SECP1513-01: **TEKNOLOGI DAN SISTEM MAKLUMAT**
(TECHNOLOGY AND INFORMATION SYSTEM)
Semester 1, 2024

Faculty of Computing, Universiti Teknologi Malaysia
Group Assignment: Design Thinking
Instructor: Associate Professor Dr Azurah binti Abdul Samad
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Group: 3

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1.0 INTRODUCTION

Autism spectrum disorder (ASD) or simply autism, refers to a broad range of conditions characterized by challenges with social skills, speech, repetitive behaviours and non verbal communication. In fact, there is not one type of autism, but there are many of it. Autism looks different for everyone and each individual with autism has their unique challenges and strengths. Some autistic individual live completely independent, while others need less assistance in their daily activities. Since autism is a lifelong disorder, a person with autism may experience changes in their requirements, skills and challenges throughout time. They could require various forms of assistance and accommodations as they move through different phases of life. A person's abilities and results in later life can be significantly impacted by early intervention and therapy.

The design thinking project is important because it enables us to create lasting value for users. It aims to solve a concrete human need. By using an observational, human-centric approach, our team uncover main problems from the consumer that they may not even be aware of. Design thinking provide solutions to those problems once they are identified. Other than that, it leads to more innovative solutions to solve the problems that most of the users had because design thinking plays a major role by finding the roots of the problems that have never been known.

We can solve the problems using iterative approach which also leads to innovative solutions. Instead researching the problem for a long period of time without any result, design thinking favours creating prototypes and test them out to see how effective they are. With that being said, you can achieve a deeper understanding of the problem.

Thus, after long and throughout discussion with the team applying the design thinking process, we decided to create an inhaler including a band for autistic kids (5-15 years old) where parents can use it when their children throw tantrum, meltdowns or even when their child cannot calm and behave properly. This will be a great help to the parents on the long run.

2.0 PROBLEM BACKGROUND

There are many of us who have seen a child throw a fit in public. It is simple to condemn parents and kids for such actions. But at the time, few of us would have considered autistic spectrum disorder (ASD). An autistic meltdown can be characterised by a burst of emotions and fury, screaming, and other disruptive behaviours. So, how can we differentiate between an autistic meltdown or tantrum. Experts use the terms "meltdown" and "tantrum" to refer to two distinct circumstances, despite the fact that many approaches do not distinguish between the two and both are regarded as bad behaviour. There are five main points we can discriminate between both of them.

Tantrum is goal oriented, which means it aims to achieve a desired object or action while meltdown caused by a type of overstimulation such as sensory or unpredictability. Tantrum often occurs happens in toddlers and young children but meltdown in other case, can happen at any age. Also, tantrum happen very sudden as well as after an unmet demand. However, meltdown on the other hand, usually starts after signs of anxiety and distress. Last but not least, autistic person when having the tantrum usually seeks attention and requires an audience and for meltdown, they tend to escape from source of discomfort and even does not need attention.

With that being said, parents play crucial role to handle this kind of behaviour of autistic children. However, they also are busy with their work life and it’s a quite a challenge for them to balance both. So, how can parents of the autistic children handle these situations easily?

3.0 METHODOLOGY

3.1 Empathy

To start our project, we thoroughly analyse the problem background and we kick off by observing parents who had autistic individuals and found out that they sometimes had a hard time to control their autistic children behaviour especially when they are throwing tantrums. For instance, the children suddenly got mad or having meltdowns when something does not turn out in their way. This reaction or behaviour is very common amongst these special children. To be more specific, when they get told to stop doing something they want to continue to do like playing video games.

In order to grasp the problems, our team has conducted an interview with the brother who have an autistic little sister and we also did our research thoroughly. Our interviewer said that there was a time where his little sister does not want to go to school but her parents insisted her to go and that is where she starts throwing tantrum. In fact, this kind of behaviour actually matched the work of what we researched. In fact, this kind of behaviour is very common amongst these individuals.

In order to immerse into what are the problems that the user have, we try to increase our heart rate by doing some physical exercises. After that, we try to calm down ourselves by resting rather than using tools and the result is way different. This shows that using a tool is an alternative to calm down a person.

3.2 Define

Our team of four has spent a lot time and energy conducting comprehensive studies, holding group meetings and carrying out detailed assessments over the last few months. We have been able to understand the issue thanks to the empathy process. We have discovered important insights based on the observation, participation and immersion we had done. Our research has led us to a specialised inhaler that combined with a sophisticated application is required to help solving the issue.

Figure 1: First meeting

On the first meeting, we just simply outlined the problem we wanted to solve in detail, which led the groundwork for our project. The team members gathered to disscuss their premliminary thoughts, findings and preceptions regarding the difficulties users encounter. At the same time, we done a brainstorm storming session to disscuss possible methods, giving inclusion and usefulness top priority in our solutions. Not only that, we also talked about the projetcs's scope and available resources during this crucial meeting, which helped us set goals and allign them. Also, we asssigned roles and responsibilities to ensure efficient collaboration. Each member commited in their own research and gathering relevant data before our next meeting. By the end of the first meeting we shared our understanding of the problem and outlining our approach.

Figure 2: Second meeting

In addition to reviewing what we had done after the first meeting, the second meeting gave us a chance to hone our concepts in accordance with information we have gathered. Each of us gave elaboration on our own research, emphasizing important discoveries and possible fixes. We had long discussions and evaluated the viability and effects of several strategies as a result of this cooperative teamwork and we already recognise trends as well as major problems that users' face. The idea of a customised inhaler combined with a heart rate tracker came about as a result of the team's agreement on the significance of developing a solution that combines technology and usability. In order to direct our future steps, we also created an indicator that include the design framework and user engagement tactics.

3.3 Ideate

We started our design thinking project's ideation phase by coming up with original and useful concepts for the product and its related application. Our main priority of the product is to make sure that the products could address the users' needs effectively while maintaining simplicity and usability. We discussed that the product name would be Inhalaid because it conveys a feeling of purpose and creativity and is both distinctive and captivating. To make sure it stands out in the market, we verified that no other product currently uses this name.

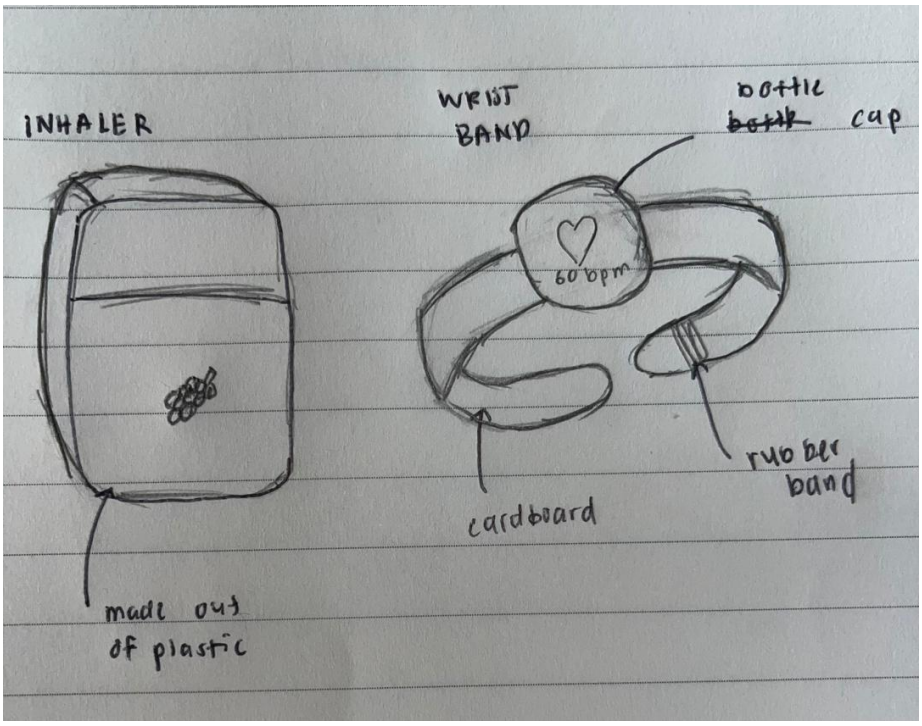


Figure 3: Early drawings of both inhaler and the wrist band

Figure 3 above shows early designs of our inhaler and we all agreed that a small as well as portable inhaler was essential for the product design. We envisioned an inhaler that is small enough to fit into pockets and bags and be carried around easily throughout the day because we know that users value accessibility and convenience of use. Not only that, we also thought of a natural refill for the inhaler refill as well the flavours that user might like. After giving it some thought, we decided on an initial size of 7cm in height and 4 cm in width since we think it balances utility and usefulness. The material that we planned to use for its mock design is the outer layer will be made out of plastic and the refill just produce a sweet smell based on the flavours used.

As for the wrist band, we planned to make it very similar to smart watches including the material used for the band which are mainly rubber instead of animal skin. Animal skin is more expensive than rubber material and not recommend to use because it endangers animals. The display only shows heart rate of the user. It does not have clock feature or any sort of applications installed.

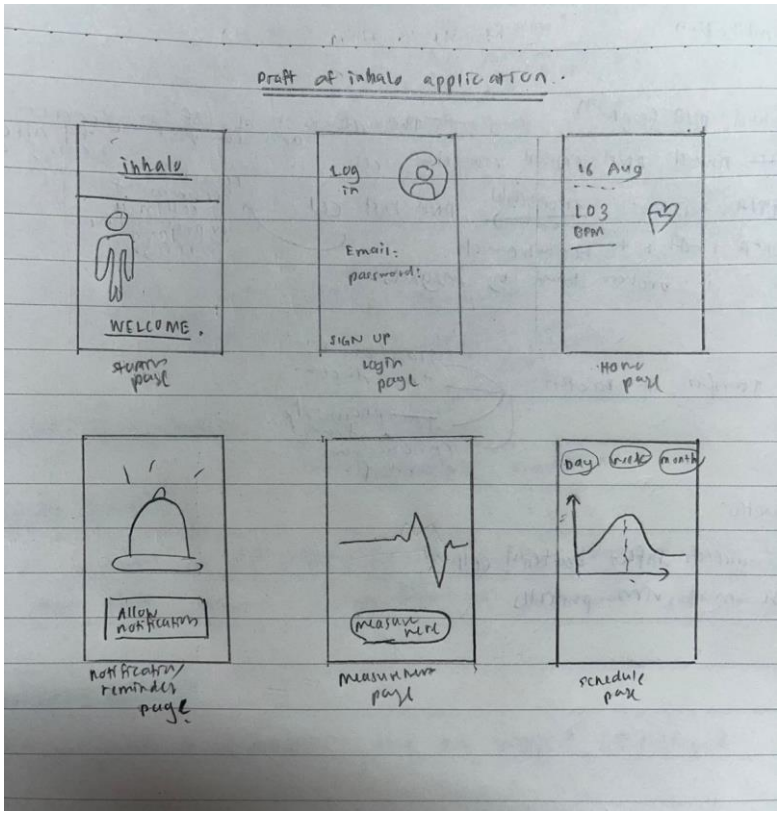


Figure 4: App design in the early phase

This is the early design of the Inhalo application and it only consist of six simple screen layouts. For the starting page, we put our app logo at the top of the screen an a button to get started. Next, the user must put their email and password before login to their account. If they does not have existing account they can click or press the “sign up” button to create an account. Then, the home page act as the main page of the app which display the heart rate of the user in bpm and also the day and date. Beside that, we also create a notification page that act as reminder and alert to the user heart rate in case it past the limit of the standard. We also enable the first time user to measure their heart rate using their mobile devices. Lastly, there is a schedule page where user can track their heart rate in three categories such as day, week, month.

3.4 Prototype

We concentrated on creating prototypes during this phase using the creative concepts we had already discussed. We developed a mock version of each of our products. Figure 4 below is the mock inhaler that we created using durable plastic. The plastic cover was designed with ergonomics in mind, offering a comfortable grip and a visually appealing appearance. The inhaler's interior was filled with a natural refill made of eco-friendly materials, which was chosen for its sustainability and effectiveness. The combination of these materials not only ensured the inhaler's practicality but also its appeal to consumers who care about the environment. Images below are the list of flavours we have for the user's to choose.

Peach

Grape

Mint

Lime

Figure 5: All the flavours we have for now

Figure 6: Wristband that tracks the user heart rate (optional for the user to buy)

We used recycle materials in an inventive way for the wristband prototype. The wristband's primary structure was made of cardboard, which offered a flexible and lightweight foundation. In order to illustrate where the technology would be embedded, we use bottom of the bottle cap to represent the sensor and the top of the bootle cap to display heart rate. We also used a rubber band to keep the wristband on the wrist, making sure it fit firmly and adjustable. For the actual product that will be made in the future, the material used to create the wristband are very similar to all types of smart watch.

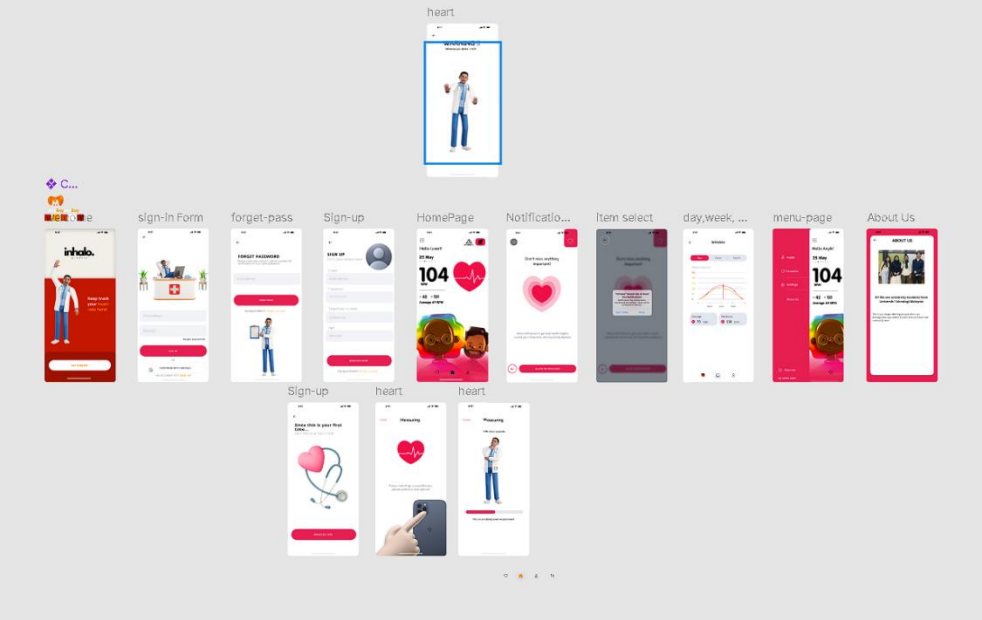


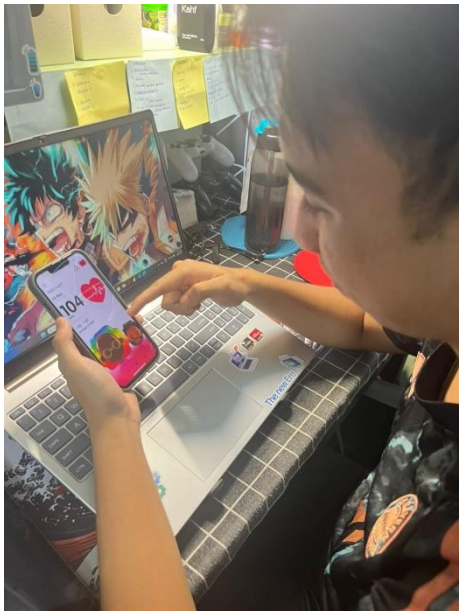
Figure 7: Mock application developing process

Our main focus when designing the application was on simplicity and superb performance. Our team suggested that the app should be used in combination with inhaler. The primary function would be to track the user's heart rate on a daily basis. This feature was chosen because it supports our objective of encouraging better health monitoring while keeping an intuitive interface. If the app is simple and easy to use, we hope to give users a seamless experience that enhances the physical product.

3.5 Test

After we developed the prototypes of each our product, we briefly explained our products and app to Mr Asyik Illahi the elder brother of an autistic sister and some UTM students on how it works. This mode actually helps us on improving the products and app for users' convenience. The feedback we received from them play crucial role on how we improved our products and the system of our application.

UTM student with Inhalaid

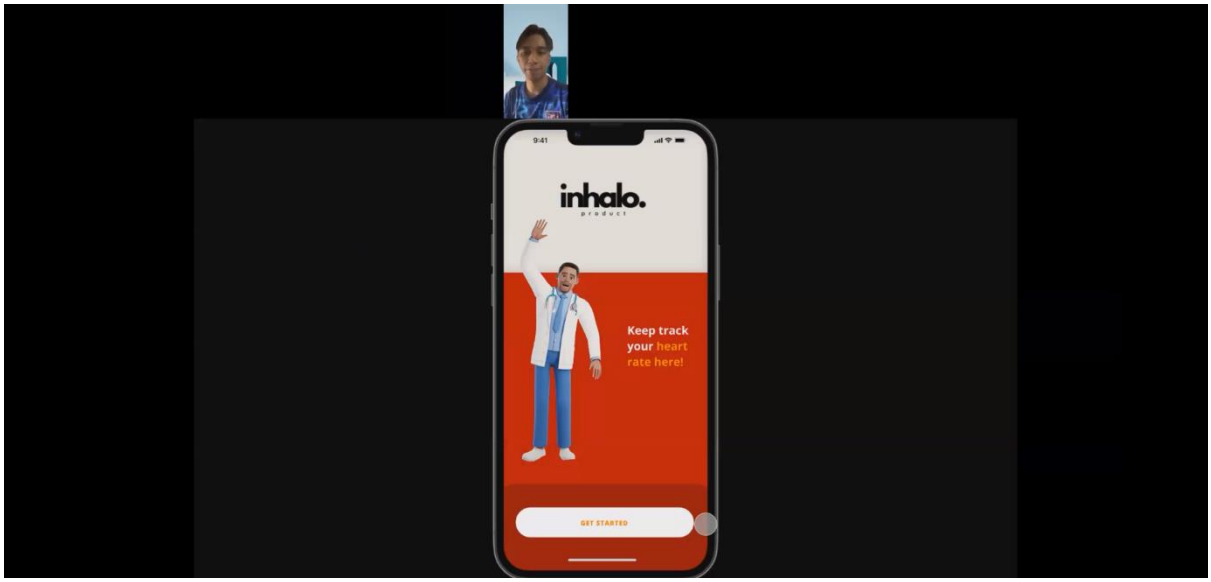


UTM student with inhalo app

UTM student with wristband

Figure 8: UTM students trying our products (wristband & Inhalaid) and application (Inhalo)

On December 2024, we met couple of students from Universiti Teknologi Malaysia (UTM) to help us reviewing our products. The students gave us important information about the user experience by wearing the wristband, testing the inhaler, and interacting with the simulated application. Their comments pointed up areas that needed work, including the prototypes' convenience and durability, the usability as well as other elements that would increase customer satisfaction.



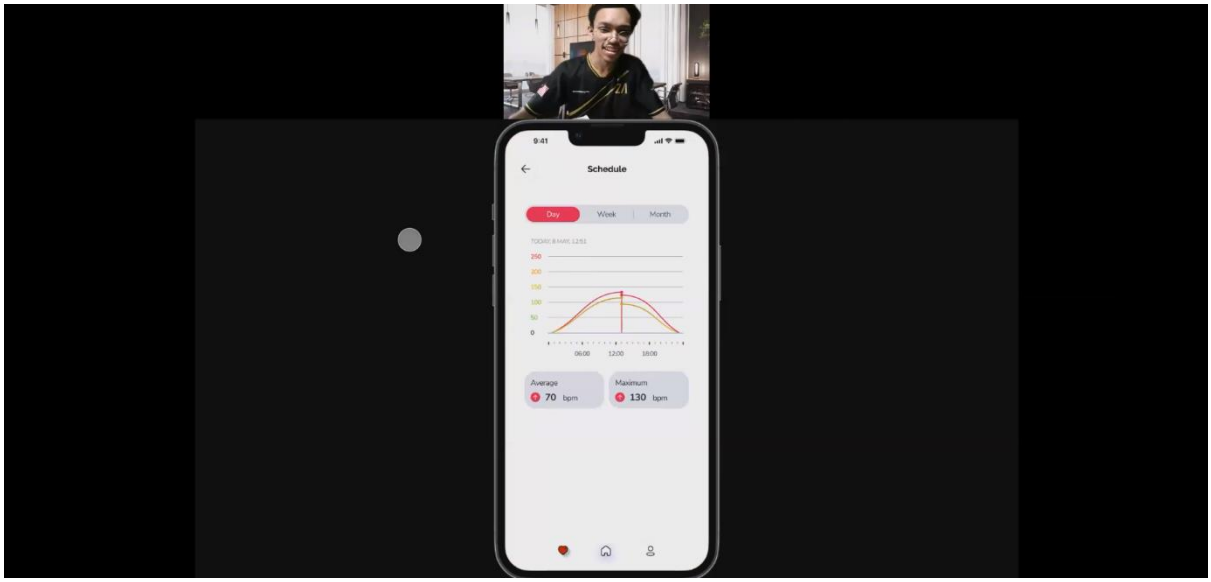
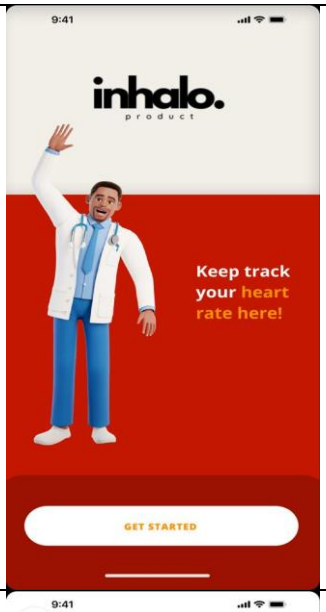
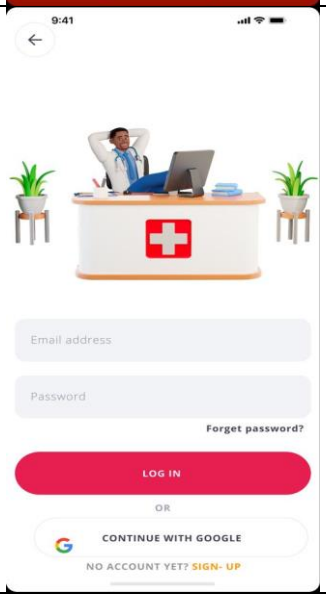


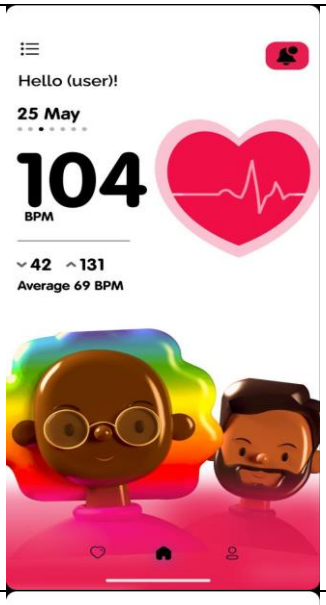
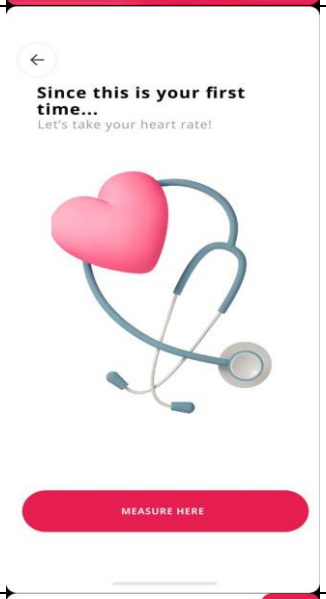
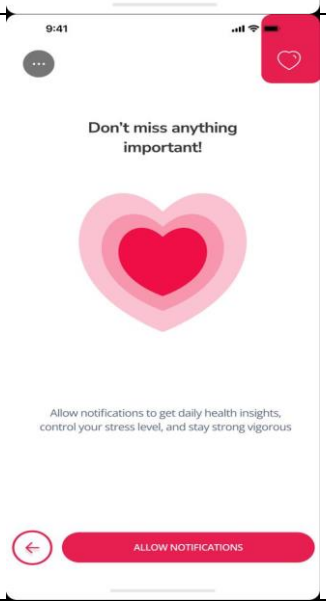
Figure 9: Our meeting again with Mr Asyik by showing how the app (Inhalo) works

On the 14th December 2024, my team setting up a meeting with Mr. Asyik Illahi, an individual who has deep and better understanding because he was the older brother of a girl with autism. His individual experiences gave him a distinct viewpoint on our products' usability and functionality. Farhan thoroughly described the features and capabilities of our application and products throughout this session. We gave a demonstration of the app's interface, emphasising its usability and the features that were specifically created to help users. Additionally, we demonstrated the materials, design decisions, and intended applications of our inhaler and wristband prototypes. Thanks to this presentation, Mr. Asyik Illahi was able to thoroughly comprehend our goal and offer insightful criticism and things to make the app better.

4.0 FEATURES OF PRODUCT

Our product Inhalaid is an inhaler that can linked to Inhalo application in smartphones, smart watches and other smart devices. If you don't have or can't afford smart watches, we have included a wrist band with the inhaler as a package. By using the application, users are able to keep track the heart rate of autistic children easily. They can see the heart rate on their own smart devices like smart phones or smart watches by simply downloading the app. However, if you use the wrist band, it will automatically display your current heart rate on the wrist band screen as it only programmed. Next, the signal is given as a reminder when the heart rate passed the average beats per minute (bpm). The average bpm is determined by the user's age. Also, the users can check their average heart rate by day, week and month. Users can check our website for more detailed information about our products.

	• This is the starting menu of our inhalo app. • The friendly doctor there are welcoming the user into the app • The "Get Started" button will navigate the user to the login page
	• This is the login page where you need to enter your email address and password to log in to your account • There are also forget password menu in case you forget the password to your account • Sign up button is for the new user who does not have existing account in the app

	• This is the home page menu • It displays your heart rate in beat per minute (bpm) • The notification button on the top right will direct the user to turn on the notifications or in other wors reminder to the user
	• If this is your fist time in this app, you will need to measure your heart rate first by clicking the measure here button. • Later, it will measure your heart rate and you will be back in the home page
	• This is the notification page • Users can press the “allow notification” button in order for it to act as their reminder when the limit is above average • After that, users will get notification from their smart phones

	• The schedule page, is where the users can check their heart rate every hour in a day • They can also press the week option to check their heart every day in the week. • This also apply for the month option
	• The page here is about our team members who developed the ideas in making the project

Table 1: Some screenshots of features in Inhalo application

Figure 10: Screenshots of our website

Our product website is created to provide an informative experience for users who are interested in our products. The website features a modern, user-friendly interface that is easy to navigate, ensuring visitors can quickly find the information they need. In the inhaler section, we give a thorough rundown of the inhaler's design, emphasising its long-lasting plastic outer layer and eco-friendly natural refill, explaining how these materials ensure both effectiveness and sustainability. We also put step-by-step instructions with images to demonstrate how users can use the inhaler correctly for maximum benefit. Moving to the wristband section,

5.0 USER STUDY

To further investigate the users' problems and requirements, we conducted an interview and we got feedbacks from the UTM computer science students via google document that we share with them. The information we gain from the interview and google form will be used to make sure the users' needs. This will greatly help us in keep improving our product values.

Background of Interviewer

The full name of the interviewer is Mohamad Asyik Illahi bin Nasruddin. He is 19 years old and a UTM student, majoring computer science (bioinformatics) with honours. He is the elder brother and a guardian of Noor Khairunisa binti Nasruddin. She is the youngest within the family and the one who has the autism.

From our perspective, he is a very diligent student and a caring guardian to Noor Khairunisa which shows that he is very dedicated in both studies and family. The knowledge he have bring a unique perspective to his interviews, reflecting better understanding of how her little sister autism.

Figure 11: Photo of Mr Asyik

Acknowledgements of Similar Products

Based on the user study, both groups were not aware of any similar products to Inhalaid. Some of them only know the application that tracks heart rate which is (Cardiio: Heart Rate Monitor). As for the inhaler, they only aware the inhaler used by asthma individuals because only asthma individuals use inhaler every day to reduce inflammation and sensitivity of the airways. Based on my.clevelandclininc.org, there are three types of inhalers. The types are metered-dose, dry powder and soft mist. Our product use metered-dose type because it puffs dose of medicine when you press on it. Lastly, as for the wrist band, they know it is one of the features of all smart watches but it is cheaper alternative.

User Feedback

Majority of the feedbacks that we received from both interview and google form are showing the interests and concern of the given idea. They are willing to share and recommend our products as long as we keep improving better in the future. They have high expectations on the inhaler based on the size and the ingredients used.

Figure 12: Screenshots of our feedbacks data

6.0 BUSINESS ANALYSIS

Design thinking project benefit greatly from business analysis, which carefully assesses the strength, weaknesses, threats as well as opportunities for improvement of our products. By using this method we can have a stable economic rate of our products in the near future. This table highlights key points of products. This method is very effective to run any kind of business.

Strength	**Weaknesses**
• Our inhaler comes with variety of flavours including grape, peach, lime and mint. The ingredients used are all natural ingredients. • Both application and band act as reminder for the user • The products are at affordable prices. The app also is free on both apple store and play store platforms	• The inhaler refill can last only last for 2-3 weeks depends on how many times used. • Wristband have only one feature that tracks the user heart rate only
Opportunities for improvement	**Threats**
• Update the application regularly to make it more user friendly • Get feedback from customers and improvised based on the reviews received	• Can lead to allergies for certain users who are allergic to the flavours of the product

Table 2: Business analysis strategies

7.0 REFLECTIONS

Finally, we almost reached the end of our design thinking project report and each of our team member contributions allowed us to tackle the challenges from multiple angles, and ensuring the success of the project. Based on the design thinking project, each of us come with reflections, elaborating lessons they gained throughout the project.

In developing my project, I have learnt a lot of new stuff specially making products and an app that can be useful to user. Throughout my developing process, I understand the needs of the target audience and what system that I should focus on more so that it will fulfil the audience. My team and I are working so hard to make sure the successful of this project in every strategy such as video editing, apps designing, brainstorming, and developing a website. The inhaler component had its own challenges, particularly by the ingredients that can be used by children with autism also the design of the inhaler should be a lot easier than a normal inhaler in market. More on that, having a heart tracker apps can be useful along with the inhaler for the autism. We ensure that everything is being put in place to gain the user's trust. Moving forward, I would like to explore along with my team more about the impressive features, such as alert systems and customization that could better specifically need of user.

-NUR ANISAH SOLEHAH BINTI MOHD HAMIM

Working on the design thinking project was such an eye-opening experience. It really taught me how important it is to focus on understanding people's needs before jumping into solutions. Collaborating with others and hearing different perspectives pushed me to think in ways I hadn't before. I realized how valuable it is to embrace trial and error prototyping and testing weren't just about getting things right, but about learning what doesn't work and improving from there. The process wasn't always smooth, but that's what made it so rewarding. It reminded me that creativity thrives when you stay open-minded and flexible, and it's okay to fail as long as you keep moving forward. This project gave me a fresh perspective on problem-solving and how to approach challenges with empathy and curiosity.

-ALLISYA MAISARAH BINTI SURAIZAL

As a computer science student, my ultimate goal is to contribute meaningfully to innovative technological solutions that improve people's lives. I dream of creating applications that efficiency like personalized AI-driven tools for healthcare or education. This design thinking project has completely improved my overall problem-solving skills. It helps me learn about defining clear problem statements and solve solutions through ideation, prototyping, and testing. Not only that, this project highlighted the importance of collaboration, which process a project with teamworking. Working in a team taught me how to communication to each other for sharing ideas and develop the app. Looking ahead, I plan to expand my technical knowledge, strengthen my user-centred design abilities, and develop a solid portfolio to increase my industry potential. Lessons learnt will surely help me achieve my career goals.

-MINDY NG YU FANG

My goal is to make a significant contribution to the healthcare business by harnessing breakthrough technology to improve patient outcomes and quality of life. I specifically want to create solutions that address chronic diseases, promote preventative care as well as improve the accessibility for whole communities. From my point of view, design thinking emphasises empathy, hone the creativity of person, iterative problem solving, all of which are aligned with my dream goals. By using this design thinking methodology, our team has created products where it helps myself to understand and improve something that will help me in the future. For instance, the combination of the application, wrist band and inhaler are great but there are always room for improvement and thus feedbacks from users help us make our product more efficient in the future. Last but not least, to improve my potential in industry, I plan to enhance my knowledge in Internet of Things (IoT) to make it easier for me to handle even bigger projects and I will make sure to stay updated on trends by continuously immerse myself in social media like Instagram to gain insights. All in all, this project definitely helps me in many ways and will benefit me in the near future.

-MOHAMAD FARHAN BIN MOHAMAD HARIRI

8.0 TASK DISTRIBUTION

The success of our design thinking project is massively relied on the efforts that each of us poured into it. Each of the team members contribute to the team by take responsibilities of their roles and together, these roles combined ensured the success of this design thinking project. List below is the task distribution each of the members.

1. ANISAH (TASK GIVING & WEBSITE DEVELOPER)

- Responsible of managing the overall project and providing direction to the team
- Ensuring that the project stayed align with the initial goals
- Handled the creation of project's website and design
- Responsible for designing and building project's website that served as central hub, providing information and ensuring the apps are user-friendly interface and accessible to a wide audience
- Coordinated with other team members based on each member's skills and led regular for project's process
- Making sure that each member are doing the project as it was planned in the beginning

2. FARHAN (APP DEVELOPER & DESIGNER || REPORTER)

- Responsible for ensuring app was functional, user-friendly and met the requirement for the target audience particularly individuals with autism
- Design the app's layout, functionality, and core features.
- Ensuring the apps are needed to be easy to use while providing real-time heart rate monitoring and data analysis
- Designing app's interface that focused on creating a calm, intuitive, visually appealing design to cater to users with autism
- Conducted testing to ensure the apps worked seamlessly across different devices, the heart rate are accurate and no bug in the functionality.
- Making a report for every meetings and every aspect of the project.

3. ALLISYA (PHOTOGRAPHER AND VISUAL CONTENT EDITOR)

- Attended every meeting and took photographs to document the progress of the project
- Create visual timeline of the work and were important for representing the work visually during final presentation.
- Responsible for editing the images so the picture is clear, high quality, and formatted it to website and video
- Cropping, adjusting brightness and contrast
- Ensuring that the photos fit the overall originality of the project
- Helping the website developer to design the website and enhance the quality for the final presentation
- Showcasing the feedback of the products and document the specific details

4. MINDY (VIDEO COMPILER AND PRESENTAION EDITOR)

- Responsible for editing the footage and images captured during the project
- Creating cohesive video that would shows all the work and brainstorming process
- Use all the pictures and video gathered throughout the project and edited it for final presentation.
- Ensuring the video served as visual centerpiece for our project presentation.
- Designing the and ensuring the video and slides are complemented each other and flowed smoothly
- Creating the video that highlighted the key points and was engaging for the audience
- Making the video based on the flows given

9.0 GANTT CHART

Figure 11 below are the Gantt chart on the progress of our design thinking project from where we kick off until the end of the project. The Gantt chart serve a purpose to outline all the progress we have done for these couple months on the project. This chart shows how much efforts our team has poured into this project to making it successful.

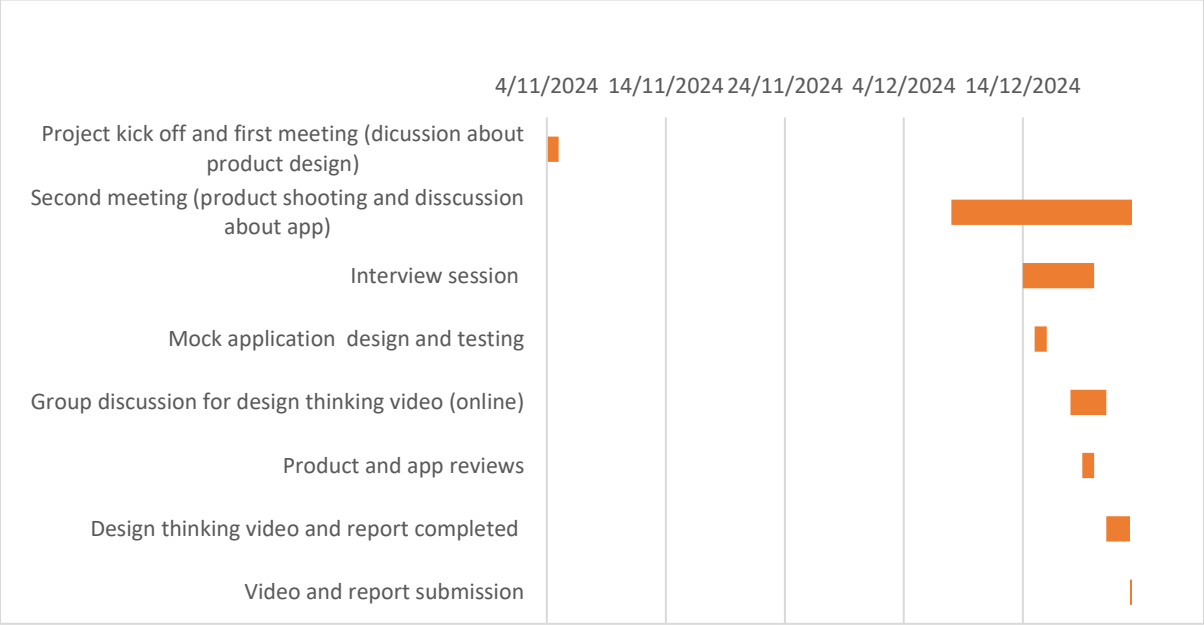


Figure 13: Gantt chart for our design thinking project

10.0 CONCLUSION

All in all, by utilising a user centred approach, the design thinking project has effectively addressed the original problem background. Our team has created a well-done solution that satisfy the requirements of our target audience through in-depth research, ideation, prototyping and testing. The efforts our team and valuable feedbacks from our interviewer and UTM students for filling the google form has make this project a success.

Overall, this project has proven the effectiveness of design thinking in addressing difficult problems and has laid a solid foundation for future endeavours. We hope that this design thinking project will be beneficial to the parents of autistic children.

11.0 REFERENCES

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