FACULTY OF COMPUTING
UTM Johor Bahru

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Subject : Technology and Information Systems (SECP 1513)

Section : 01

Task : Design Thinking Project is: Digital Solutions for the Autism & ADHD Community

Group members:

No.	Name	Matric Number
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Video link:

https://youtu.be/x4O9guGL4OA?si=6qs-fn_xwQ9GHDPW

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Introduction

Attention-Deficit / Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder that affect both children and adults, impacting attention and daily functioning. Traditional screening methods include heavily verbal questions, prolonged observation, and subjective judgement. Besides, children may struggle with verbal expression and sustained attention during process while adults screening depends huge on self-reported symptoms.

To solve these problems, DrawSense ADHD that designed for children and adults, a mobile-based digital screening tool. It used to help clinicians observe attention, impulsivity and executive functioning in low-pressure condition by behavioral questions and drawing task. DrawSense ADHD is developed to assist in screening decisions in mental settings. DrawSense ADHD does not aim to make any medical diagnosis.

Empathy Phase

Empathy research

ADHD is a most common behavioral disorder in children, and the occurrence will keep on increasing over time. Based on the statistic we gain, the community prevalence globally around 2% and 7%. However, ADHD is still under diagnosed in adults and children.

ADHD diagnosis in the early stages of life is an effective way for children to gain access to treatment, although there are various challenges in the diagnosis process. For instance, there may be limited consultation time, unclear guidelines, or inhibitions on the part of children in expressing themselves. Drawing activities are often an effective means of allowing the child to freely express themselves.

The mean total scores of the four variables and their comparison between the two groups

Variables	Group	Minimum	Maximum	Mean	SD	P value
Incompatibility and emotional problems	ADHD	12	23	19.79	2.94	0.001
	Normal	3	22	12.11	4.74	
Impulsiveness index	ADHD	7	21	12.31	1.84	0.001
	Normal	2	10	5.63	2.00	
Non-impulsiveness index	ADHD	1	11	5.26	2.29	0.001
	Normal	6	16	10.36	2.33	
DAF	ADHD	1	10	5.89	2.22	0.001
	Normal	0	7	2.88	2.13	

Composite Character

- Name: Arief Boediman bin Abdul Aziz
- Age: 54
- Occupation: Family medicine
- Experience: The front face of health treatment; addressing wide range of medical issues and offering comprehensive care for patients.

Empathy Interview

Q: Do AI could satisfy medical expertise by providing useful analysis and advice regarding ADHD screening? And how?

A: AI may help in ADHD assessments as it objectively uses data. This helps remove biases that may occur during consultations. Since it recognizes behaviors associated with ADHD symptoms and administers standardized ADHD screening materials, the use of AI may benefit professionals by helping them make informed decisions.

Q: Children behavior could be unpredictable, and this would lead to struggle during consultation progress. How can this affect the screening process?

A: One challenge is that children's unpredictable behavior can result in limited, incomplete, or inaccurate data being collected. In addition, a child's behavior is often highly dependent on context, meaning they may act very differently at home, in school, or in other environments, which can make interpretation more difficult.

Q: What features would you like to be developed from AI that could provide useful assistance in future regarding this matter?

A: The above-mentioned challenges can be overcome by using an all-round, AI-assisted approach for collecting and processing the collected data. With the combination of inputs from sensors, observation, and reportage from caregivers, it is possible for an AI module to understand the behavior in multiple contexts. Contextual and continuous observation helps in knowing the behavior patterns, which can provide accurate results after multiple observations.

Define Phase

Problem reframing

From the empathy interview, key challenges were listed out, limited consultation time, children's difficulty in expressing symptoms, subjective observations, and lack of friendly screening tools. These challenges emphasized needed for a more efficient and objective screening application. In low-pressure activity like drawing, clinicians can observe attention, impulsivity and executive functioning in a short period.

Define statement

The healthcare provider needing to screen for ADHD in children requires an efficient and engaging, yet unbiased and digital, method to note attention and behavior patterns. A child centric drawing task and question technique, aided by artificial intelligence, provides an easy and non-intrusive way for the healthcare provider to note the necessary behavior patterns, while also offering good visual insight.

Ideate Phase

Problems Faced (ADHD-related)

1. **Limited consultation time for behavioral observation**

- Enables clinicians to quickly assess a child's behavioral patterns within a short time

2. **Children's struggle to express symptoms verbally**

- Provides a low-pressure activity that minimises verbal communication and supports children with limited expressive abilities.

3. **Behavioral observations can be highly subjective**

- Provides structured and standardized analysis, support the accuracy of professional judgment

4. **Difficulty maintaining child engagement during consultation**

- Introduces a simple and non-intrusive task that allows clinicians to observe attention and behavior without forcing patient

Solution

To solve these problems, various digital approaches have been considered, among them being questionnaires for parents and drawing screening tools. Low-pressure tasks, such as drawing, enable children to naturally express themselves in a non-verbal manner while also indicating attention and impulsivity through behavioral expressions of this activity. Artificial intelligence approaches have been utilized in this process to transform observations into more structured and more standardized screening methods.

Idea selection

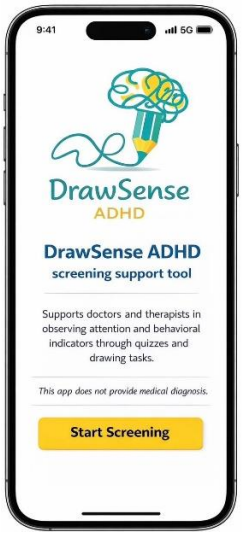
Our team chose the final prototype, DrawSense ADHD. It is useful, interesting and well-aligned with the problem stated. DrawSence ADHD is an AI-supported screening assessing visual attention and behavior through quiz and drawing task to determine ADHD. It also allow healthcare professionals to rate attention, impulsivity and executive functioning in consultation. This application help to screen patient more easily. Next prototype section will describe clearly what this application doing.

Prototype and Test

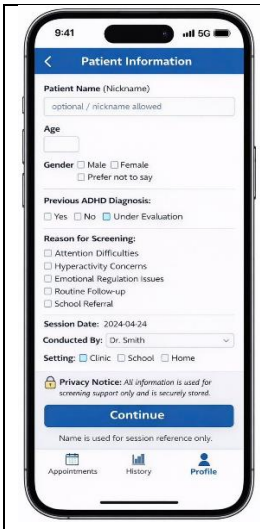
Overview

Prototype of DrawSense ADHD show a complete and structured screening flow had been designed to support ADHD screening process for all age. Flow guides doctors and therapists step-by-step, from patient information, behavioral quiz page, drawing task, scanning and result and managing follow-up appointments.

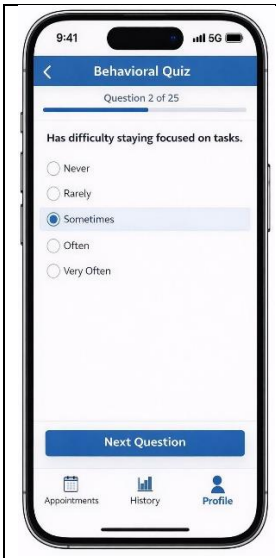
Screen 1: Welcome Page

	Introduces the app and state that it is rather than diagnostic system. A “Start Screening” button allow to start the section.

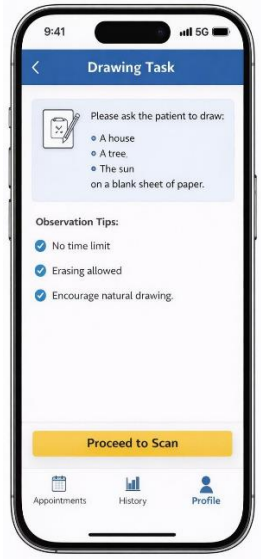
Screen 2: Patient Information Page

	Allow doctors enter patient information.

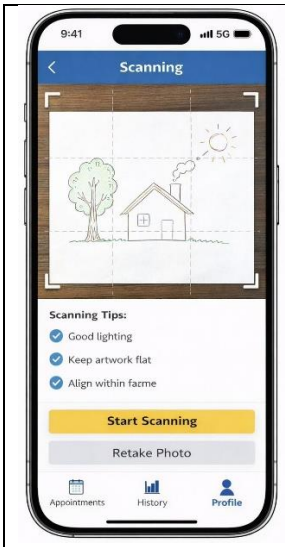
Screen 3: Behavioral Quiz Page

	Shows structured questions that focus on issues attention, impulsivity and behavioral patterns by using Likert-scale format (eg. Never to Very Often).

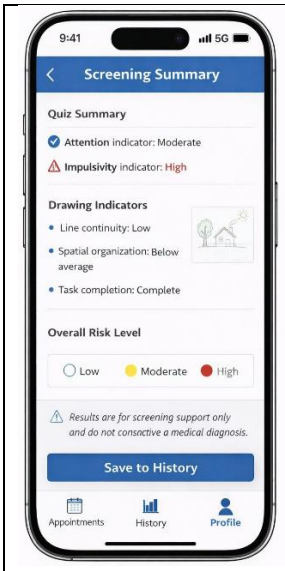
Screen 4: Drawing Task Page

	Then, the Drawing Task page asks patient to complete a drawing task (eg. House, tree, sun) without time limit and allow observe patient's actions.

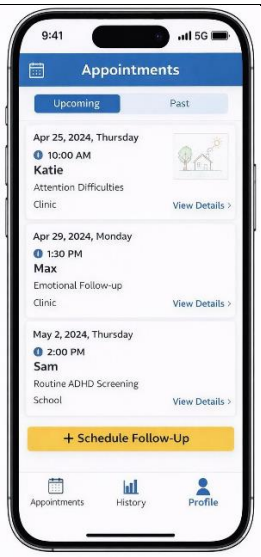
Screen 5: Scanning Page

	Clinicians scan the drawing in good condition (eg. Proper light) to ensure accuracy.

Screen 6: Report Page

	Present screening summary combining quiz and drawing including attention level, impulsivity and overall risk level. Result can be saved in history.

Screen 7: Appointment page

	Allow clinicians to see past records and next schedules.

<u>Usability Testing and Improvements</u>

Usability testing has been carried out through scenario-based demonstrations with team members simulating clinicians. These feedbacks had been taken and have resulted in improvements, such as changing all quiz question wording easier to understand, ensuring that the quality of the drawings does not affect the results, and providing guidance for minimizing mistakes.

Reflection

Chia Jie Ling:

My goal in my course is apply computing and data analysis skills to solve problem faced, especially in healthcare. This design thinking project showed me how technology combined with empathy with user-centered design to settle mental health challenges example ADHD. It can improve my problem-solving and creative thinking skills. To improve my potential to industry, I plan to enhance my programming, system design and communication skills in my academic journey.

Aimi Nasuha:

My aim is to learn more about the link between biology and computer science, and how these disciplines will shape innovation in the years to come. The ADHD Digital Solution project allowed me to assess user requirements and apply technology in the healthcare domain, and it has further strengthened my problem-solving and critical thinking abilities. By completing this project, I have realized that innovation lies in bridging technical expertise and understanding user requirements. In order to better prepare myself for the industry, in the coming months, I would like to improve my skills in computation by taking courses and attending workshops to learn new technologies being used in the industry.

Afif Azfar:

This program enables me to interlink my passion for biology and computer science while developing novel insights in research and programming. It can feed my curiosity. The design thinking project relates to my interlinked goals because I was supposed to identify the available technology tools needed by medical experts to aid patients with ADHD. This opportunity has given me a clearer perception of implementing real-world solutions through interdisciplinary approaches. In order to stay updated within the professional setup, I will be working on improving programming knowledge and learning new technologies.

Thiviya a/p Krishnan:

My goal in this program is to acquire expertise in computer science and bioinformatics, enabling me to develop useful technological solutions for everyday problems, especially in mental and emotional aspects of human well-being and health. I have incorporated these aspects in my design thinking project, with the aim of benefiting individuals with ADHD and improving their lives by developing useful technological tools to address these challenges. Nevertheless, in my pursuit of becoming better equipped in this profession, I want to improve my programming and problem-solving skills, apply design thinking to my upcoming projects, and advance my skills in managing my time and working independently and in teams.

Task division

Name	Task
Chia Jie Ling	Introduction and Prototype section of the report, including overall concept explanations.
Aimi Nasuha binti Husnizamudin	Define and Ideate phases, including problem statements, user needs and idea generation
Afif Azfar	Empathy phase of the report and prepared the interview and questions.
Thiviya a/p Krishnan	Prototype draft, edited and finalized the video, including clip arrangement, transitions and overall presentation.

Visual evidence was collected to support the Design Thinking process. Online discussions via Google Meet and physical discussions were carried out to divide the task and discuss the draft of report. These activities demonstrate collaboration, ideation, and prototype testing throughout the project.

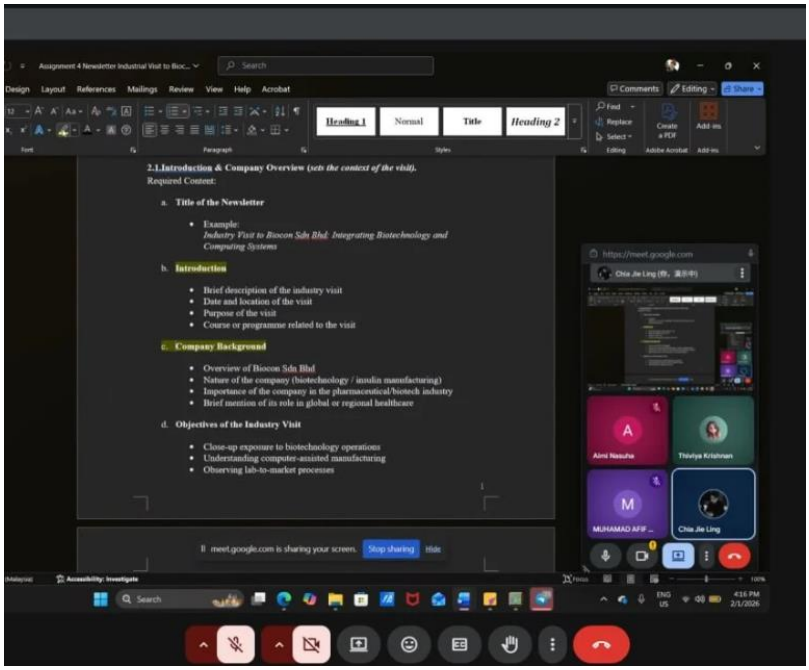


Figure 1: Online discussion and ideation session via Google Meet

Figure 2: Physical prototype testing and workflow simulation

Conclusion

In conclusion, this project applied Design Thinking to create a screening support app, DrawSense ADHD. It is a screening support app for children and adults. The app demonstrates a way to improve screening using technological advancements. It provides a remedial approach that incorporates technological advancements with medical ethics. Future applications of this project could be enhancing it with real-world test and more accuracy to it.