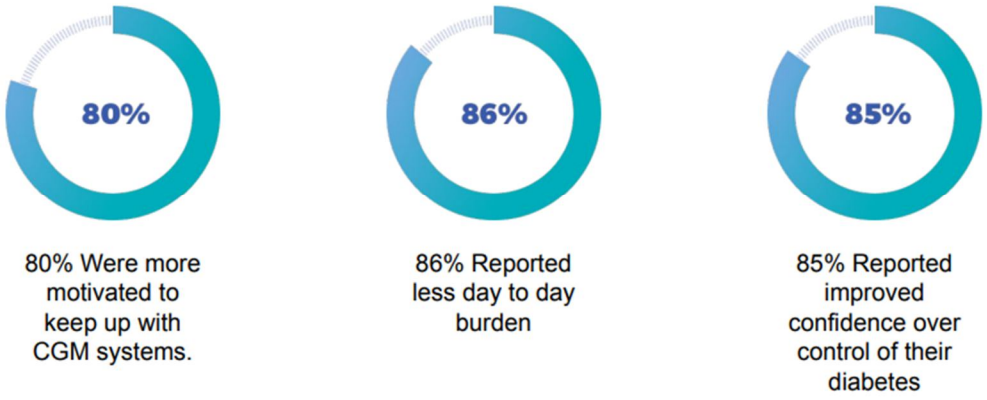
A. Potential User Base

Potential users can be virtually anyone who is diagnosed with diabetes irrespective of its type.
Specific patient groups. Indians between the age of 18 to 35 years are most vulnerable, data shows that 73% increase in the number of claims between 2016 and 2018.

B. Competitive Analysis

Parameters	Eversense	Dexcom	AccuCheck
Product Overview	A continuous glucose monitoring that is transplanted, and gives real-time diabetes monitoring.	Wearable and invasive continuous glucose monitoring system that gives real-time data.	An instant but not continuous blood glucose monitor that is invasive
Product Functionality	90 days an under-the-skin sensor, a removable and rechargeable smart transmitter that transmits data onto the phone and shows sugar levels.	A slim sensor continuously measures glucose levels just beneath the skin and sends data wirelessly to a display device through a transmitter.	Draw blood and check it on sensor strips that read the sugar levels and show data on the device meter.
Key Differentiators	The sensor stays inside the body and has to be placed through a medical procedure. Needs a transmitter to stick on the skin to transmit data from the sensor to the phone.	The sensor can be removed and placed again, it sticks to the skin and is not inserted inside. The sensor is directly connected to a transmitter.	Simpler prick and draw blood concept. A blood drop is put on the strip and the monitoring device reads it and shows the sugar levels on the screen.
Key Problems Solved	Painless and no pricking or drawing blood for up to 90 days.	No need to store it on needles and strips. Less painful.	At home and anywhere monitoring blood glucose levels.
Brand and Design	Eversense is designed for accuracy, comfort, and continuous wear, leading to more time in range, and you that feels better! Eversense sees itself as a future health and technology start-up company.	Listening to the needs of users, caregivers, and providers, Dexcom also invests its identity extensively around athletes and celebrities to empower and support the world of diabetic patients.	AccuCheck emphasises trust and doctor's support in India. They have a Blue-green theme that promotes medical values in the users.

Pre-existing data shows that after trying CGM systems 80% were more motivated to keep up with CGM systems. 86% reported less day-to-day burden and 85% reported improved control of their sugar levels.



This states that the future of CGM is promising if the data was taken from an invasive device, the potentiality of a continuous glucose monitoring system that is noninvasive with proper health and statistical data on smartphones is huge.

C. SWOT Analysis

Strength	Weakness	Opportunities	Threats
Accuracy in Blood Glucose levels.	Copyable user experience design for existing competitors.	Few competitors in the non-invasive areas.	Comply with the government regulations.
Non-invasive and painless.	Gaining trust in the medical field and patients.	The underserved market for the product.	Purchase costs might be higher than due to technology.
A smart blood sugar application.	Privacy and security issues for patients to store data on an app.	Collaborations with doctors and influencers.	Doctors approves and accept of sugar levels.

D. Problem

1) User Problems

- To have a painless experience for checking blood glucose levels.
- To not spend money regularly on monitoring blood sugar levels.
- To be able to check the sugar level anywhere and anytime.
- Do not worry about waste management in the process.
- To keep an accurate record of the sugar levels and have a systematic history of sugar levels.

2) Business Problems

- To keep the cost low and bring the device to a minimal miniature level so that it is wearable like a watch on the wrist.

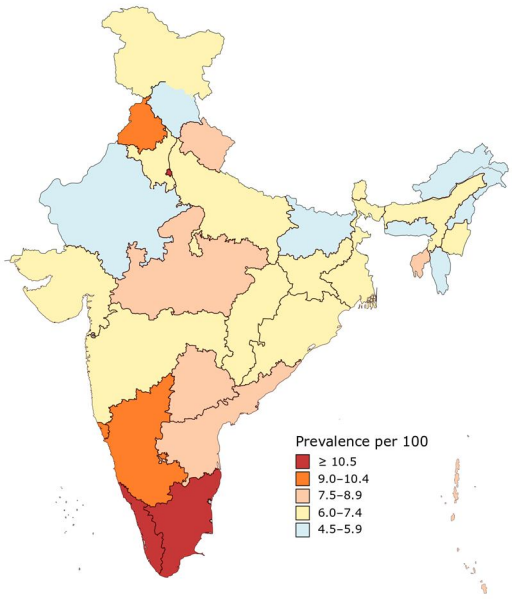
E. User Segmentation

1) Behavioral and Psychographic

- Specific patient groups.
- Obese lifestyle with high risk for diabetes.
- People who earn a good income are willing to spend on a glucose monitoring device.
- They value the approach with their life and are health conscious.
- Are at a high risk of fluctuations in their sugar levels and want to be in control

2) Demographics

- Anyone suffering from Diabetes
- Mostly between the age of 18-35
- Prevalence of diabetes in Indian states in 2016. [5]
- The majority in Metro Cities
- Convenience-oriented high-budget individuals.
- Upper middle class and middle-class patients.



F. Participants

1) Quantitative Research

Survey insights suggest that out of the total participant's majority of them were males with 68.4% and only 31.6% were females. Out of which 52.6% were in the age group of 24 to 64 years old and were adults and 73.7 percent of them were diabetic.

More than half of them used a glucometer, and only a quarter of them checked their blood glucose level regularly. Rest ¾ check monthly or annually. On a scale of 1-10 majority reported on the larger scale complaining about the pain level while pricking, this suggests why most people don't get checked regularly.

It also bothers them to responsibly discard medical waste. While the majority of them accepted a better non-invasive sugar monitoring device and an intelligent application.

2) Qualitative Research

Participants	Orientation	Interview
• Finding the right candidates. • Availability of Time. • Comfort Level.	• Familiarising with the Topic. • Experience of any previous products used. • An overall idea on diabetes.	• Perspective on the disorder. • Problems faced. • Glucose monitoring systems. • Opinion on the non-invasive glucose-monitoring system.

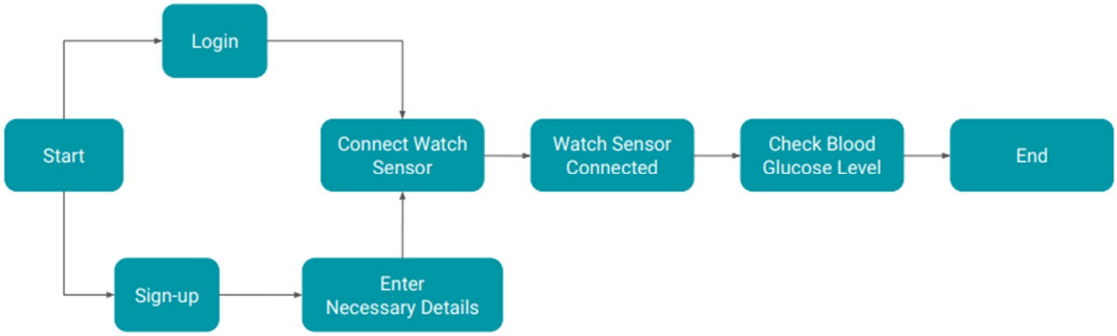
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III. RESULTS

The results from the research suggest that keeping in mind the potential user base and their needs and wants a design for a non-invasive continuous glucose monitoring system was established with the following task flow and an information architecture providing a better user experience for these diabetic patients:

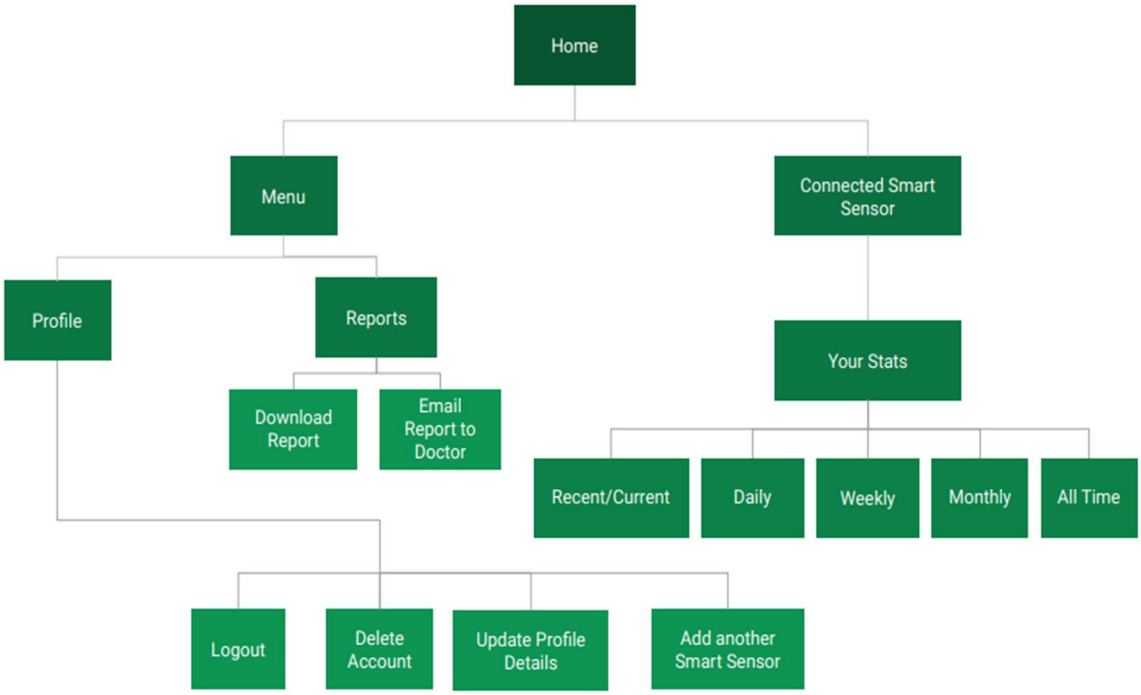
A. Taskflow

The user starts the application, then logins or he/she is asked to signup. If signed up, the user is required to fill in the basic details for setting up the profile. Once logged in, it is asked to connect the sensor, finally, after the sensor is connected, the user can check the blood glucose levels, thereby completing the task.



B. Information Architecture

Information architecture starters with a home that displays the sensor connected and the statistical data showcasing recent, daily, weekly and monthly readings as you scroll down. In the Menu, there are two options: Profile and Reports.
Under the reports, the user can directly download or send their readings to the doctor. While in the profile section, the user can update his/her details, add a new sensor, log out or even delete the account.



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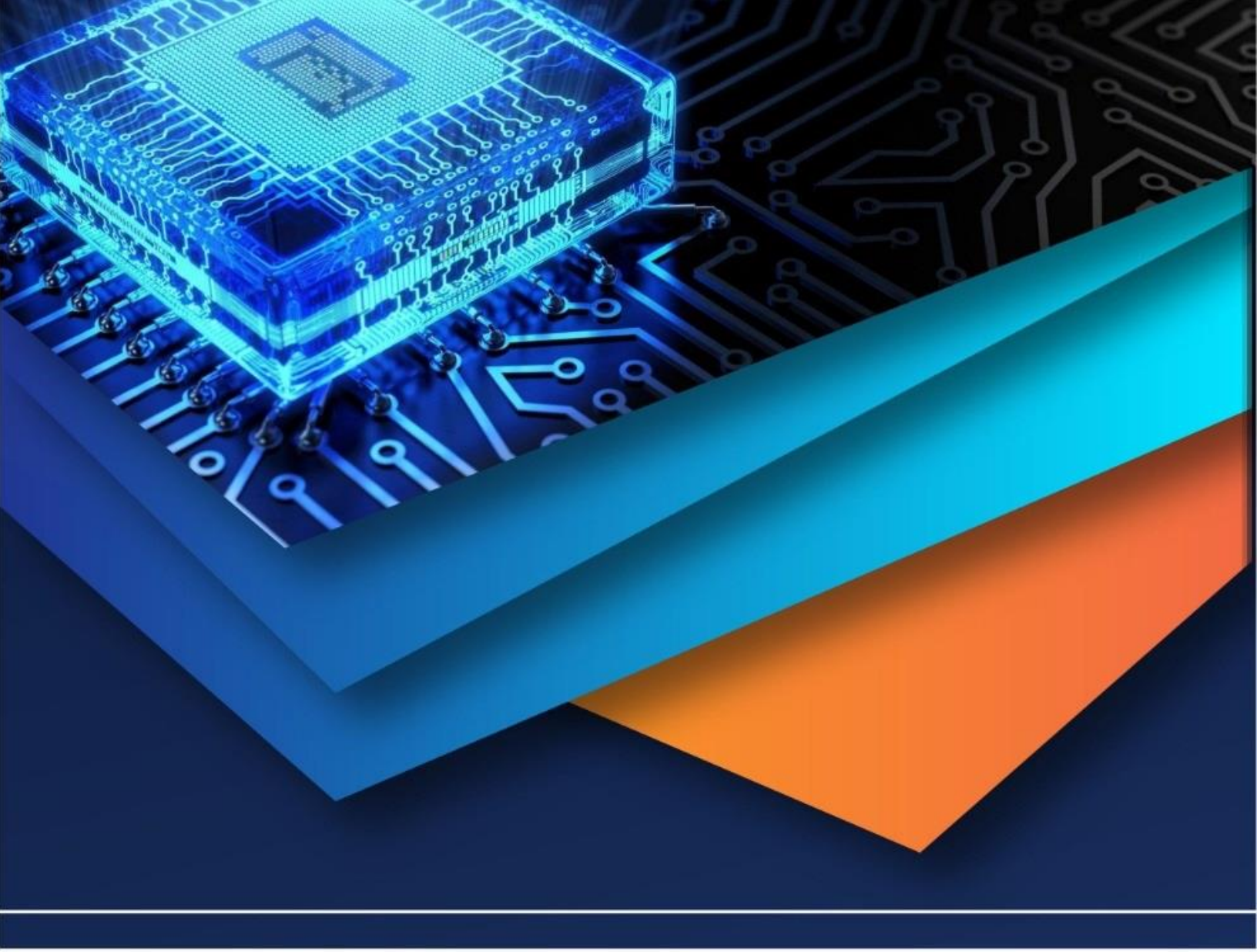
IV. DISCUSSION

This design study and its discussions were carried out with doctors - diabetologists and also with jurors from the industry for the minor project at the institutions, surveys, and interviews also pulled out a positive response with concluding great potentiality for this design in India. This case study is open-ended and presents groundwork for further development in the health care industry for better human-computer interaction.

REFERENCES

[1] Blood Glucose Monitoring Using Non-Invasive Optical Method: Design Limitations and Challenges: Anuj Srivastava, MD Koushik Chowdhary, Dr. Shiru Sharma, Dr. Neeraj Sharma. IJAREEIE ISSN 2278-8875, Vol. 2, Issue 1, January 2013.
[2] Noninvasive Blood Glucose Monitoring, David C. Klonoff, MD, FACP: Diabetes Care, Volume 20, Number 3, March 1997.
[3] Barnard KD, Kropff J, et al. Acceptability of Implantable Continuous Glucose Monitoring Sensor: Journal of Diabetes Science and Technology 2018, Vol. 12(3) 634 -638. DOI: 10.1177.
[4] According to the widely used theory of colors and color psychology, Google and Open sources.
[5] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6227383/

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