UTM UNIVERSITI TEKNOLOGI MALAYSIA
FACULTY OF COMPUTING
UTM Johor Bahru

Report on Design Thinking Project

Subject : Technology and Information Systems (SECP 1513)
Section : 01
Name of Lecturer : Dr. Azurah A. Samah
Date : 30/11/2023
Title of Design Thinking Product
: DREAMDRIFT
Video Link (youtube) : https://www.youtube.com/watch?v=vaUDmva50o4

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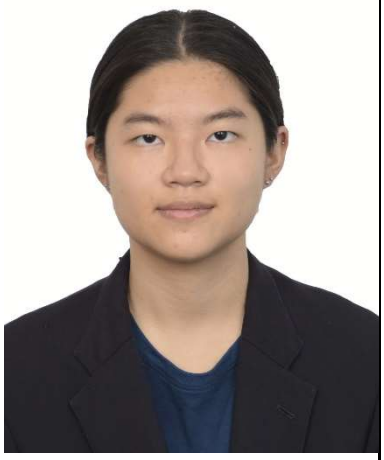 Name: PHAVANEE KATRIYA PHON-AMNUAISUK Matric Number: A23CS0170 E-mail: phavanee@graduate.utm.my Phone number: 019-668 4301 SECBH	 Name:SEOW YEN ZHI Matric Number: A23CS0177 E-mail: seowyenzhi@graduate.utm.my Phone number : 012-684 4311 SECBH	

Comments by Grader:

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1.0 INTRODUCTION

It is no secret that sleep quality plays a vital role in our day to day lives. Poor sleep quality has been shown to affect cognitive performance, overall health and other brain functions. The crisis of poor sleep also has pervasive impacts on our economic and healthcare systems. The National Sleep Foundation estimates that insomnia related workplace errors and accidents cost the economy $31.1 billion USD in the year 2012.

Given the effects poor sleep has on the individual and on our social systems, increasing public sleep quality should be the number one concern of many institutions. Even so, short-term insomnia seems to be prevalent in at least 1 in 5 preteens as well as in 1 in 3 adults, while people who suffer from chronic insomnia make up 10% of the population. This shows that not enough has been done to improve public sleep quality.

If public sleep quality could be improved, it will positively impact public health in the long run and lead to a more rewarding economy. Hence, in this design thinking project, we aim to find users affected by poor sleep, the problems affecting their sleep quality and build innovative solutions to improve it.

2.0 PROBLEM BACKGROUND

Most people tend not to place too much attention on the quality of sleep they get. Given the stresses of a modern lifestyle, one may find it difficult to devote much time, energy or thought into their sleep and the way it affects their daily lives. Hence, those who typically get poor sleep only have a moderate awareness of sleep hygiene practices.

The scope of this problem widens when we consider that those who have poor sleep are not only affected by their sleep hygiene practices, but also by environmental factors such as sound, temperature, light and humidity. The task of fine-tuning an optimum sleep environment becomes difficult when one has to tackle all these factors, which becomes nearly impossible while asleep.

Poor sleep creates a vicious cycle wherein those who suffer from it continue to deteriorate physically and mentally, further affecting their sleep. Understanding the web of factors that affects one’s sleep quality is crucial to innovating a solution to a good night’s sleep and a good life.

3.0 METHODOLOGY

3.1 THE DESIGN THINKING PROCESS

EMPATHISE MODE

We have decided to make our target population people who face trouble sleeping. A list of criteria was prepared to identify people who would be classified as suffering from poor sleep. After selecting some respondents who fit our target population, we moved on to questions about their sleep quality, solutions they have tried and their sleep environment to better understand their own situation. This is helpful for us to come up with more suitable ideas during the ideate phase.

Observation

We observe that a lot of people still have low awareness of sleep hygiene and bad sleep habits. For example, some people use their gadgets before bed. These habits contribute to unhealthy sleep and cause one to wake up feeling not well rested.

Engage

In order to really understand the depth of the users' problems and their requirements, we conducted interviews and handed out surveys to people who face problems in their sleep. Most interviewees attribute their poor sleep to environmental factors such as light and temperature.

Immerse

The group collected numerous articles and videos featuring those who suffer from sleep problems ranging from mild to chronic in order to better understand their experience and empathise with them. These articles and videos detailed their experiences, emotional turmoil and the impact sleep loss has brought to their life.

DEFINE

Using the knowledge that we have obtained during the initial empathise stage, we analysed and synthesised key problems encountered by those afflicted by poor sleep and created a clear problem statement. Our initial problem statement of "How do we improve the population's sleep quality", was reevaluated to "How do we improve the sleeping environment of the population" during the assessment phase. Based on our analysis, we decided that by building a prototype that could interact with the users' sleep environment, we can increase their quality of sleep.

IDEATE

Our group of four gathered together to brainstorm ideas before we enter our final phases. We spent our time discussing the most effective features to include in our application and sensor device. Together, we came up with several sketches of the sensor device before settling on a final

one. A few designs of the application were discussed and finally tasked to a few members to bring it to life.

During this phase, we wanted to ensure that everyone was on board with the ideas being put out and we encouraged criticism and improvements to existing ideas for assessment. For example, the idea to make set parameters for a suitable sleeping environment was removed, as everyone experiences optimum sleep in different environments. Ideas such as giving user information on sleep were expanded upon to include information from reputable sources only, such as the National Sleep Foundation.

Each member had to speak up and present their own version of the prototype and application so that everyone contributed to the final project.

PROTOTYPE

In this design phase, we set out to turn our ideas into something tangible. This will allow the user to interact with our ideas and allow them to give more constructive feedback. Using Figma, we created a mockup of the mobile application which would accompany the prototype of the IoT device. As we create the prototypes of the IoT device and mobile application, we made sure that the user-friendly design, ease of use and portability of predecessor technologies is maintained while adding new features and modifications to them. Several tweaks were introduced during the assessment phase to address problems such as readability and intuitiveness.

TEST MODE

At the end of the project, we conducted another assessment point in order to make sure that our end product meets our initial objectives and solves the problem statements that we have laid out.

We presented the prototype to the interviewees and survey respondents in order to understand what they think and how they feel about the product. This would allow us to refine our design and go back to the drawing board if the prototype still has lacking features. By going through the test mode, oversights and flaws in design can be identified and fixed.

4.0 THE PROPOSED SOLUTION

4.1 ACKNOWLEDGEMENT OF SIMILAR PRODUCT

Currently, there exist apps and devices that aim to track and improve sleep quality on the market. These include wearables such as Fitbit and Apple watches that pair with mobile applications to give the users a sleep score rating as a guide to improve their sleep. Android apps that track sleep quality are also available, using the phone as a sensor device to collect data from the users' environment. These technologies provide comprehensive analyses of the end users' sleeping activities and suggest steps that users can take to improve them.

4.2 FEATURES OF PROPOSED SOLUTION

Our proposed solution improves upon predecessor technology by creating a sensor IoT device that interacts with the users' surroundings alongside an application with predictive technology that leverages machine learning techniques to create a system which is able to automatically tweak the users' sleep environment based on their sleep trends.

The IoT device is fitted with various sensors that will be able to interact with the environment to collect a stream of information from it. Receivers and transmitters fitted into the device will be able to interact with the vicinity to transform the sleep environment.

The application, on the other hand, will build a personal profile of the users' sleep quality and how it differs in different environments. Predictive techniques can be used to gauge what tweaks should be made to the sleep environment to improve sleep quality. The device, along with the application, will fully automate the process of creating the most optimum sleeping environment.

Welcome Back

Login

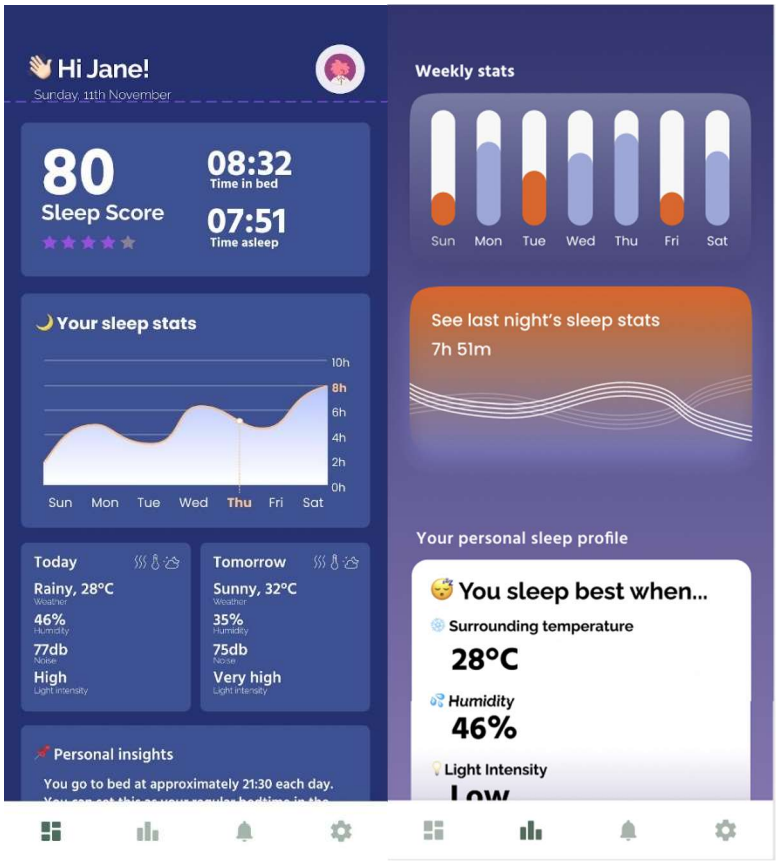
Email

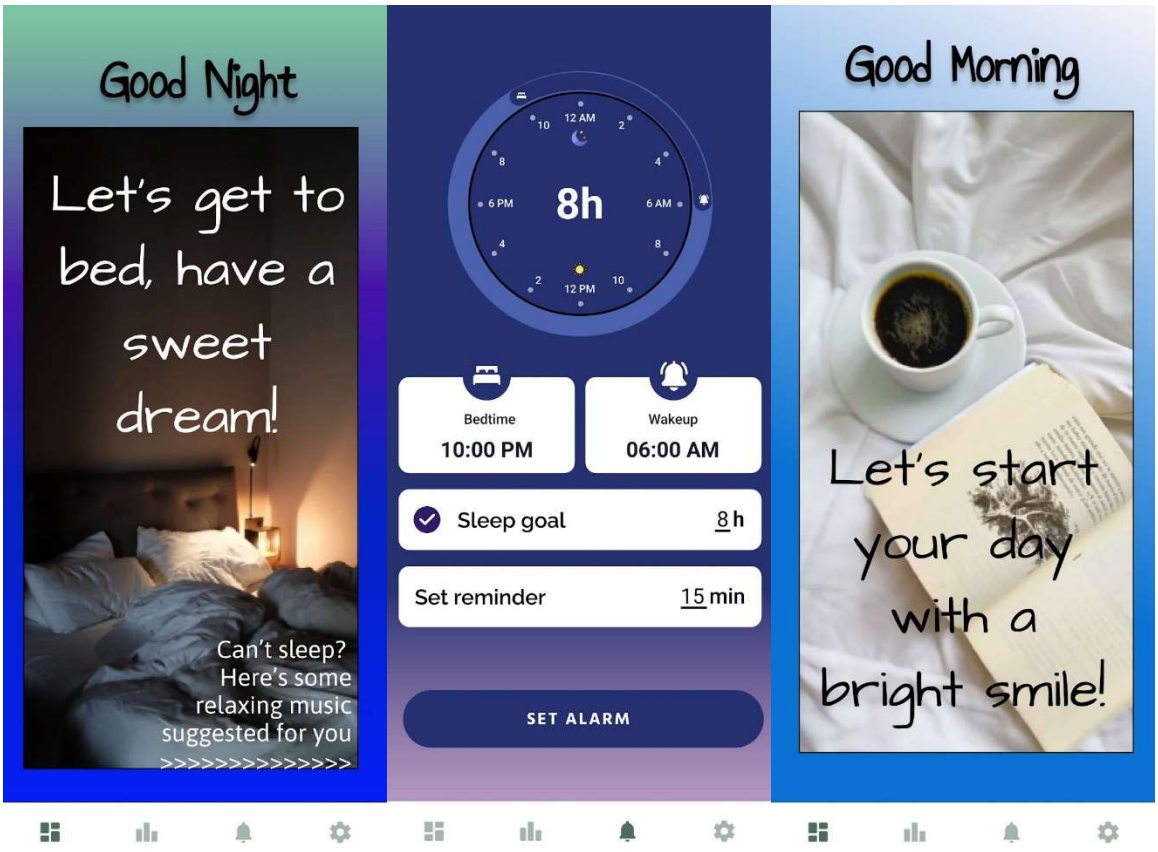
Password

Forgot Password?

Login

Don't have an account? Sign Up




Good Night
Let's get to bed, have a sweet dream!
Can't sleep? Here's some relaxing music suggested for you
>>>>>>>>>>>>>>>
12 AM
2
4
6 AM
8
10
12 PM
2
4
6 PM
8
10
8h
Bedtime
10:00 PM
Wakeup
06:00 AM
Sleep goal
8 h
Set reminder
15 min
SET ALARM
Good Morning
Let's start your day with a bright smile!

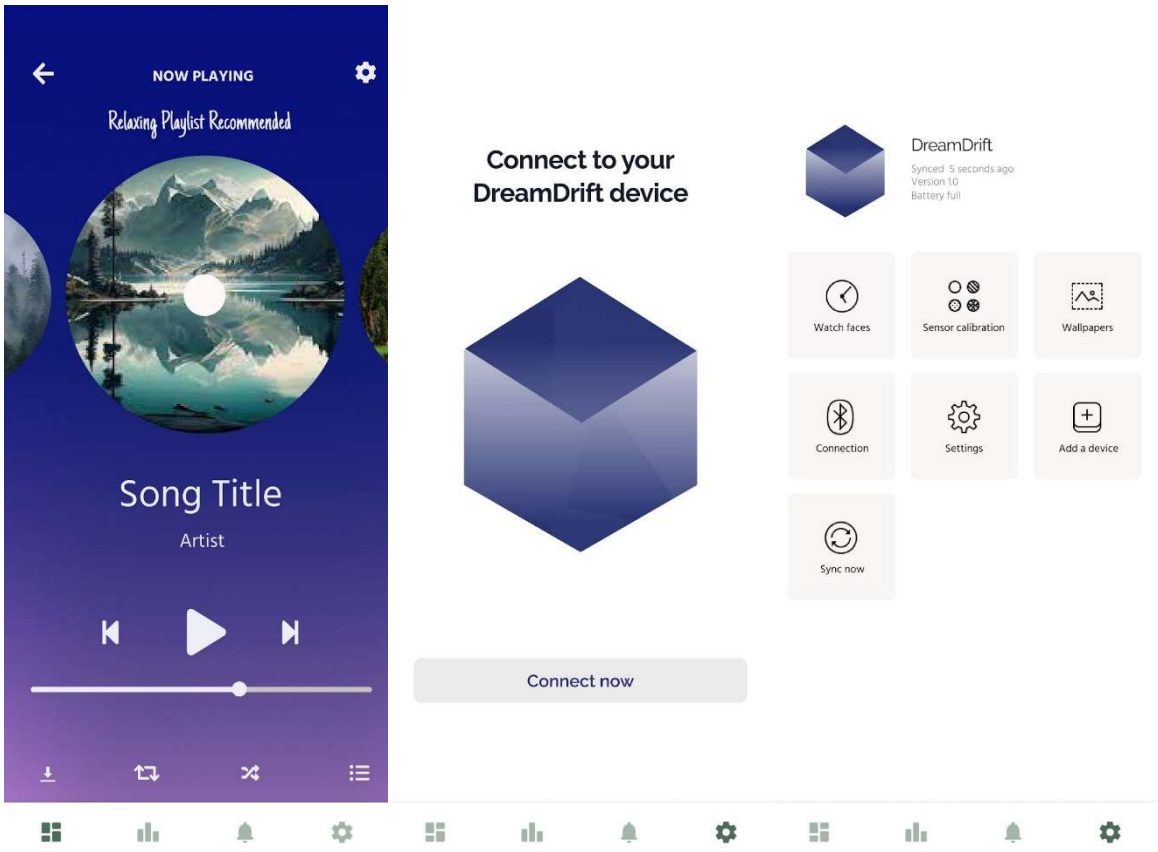


Figure 1: Screenshots of Features in DreamDrift Application

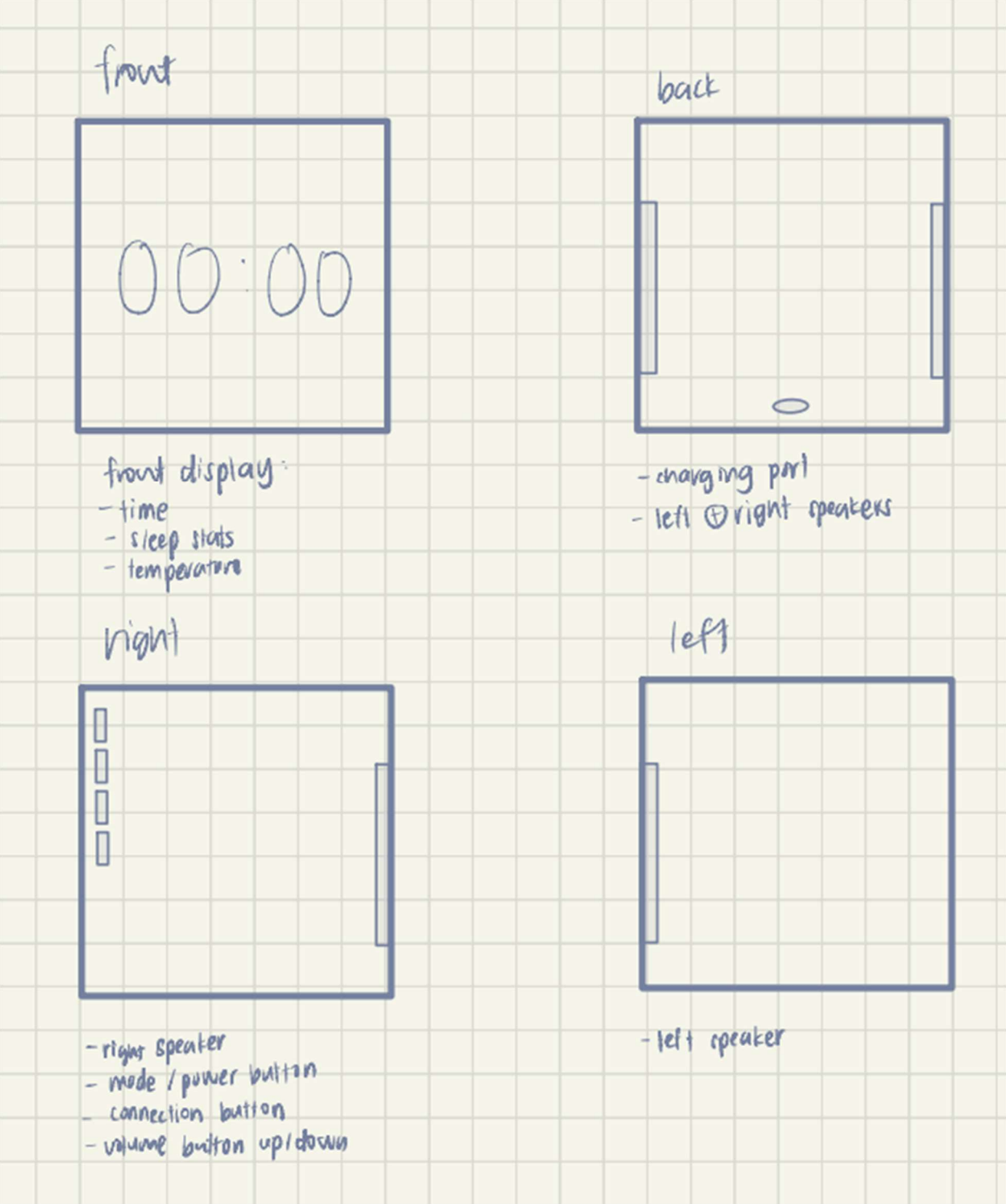


Figure 2: Design of Sensor Prototype

5.0 USER STUDY

5.1 USER STUDY RESEARCH ON SLEEPING QUALITY

We conducted a comprehensive user study by using a Google Form and interviewing 43 people to conduct research on sleeping quality of the public.

Demographic Insights

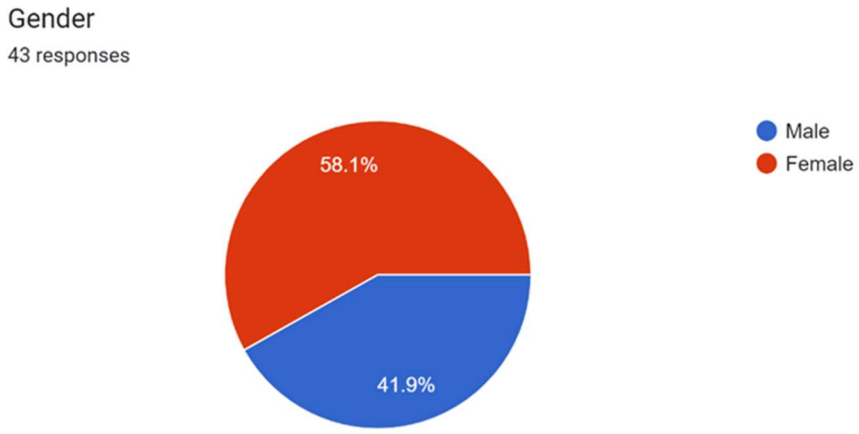


Chart 1 : Gender

Gender	Number (people)	Percentage (%)
Male	18	41.9
Female	25	58.1

Table 1 : Gender

The respondents of this research are students of University of Technology Malaysia (UTM). The respondents are mainly female, which comprises 25 respondents (58.1%) and 18 male (41.9%) of the total respondents.

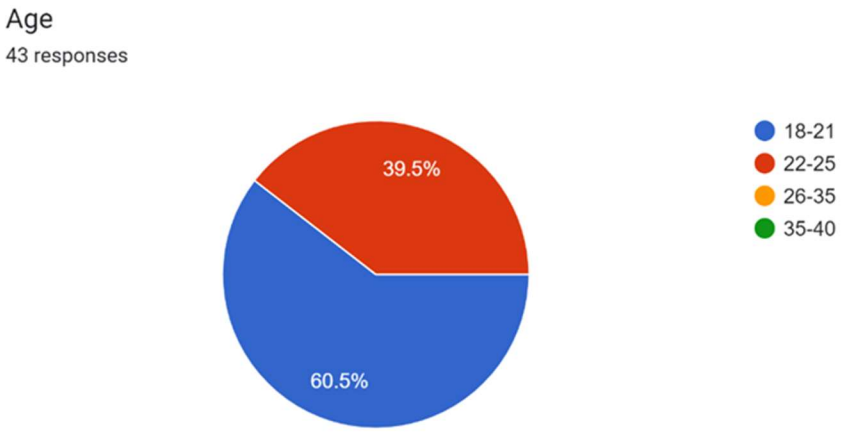


Chart 2 : Age

Age	Number (people)	Percentage (%)
18-21	26	60.5
22-25	17	39.5

Table 2 : Age

The respondents are mainly from the age group 18 years old to 25 years old. A total of 26 respondents are between 18 to 21 years of age (60.5%). The remaining 17 respondents are from the age group 22 to 25 years old (39.5%).

Sleep Quality Rating

Based on the survey and interviews, the respondents were asked to rate their sleep health. Those who did not experience poor sleep quality were excluded from the final study. Respondents in the final study experienced inability to sleep within 20-30 minutes, have problems with frequent waking up during the night, wake up too early and lack sleep and experience all these symptoms at least 3 nights a week.

Factors That Affect Sleeping Quality

Based on the survey, the majority of respondents agree that their sleeping environment is the main factor that affects their sleeping quality.

Five respondents stated that the high temperature of the environment caused them to have poor sleep quality while one respondent stated that the low temperature at night causes them difficulties to sleep well. Two respondents suggested that their bright sleeping environment has led to poor sleeping quality. Other elaborations include environmental factors such as dryness of air and loud noise during the night, both having one respondent respectively.

Other answers included lifestyle problems --- working till late at night and not feeling tired enough to sleep, each having one respondent (6.3%). One respondent (6.3%) states that hunger during the night led to sleeping difficulties. Another respondent proposes that excessive stress leads to sleep difficulties (6.3%).

Methods to Improve Sleeping Quality

Based on this research, 25 out of 43 respondents reckoned that their sleep quality can be improved by changing their sleep environment. Improving mental conditions and practising a good diet both received 18 respondents each, while 17 respondents agree that creating lifestyle changes can help improve sleeping quality.

Based on the results, this situation clearly shows that all of the respondents have poor sleep and are the target audience for our product, DreamDrift.

5.2 USER STUDY ON FEEDBACK TOWARDS DREAMDRIFT

We conducted a comprehensive user study using a Google Form to gather valuable feedback on DreamDrift. Here are the key findings from our study:

Design Satisfaction

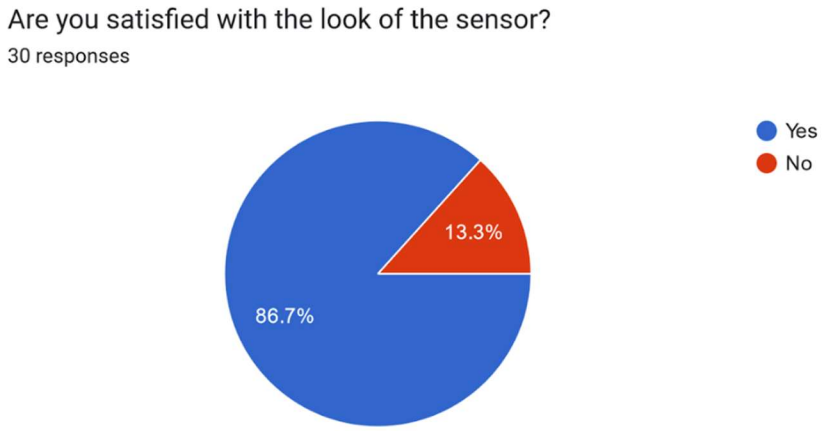


Chart 3 : Design satisfaction

Satisfied with the look of the sensor	Number (people)	Percentage (%)
Yes	26	86.7
No	4	13.3

Table 3 : Sensor design satisfaction

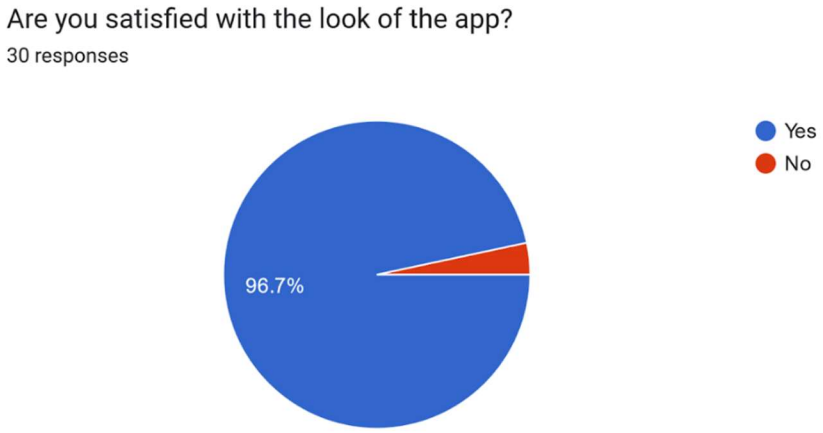


Chart 4 :Application design satisfaction

Satisfied with the look of the app	Number (people)	Percentage (%)
Yes	29	96.7
No	1	3.3

Table 4 : Application design satisfaction

The feedback on the appearance of the DreamDrift sensor was positive, with 86.7% expressing satisfaction. Similarly, an overwhelming 96.7% were satisfied with the look of the associated apps. These results highlight a notable level of contentment with the design elements of both the sensor and the application.

User suggestions, feedback and future improvement

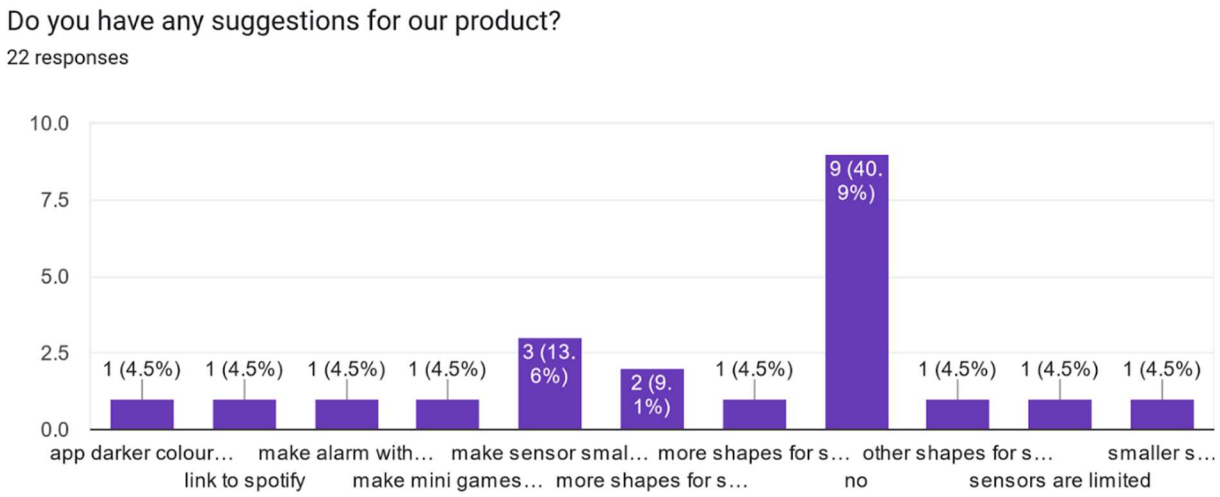


Chart 5 : Suggestions on product

Further improvements are needed before this product can go on the market. The improvements that have been suggested by initial testers include suggestions on aesthetics, functionality and portability.

2 respondents recommended exploring more shapes for the sensor, and a number of different respondents each provided diverse suggestions, including a darker colour scheme for the app, linking with Spotify and making mini-games into the alarm. This feedback offers valuable insights into potential areas for refinement and expansion.

In summary, the user study reflects a high level of satisfaction with DreamDrift's effectiveness in enhancing sleep. This feedback will be instrumental in shaping the future iterations of DreamDrift, ensuring that it aligns more closely with user expectations and preferences.

6.0 BUSINESS ANALYSIS

We continue the evaluation of Dreamdrift with business analysis using SWOT (strengths, weaknesses, opportunities, threats).

Strengths	**Weaknesses**
• User-friendly • Automates part of users' life • Cheap to produce	• Still cannot account for other factors such as diet, physical activity before bed
Opportunities	**Threats**
• Can be further improved to collect more data from user • Can be further enhanced to add more features but still in control such as adding spotify	• When the device is used for an extended period of time, the battery will quickly drain.

7.0 CAPACITY BUILDING AND SOFT SKILLS DEVELOPMENT

We have acquired plenty of experiences and soft skills from this programme that will aid us in better adjusting to a world that is changing quickly. When we guide the members of our group through a task that we are proficient at, we have developed our leadership abilities. We gained knowledge on how to form groups, settle disputes, and establish the ideal culture. We also gained experience in teamwork and understood the need of cooperating to achieve a common objective. We are aware of how crucial it is to collaborate with people rather than work alone.We also realise how crucial it is to have strong communication skills in our daily lives, both verbal and nonverbal. We developed our speaking skills so that we could accurately communicate with both of our group members and users. We also came to the conclusion that it's critical to present positive body language and facial expressions.

8.0 REFLECTION

I do hope that I am able to gain more knowledge not just from what is taught but also learn through hands-on projects. Through this design thinking, I am able to think critically. By critical thinking, I have to think more and view the problem from different angles. Through this design thinking, I am able to be more creative and innovative. This is due to the fact that I have to compare our product with the existing product that is similar on the market. I need to have more improvements on our product and modify the current product based on the needs to be comparative. By having the experience through this design thinking, I am able to identify my weakness and it is not too late to know about it. There are still many improvements that are necessary to improve my potential in the industry. I need to upskill myself from time to time to be able to keep track with the needs in the industry. I am also aware that as computer science students, we have to face different users in the future and we should always be prepared to face different challenges to encounter with users' problems.

As for me, finishing this project allowed me to gain a lot of knowledge. I learn about the issue we're having by interviewing people and doing a survey. We try to gather all the ideas of group members to solve the problem. Even though it was initially just a draft, I'm amazed that we were able to design the app that we imagined. Other than that, I am learning about computer applications and software through this project. We have the opportunity to discuss the preliminary stages of application development with this design thinking project. We will develop both our hard and soft skills, such as team communication and design thinking methodology, to maximise our potential in the field. Although, we encounter a few problems during the process of this project but in the end we manage to complete it. It is my goal to continue assisting people in resolving their issues in the future. I'm hoping to stay current on the latest issues because I know this field will make people's daily lives easier.

9.0 REFERENCES

Ahrberg, K., Dresler, M., Niedermaier, S., Steiger, A., & Genzel, L. (2012, December). The interaction between sleep quality and academic performance. *Journal of Pyschiatric Research*, *46*(12), 1618-1622. https://www.sciencedirect.com/science/article/pii/S0022395612002786

Grandner, M. A., Hale, L., Moore, M., & Patel, N. P. (2010, June). Mortality associated with short sleep duration: The evidence, the possible mechanisms, and the future. *Sleep Medicine Reviews*, *14*(3), 191-203. https://www.sciencedirect.com/science/article/pii/S1087079209000720

Han, E. (2022, January 18). *What Is Design Thinking & Why Is It Important? | HBS Online*. HBS Online. Retrieved October 31, 2023, from https://online.hbs.edu/blog/post/what-is-design-thinking

Johnson, D. A. (2018, June). Environmental Determinants of Insufficient Sleep and Sleep Disorders: Implications for Population Health. *Curr Epidemiol Rep*, *5*(2), 61-69. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6033330/

Krystal, A. D. (2008, September). Measuring sleep quality. *Sleep Medicine*, *9*(1), S10-S17. https://www.sciencedirect.com/science/article/abs/pii/S138994570870011X

Suni, E., & Truong, K. (2023, September 26). *100+ Sleep Statistics - Facts and Data About Sleep 2023*. Sleep Foundation. Retrieved October 30, 2023, from https://www.sleepfoundation.org/how-sleep-works/sleep-facts-statistics#references-221321

Telzer, E. H., Fuligni, A. J., Lieberman, M. D., & Galvan, A. (2013, May). The effects of poor quality sleep on brain function and risk taking in adolescence. *NeuroImage*, *71*, 275-283. https://www.sciencedirect.com/science/article/pii/S1053811913000724