Assisting over thinkers to reframe cognitive processes

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Abstract— **Overthinking refers to the process of dwelling on thoughts and ideas for an extended period of time, often leading to a feeling of mental exhaustion and anxiety. It involves analyzing and interpreting situations and events in excessive detail and repeatedly replaying scenarios in one's mind. We found that people who are experiencing an overthinking issue, are unable to make tough life decisions or when they are dealing with insecurities. Causes of this mental clutter are daily stress, the paradox of choices, too much stuff, and the negativity bias. We also found the SMART (which stands for Specific, Measurable, Attainable, Relevant, and Time-bound) goals design approach during our literature study. Through our research paper, we try to solve this issue by employing Design Research Methodology (DRM). During this DRM, we did secondary research, conducted interviews with stakeholders as a part of our primary research, and talked with psychologists to deepen our knowledge in this domain which helped us to define our target users. The outcome of this research was a mobile application that aims to assist overthinkers in social interaction and achieving their individual goals while also assisting them to reframe their cognitive processes**.

Keywords—Anxiety, Cognitive process, Goals, Overthinkers, Stress.

*JEET Category—***Research**

I. INTRODUCTION

According to the World Health Organization (WHO), In 2019, 1 in every 8 people, or 970 million people worldwide, were overthinking and suffering from a mental illness, with anxiety and depressive disorders being the most prevalent. Due to the COVID-19 pandemic, the number of people who suffer from anxiety and depressive disorders greatly increased in 2020. Mental disorders involve significant disturbances in thinking, decision taking abilities, emotional regulation or behavior and most people do not have access to effective care. The goal of this research paper is to develop a system that assists overthinkers in improving their social interaction skills and achieving their personal goals, while also helping them reframe their cognitive processes. The objectives of the study are: (1) To help participants recognize and analyze how their mental models affect their behaviors and decision-making processes. (2) To provide a safe and supportive environment for overthinkers to practice social interaction skills and receive constructive feedback. (3) To develop strategies to help overthinkers set and achieve their personal goals. (4) To conduct research and gather data on the cognitive processes and behaviors associated with overthinking and social anxiety. (5) To design a system that encourage overthinkers to reframe their cognitive processes, challenging negative thoughts and beliefs. Before conducting the research, we made hypothesis which is majorly divided into behavior, attitude and feature. We also validated it at the end of the study.

II. LITERATURE REVIEW

A. Secondary research

Starting with secondary research, we began to draw from research articles on the topic of Overthinking, Decision making and Goals when we stumbled upon an eye-opening statement by Edith Eva Eger, Psychologist – The best decisions are made when we use our emotions to inform our reasoning and our reasoning to guide our emotions. Then we studied the causes of mental clutter which are as follows- (1) Daily Stress: An excessive amount of stress is the primary reason many people feel overwhelmed by life. Triggers an array of mental health issues like generalized anxiety, panic attacks, and depression. (2) The Paradox of Choice: Increases choice leads to greater anxiety, indecision, paralysis, and dissatisfaction. (3) Too much stuff: Consuming unnecessary data not only sucks our time and productivity, but also produces reactive, anxious, and negative thoughts. (4) The Negativity Bias: There is an alternative to simply identifying with the next thought that pops into consciousness." That alternative is mindfulness. We also looked for quarterly SMART goals design approach to understand it in better way. As a part of our literature review, we studied the types of overthinking which are cognitive, emotional, personality, cultural, behavioral and environmental.

B. Key insights from secondary research

The key insights from the secondary research are as follows:

(1) Overthinking is strongly linked to anxiety and depression symptoms, indicating it can contribute to these mental health issues. (2) Mindfulness meditation can reduce overthinking. (3) Overthinking can cause indecision, especially in high-pressure situations, as indicated by research studies. (4) Perfectionism is common among overthinkers, and addressing it could help reduce overthinking. (5) Overthinking is linked to poor sleep quality, leading to fatigue, irritability, and other issues.

III. METHODOLOGY

A. User interviews

We conducted interviews with our stakeholders and made 2 sets of interviews questions for different generations. First for Generation Y or Millennial (27-42yrs) and second for Generation X or Boomer (43-58yrs). Interviews were conducted in 2 rounds. From the interview, we tried to understand what strategies people make to manage or reduce overthinking when taking decisions and How overthinking affects their personal life.

A.1 Key insights from user interviews

From the user interviews, general themes we found are as follows: (1) People process both negative & positive things alone, but thinking through negative thought is most prominent. (2) Most people feel like they are constantly changing and evolving as a person. (3) When people are alone them prefer to be doing mindless activities. (4) Due to overthinking, people are unable to take confident decisions and struggles to prioritize their goals. (5) Overthinking has a negative impact on people's mental health and makes them unable to make quick decisions.

B. User survey

We conducted a user survey to gather some quantitative data. We received 90 responses of people from different expertise. Here we tried to understand who are our actual users and what problems they are facing due to overthinking.

B.1 Key insights from user survey

Frome the user survey, we found our user group range from 18 yrs. to 50 yrs. age people. 54% People admitted that they overthink multiple times a day. 68% People feels Stressed and anxious while overthinking, and sometimes overwhelmed and depressed. 59% people agreed with overthinking negatively affects their decision-making abilities. 56% People from the user survey admitted that Overthinking due to loneliness affects their mental health.

C. Subject Matter Expert interview

To get a better understanding of the more scientific side of our problem space, we turned to professionals of psychology space to give a more in depth look into cognition. We talked with 2 psychologists about the overthinking and tried to find the answers of our questions. Here we tried to understand how do they define overthinking, common symptoms or signs, causes of overthinking, cognitive behavioral techniques, productive and unproductive thinking, emotional and behavioral consequences, myths or misconceptions about overthinking.

C.1 Key insights from subject matter expert interview

Psychologist gave us critical insight which is Emotions can provide valuable information and guidance in decision making by helping us quickly assess situations, prioritize options, connect with our values, motivate us to take action, and evaluate risks. Another thing we discovered through our expert talk is the Behavior Cycle, which is the simplest way to explain how we operate as humans, and how different things influence how we act throughout our lives.

D. Affinity Mapping

We categorized all the data which is gathered from our research study and found 12 topics which we wanted to move ahead with. These themes are as follows – Loneliness, Identity, Goal accomplishment, pushing personal boundaries, Anxiety, Independence, Self-Reflection, Decision making, Comfort, Relaxation, Social media portrayal, Pushing personal boundaries and alone together.

After analyzing the 12 different topics that emerged from my affinization, we carefully selected a final five to create a cohesive framework. Each of the five topics deals with emotions and decision-making that everyone can relate to. These topics are as follows – (1) Anxiety: Everyone has experienced anxiety, which we want to alleviate. (2) Goals: Achieving goals is something they want to do without stress. (3) Identity: Identity is crucial because it implies self-awareness and how you perceive yourself. (4) Loneliness: Loneliness is caused by spending too much time alone and then spiraling into negative thoughts. (5) Decision: Making decisions is one of the most difficult tasks for overthinkers.

E. Synthesize

We used PACT analysis which is a useful framework for thinking about human-centered design. The acronym PACT stands for People, Activities, Context, and Technology. In the analysis, we consider our app idea in the context of each category and summarize our intentions of what the app will do to better understand how we would tie our analysis to our solution/design.

People: User group 18 to 50 years old people, Usable by any educational background and university students, People who are struggling with anxiety and stress, Therapists and Psychologists, Primary user is an overthinker who tends to think much before taking any decision, Potential users who want to improve their decision-making abilities, and accountability partners.

Activities: Reframing all negative thoughts generated by overthinkers, share goals with their accountability partner, share meaningful content with other community members for always being motivated to their goals, Usage would be Sem-frequent, depending on how much time they have left to fulfill proximity of goals, use emotions to take thoughtful decisions, and Set goals, track progress, and achieve the goals.

Context: The app can be used wherever (at college, home, office, etc.), and used individually as it more focuses on one's emotions and personal goals.

Technology: Mobile application, used a variety of sensors to

measure things such as heart rate, sweat composition, and skin temperature to give a good understanding of the user's feelings, Track emotions and visualizes them, and ambient computing.

IV. DEFINING

A. Target audience

Based on the research and synthesizing all the data, we defined the target audience. Primary users include (1) Overthinkers: Socially anxious overthinkers seeking tools to conquer social situations and reach their goals. (2) Accountability Partner: Supportive individuals aiding overthinkers in goal attainment and managing overthinking. Secondary users are Mental health professionals: Professionals helping those with social anxiety and overthinking seek evidence-based strategies for support. Potential Users are Individuals pursuing personal growth and seeking evidence-based strategies for social situations and goal achievement.

B. Persona

For defining the user's goals and needs, we created the persona for each stakeholder.

1. Overthinker

Goals: To make informed decisions without getting bogged down in details, to develop a better understanding of their overthinking tendencies and how to manage them effectively, to reduce anxiety and stress related to decision-making, to complete the goals or tasks within given timeline

User needs: A clear and simple decision-making process Visual aids or tools to help prioritize information and simplify decision-making Clear and concise information that is easy to understand and compare, Support and guidance to build confidence in decision-making.

2. Accountability Partner

Goals: Help overthinkers gain confidence in social situations, support overthinkers in achieving their personal and professional goals, teach overthinkers how to reframe their cognitive processes and reduce negative self talk and bias.

Challenges: Overthinking and self-doubt often hold overthinkers back from reaching their own goals, balancing their own work and personal life with being an effective accountability partner.

3. Therapist

Goals: Help patients achieve their individual goals and improve their mental health, create a safe and supportive environment for patients to discuss their issues and develop strategies to overcome them, and explore new approaches to help patients reframe their cognitive processes and achieve success.

User needs: Overthinkers need tools to help them manage their thoughts and reduce anxiety, Overthinkers may benefit from support in setting and achieving goals, Overthinkers may benefit from guidance in reframing their cognitive processes to reduce negative self-talk and increase positive self-talk.

C. Problem space

Overthinkers dwell on pre-conceived negative perceptions that reinforce unwanted behaviors and unable to achieve their goals.

D. Opportunity space

To help overthinkers attain a more realistic perception of their image, social interactions by reframing the thought process and helping them to achieve their personal goals.

E. Exploration

We also did research into possible solution spaces. We wanted to explore the possibilities of Digital Products and Ambient computing.

1. Digital Product

For the digital side, we envision a system of devices and screens connected through ambient computing to define an experience unlike any other inside a space.

2. Ambient Computing

It is the collective devices we use at home and at work, becoming extensions of each other, and offering us an overall seamless experience. A lot of different activities fall under the umbrella of ambient computing, which is a pretty broad term. For our current solution, we wanted to concentrate on these four aspects of the problem. Users can be provided with information through stationary screens, voice interaction is a natural means for users to connect with a product, physical touchpoints can be utilized to create intuitive interactions, and machine learning can combine all of these elements.

3. How might we?

We started to explore how might we questions for solution in possible spaces. Some of these questions are as follows: (1) how can individuals enhance their ability to make decisions in a more efficient manner? (2) help people become more comfortable and confident in themselves? (3) reduce anxiety in experiencing new places and people? (4) lessen the societal stigma of being alone? (5) create a platform where user can share their goals with others?

V. FINDINGS

A. Features ideations

We proceed to ideate the application's features based on the study and data synthesis. Here, we attempted to think aloud and take into account all aspects that are specifically relevant to my final themes. All features are then prioritized by using MOSCOW prioritization method which are as follows:

1. Must have

Emotions tracking, set goals, emotional profile, individual emotions (of last week, month or years), voice interaction, set deadline for goals and checking progress of goals.

2. Should have

Community, accountability partner, answer transcripts which shows pinpoints exactly where emotion was felt, previous sessions, set priority of goal, reviewing weekly and quarterly goals.

3. Could have

Chat with community members in groups, send report of your emotions to the therapist, focus areas for setting goals, take action on goals (immediately or archive), mentorship from therapist or coach, discussion forum under community, share contents with other community members.

4. Would have

Gamification, mindfulness exercise and meditation, pushing specific medication, tracking of sleep patterns, tracking of exercise.

B. Key features of the application

(1) Emotions tracking: This feature allows the user to track their emotions using a variety of sensors. This enables people to observe the effects of the entire procedure on their mental and psychological well-being by de-abstracting their true feelings. (2) Set goals: Users can create goals that can be broken down weekly. It tracks the achievement of quarterly goals so that users can plan their schedules and make modifications accordingly. (3) Community: The community feature allows users to share their thoughts with other members. Users can also get mentorship from therapists and Instructors about overthinking. (4) Accountability partner: This feature is very helpful in achieving personal goals as they provide support, motivation, and accountability throughout the entire journey of the overthinker user.

VI. IMPLICATIONS FOR DESIGN

A. Emotions tracking

A key component of mental wellness is emotional awareness, and reflect helps you envision your emotions. This de-abstract your true emotions and enables people to see the effects the entire process has on their mental and psychological well-being.

1. Home screen

A variety of sensors are used on the reflect that can detect your emotions and the intensity of them. Reflect uses this information as well as verbal responses to create our targeted questions that help guide thought processes in a healthier direction, focusing on a singular structured thought at a time.
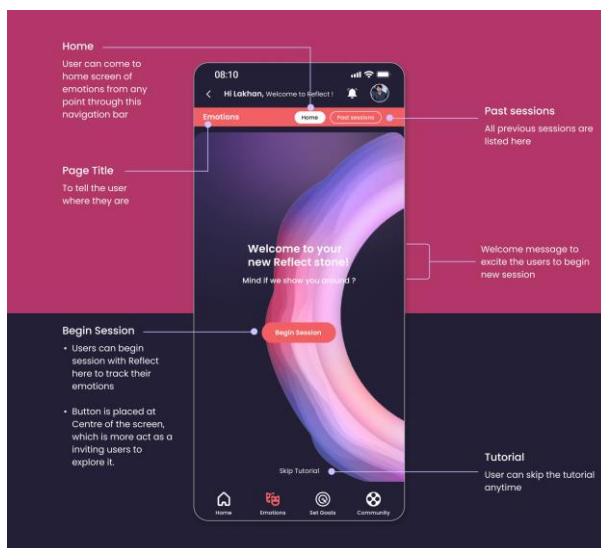

Fig. 1. Home screen for emotions tracking

2. Cutting edge technology

Reflect uses a variety of sensors that measures things such as your heart rate, sweat composition, and skin temperature to give us a good idea of your feelings during each session. (1) Heart rate variability (HRV): HRV is the variation in time between consecutive heartbeats, controlled by the autonomic nervous system. (2) Photoplethysmogram (PPG): PPG is a non-invasive optical technique that measures changes in blood volume in tissue using a light source and a photodetector. It is commonly used to monitor heart rate and arterial oxygen saturation, and is used for continuous health monitoring. (3) Electrodermal responses (EDR): Electrodermal Responses (EDR) or Skin Conductance Responses (SCR) are changes in skin's electrical conductivity in response to emotional or physiological stimuli, measuring the body's "fight or flight" response. EDR is used in psychology research and biofeedback therapy to assess and regulate emotional responses. (4) Galvanic Skin Responses (GSR): Galvanic Skin Response (GSR) is a measure of the electrical conductance of the skin that changes in response to emotional or physiological stimuli. It is commonly used in psychology research as a measure of emotional arousal and can be used in biofeedback therapy to regulate emotional responses. (5) Inertial Measurement Unit (IMU): IMU is an electronic device that measures an object's acceleration, orientation, and magnetic field, using accelerometers, gyroscopes, and magnetometers. It can be combined with other sensors for accurate positioning and navigation. (6) Infrared Skin temperature Sensor: An Infrared Skin Temperature Sensor is a non-contact device that measures skin surface temperature using infrared technology. It is used in medical and non-medical applications, including COVID-19 screening, to quickly and accurately measure body temperature.

Furthermore, it is imperative to acknowledge and tackle the issue of privacy apprehensions, specifically in the context of employing sensors for emotion tracking. As technology advances to integrate sensors measuring physiological responses, ensuring the confidentiality and security of user data becomes paramount. Engaging in a discourse around safeguarding user data is crucial, encompassing stringent privacy policies, encrypted data transmission, user consent mechanisms, and transparent information dissemination regarding data usage. Addressing these privacy concerns will be pivotal in fostering user trust and encouraging widespread adoption of applications aimed at assisting individuals grappling with overthinking tendencies.

3. Listening state

As you go through a session, the Reflect responds to your emotion through a colored glow that fluxes with intensity felt as you verbally respond. Key trigger word from the response is surfaced in the next question to show clarity of how the stone derived specific questions. Sessions last, however long they need them to, with the user having the power to end the session at any point.

4. Conversation framework

Cycles between limiting and leveraging. The sensor enters leverage as soon as it detects inputs with no known topic. If the same subject is brought up repeatedly, the discourse gets to its limit. Limit prevents a dialogue from repeating or looping without a purpose or leading to new conclusions, whereas leverage promotes known consequences and encouraging

thinking. (1) Learn: Get all of the information and data from sensors. (2) Leverage: Leverage positive thoughts and strategies to mitigate the spiral. (3) Limit: Limit the process of overthinking through guidance.
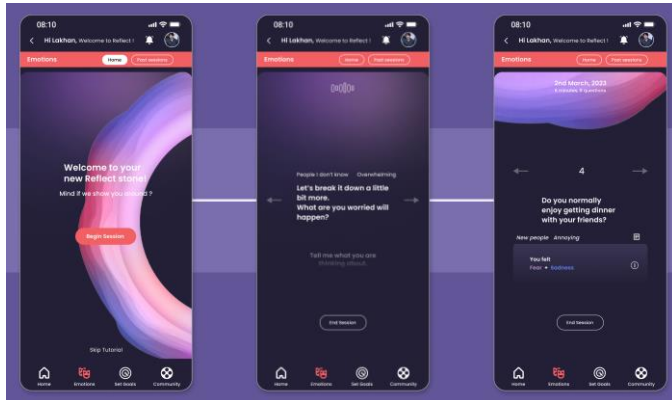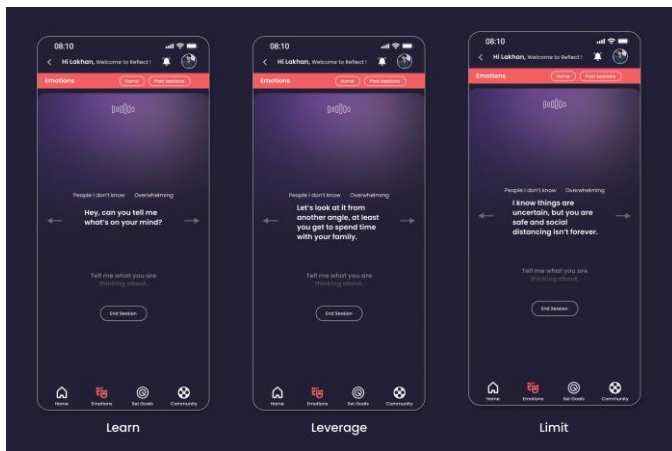

Fig. 2.   Listening state for emotions tracking
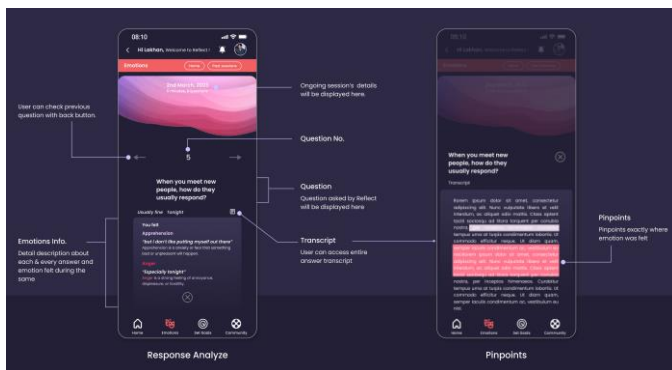

Fig. 3.   Conversation framework

Fig. 4.   Response analyze and pinpoints of conversation

B. Set goals

Users can easily add new goals and set their focus areas. It also contains user daily goals and weekly targets which help them to keep on track. A floating button at the bottom right corner is also given so that the user can easily add a new goal.

1.   Process captured goals

If the goal is actionable, then write out a step-by-step plan for how you'll do it and select Immediately option. Simply write down a series of actions you'll take on this goal and then schedule these ideas into your week. If the Goal is NOT

actionable, then put the goal into an Archive folder that's reviewed every month. If you do this for every idea you have, you won't forget to follow up at the right time.

2.   Accountability partner

Accountability partners can be very helpful in achieving personal goals as they provide support, motivation, and accountability throughout the goal-setting process. By sharing their goals and progress with someone else, users are more likely to stay committed and focused on their goals, which can increase their chances of success.

3.   Review your goals

Regularly reviewing goals provides an opportunity to track progress, evaluate successes and challenges, and make any necessary adjustments or revisions to the goals or plan. This can help individuals to stay on track, remain motivated, and ensure that their efforts are aligned with their ultimate objectives.
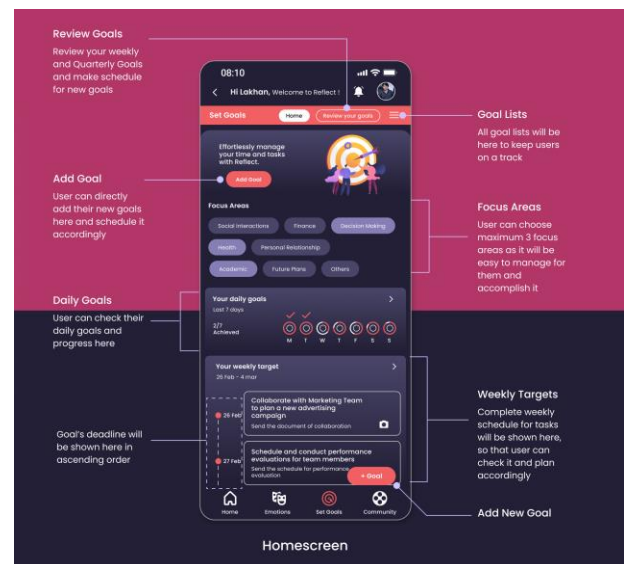

Fig. 5. Home screen for set goals

C. Community

The community section consists of mainly three features which are Mentorship, Chat room, and Share content. Mentorship features give the opportunity to users of free 30-minute sessions with Psychologists or other experts. Users can engage themself in meaningful conversations with other community members and share content with them.
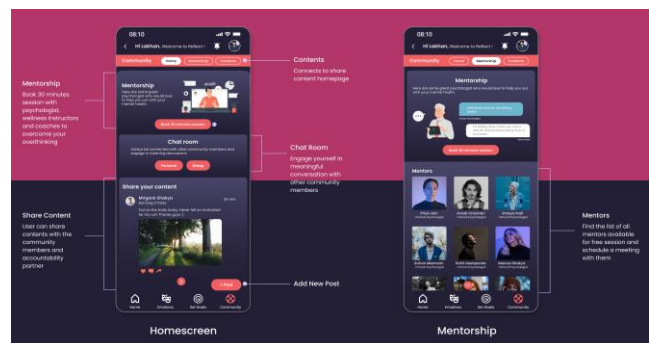

Fig. 6. Home screen and mentorship in community

Conclusion

In summary, this research paper addresses the needs of overthinkers by enhancing their social interactions, goal achievement, and cognitive processes through advanced technology and community support. Future scope for this project includes refining sensor technology, expanding community features, and exploring machine learning for more personalized interventions. Possible applications extend to mental health support platforms, educational tools, and workplace productivity enhancement, offering a promising avenue for improving the well-being of individuals prone to overthinking. However, it's important to acknowledge the project's limitations, such as privacy concerns related to sensor data and the need for ongoing research to fine-tune its effectiveness in diverse user populations. Overall, the research paper provides insights into overthinking's causes, impacts, and solutions, emphasizing the importance of emotional awareness in decision-making. It offers a mobile application prototype facilitating emotion tracking, goal setting, and community support for overthinkers. The study's contributions lie in its holistic approach to addressing overthinking issues, combining technology, psychological insights, and community engagement to assist individuals in reframing cognitive processes and achieving personal goals.

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