



TECHNOLOGY & INFORMATION SYSTEM
SECP1513 – SECTION 05

FACULTY OF COMPUTING
SEM 1 – 2024/2025

DESIGN THINKING PROJECT THEME
Big Data and Artificial Intelligence Innovation

Dr. Haswadi Bin Hassan

Group 2 - sAlvior Shoe

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Introduction

Recently, various aspects of everyday life have been revolutionized by the Internet of Things (IoT) via integrating smart technologies into daily activities and routines. This report presents concerns for foot health and the development of an innovative AI Shoe that is integrated with IoT to enhance the user's footwear experience. Our product has several features, including real-time health monitoring, milestone check-ins, danger warnings and much more.

The rise of the IoT has paved the way for a new era of unified devices, bringing ease, enjoyment and efficiency to various sectors. Wearable technology has emerged as a key player, offering fresh solutions to monitor and upgrade personal health and fitness. The concept of smart footwear stands in the middle of technology and daily life, presenting opportunities to improve users' overall well-being.

Design Thinking

Phases 1 – 5

Phase 1 : Empathy

Interview Overview

To develop and discover the problem from the usual footwear, our team conducted a few interviews with the students of Computing Faculty at the Universiti Teknologi Malaysia (UTM):

1. MUTALLIB AFSAHOV
2. ANIKA MALIHA
3. ABRAR ALTAG MOSTAFA

Key Interview Question and Responses

For the interview, we believe that one question is sufficient to answer most of our questions on problems, issues and likewise on the topic of foot health and shoes.

Q: What is the issue that is faced with the usual footwear while running or jogging?

The first interviewer said that his shoes are easily worn down and it is hard to buy good-quality jogging shoes, as well as it being difficult to get their father into fitness.

The second interviewer mentioned that she felt risky with her footwear when she was exercising, needing extra confirmation with her coach if she had injured herself.

The last interviewer gave her opinion that she had a bad jogging experience while facing a challenging environment, and she had an issue with the tracking application, which gave inaccurate data.



Figure 1.0 Interviews with a randomly selected students in Computing Faculty

Phase 2 : Define

Our team conducted in-depth interviews across campus to discover common footwear issues faced by students. Through interviewing and discussion, several key concerns emerged from these conversations:

Shoe Durability

Interviewers reported that their shoes wear down quickly, resulting in discomfort during jogging, they also highlighted the lack of support for the footwear, which negatively affected the overall jogging experience. Other than that, a shoe with bad durability will be frequently replaced, and this will be costly.

Shoe Safety

They often feel unsafe because the bad support of the footwear might cause injuries, especially in emergency situations. Thus, the efficiency will be diminished when rushing to a specific location.

Shoe Environment Adaptivity and Issue with tracking applications

Interviewers felt frustrated with their footwear in challenging environments, such as rainy days or on dirt paths. As an example, the shoes will stick into mud paths, which is giving them a bad jogging experience. Additionally, they noted problems with their fitness tracking application, which frequently provided inaccurate data. This will make them unable to reach their true fitness targets.

These interviews highlight a few footwear-related challenges faced by students, from durability and comfort issues to environmental adaptability and safety concerns.

Phase 3 : Ideate

1. Features and Benefits

1.1 General Fitness and Injury Tracking

The integrated AI within the shoe is capable of tracking both health and possible dangers such as injuries and likewise.

- This allows the user to be kept up with how well they're doing on their exercise..
- It's able to recognise when the user is injured or in pain, directly helping users by advising them to seek medical assistance immediately.
- Detects and notifies the user of potential foot injuries, when blood oxygen levels drop.
- Monitors steps taken and other walking data in real time, send live updates to the user's smartphone for easy monitoring by the user..

1.2 Healthy Feet and Waterproof Design

The shoes were thought with foot health in mind, as well as constructed with a specialized waterproof canvas, ensuring:

- A very large toe box to maximize user's comfort, improving balance and reducing risk of foot deformities.
- Materials such as gel for the insole to decrease and minimise the impact by absorption, and rubber for the sole due to its durability and flexibility.
- Full protection for the embedded AI-powered circuitry against water damage
- Reliability and durability in a variety of environmental conditions.

1.3 Charge Using Kinetic Energy

The shoes use kinetic energy to charge the power to be used by the circuit inside it. The use of kinetic energy was said efficient because:

- Users are able to not charge it manually everyday because it is automatically charged using movement, basically the change of energy from kinetic to electric energy
- The power is last longer compared to charge like normal charger

1.4 Autonomous Adjustments

These smart shoes are designed to adjust and optimize autonomously without the aid of humans. The main target for this feature are for elderly people. Using AI capabilities, the shoes can automatically perform the following functions:

- Automatically ties the shoe's laces together.
- Optimizes the shoe's insole height and width to ensure the user's feet remain comfortable during wear

2. Method of Applying Features

With features listed in the previous section, we pondered on methods of how the user will be capable of taking control of their shoes, so we settled with Bluetooth connections between the user's mobile phone and the shoe.

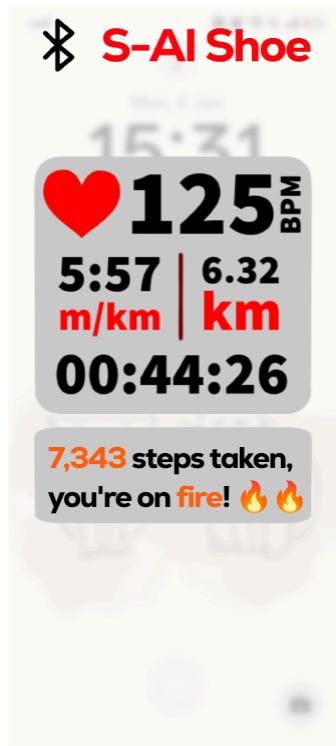


Figure 1.1 Examples of Bluetooth display

3. Relevance to the Project Goals

These features parallel with the project's objectives by merging advanced technology with Big Data and Artificial Intelligence Innovation and also applied concepts of Internet of Things (IoT).

Phase 4 : Prototype

We started our journey in developing these shoes from scratch. We used a whiteboard of one of our team members to begin drawing the design, figuring out where to place the features of our shoes in 2D at any angle (front, back, right, left, upper view and down view) before we use that for material to start developing the shoes in 3D design.

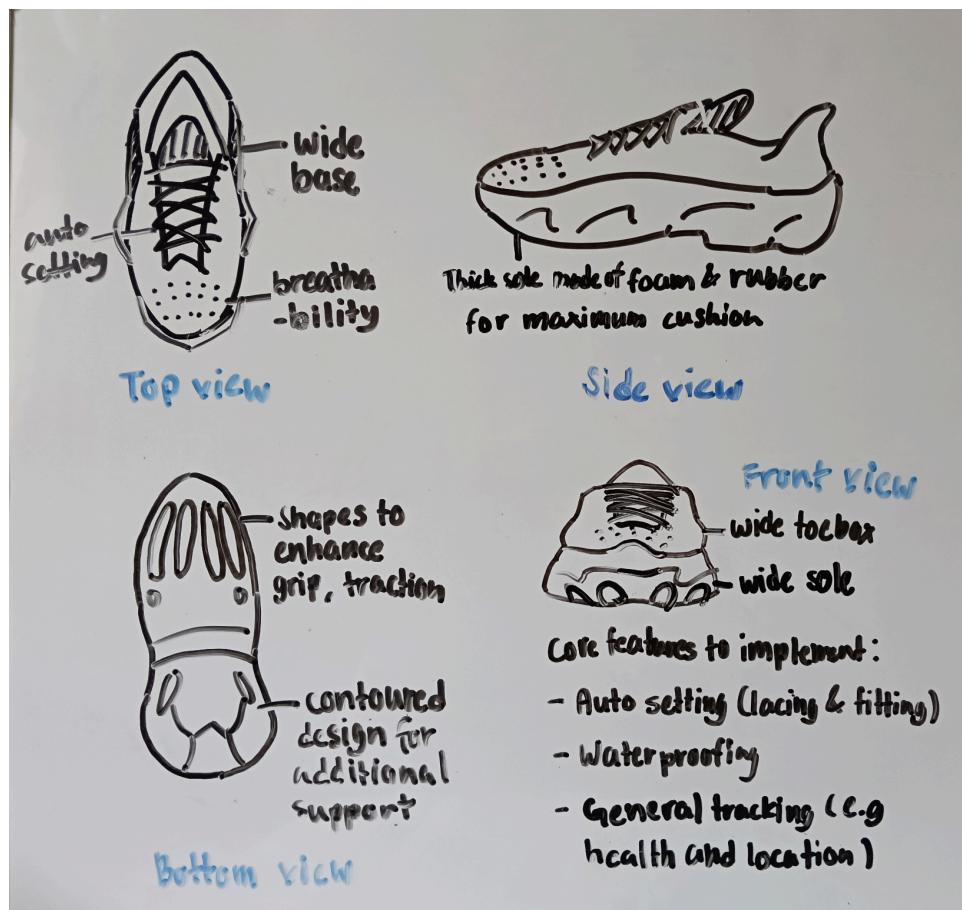


Figure 1.2 Early stage of prototype, using whiteboard drawings

For the 3D design, we use the help of digital software which is Blender version 4.0 because it is a free version of software that offers their customers to create 3D design products without paying any fees. At first, we spent about one day on YouTube just to learn and understand the basics needed to start designing the 3D shoes because we were not familiar with this software before this.

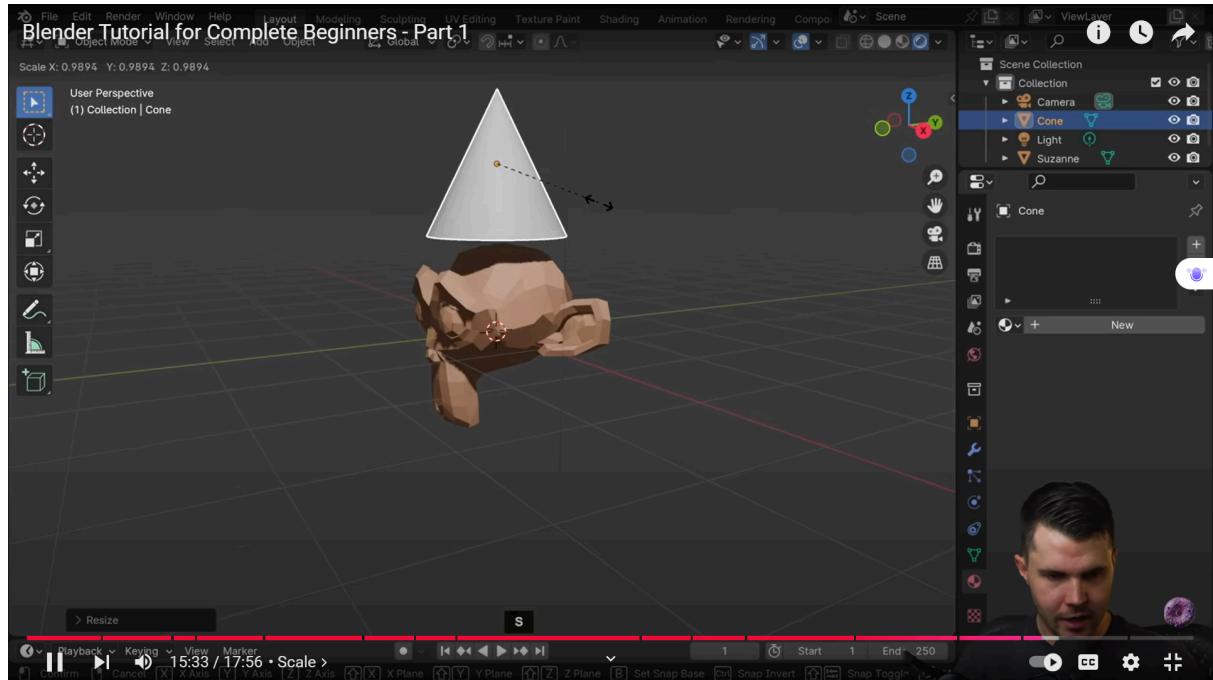


Figure 1.3 Learn basic of Blender 4.0 from [YouTube](#) (1)

After that, we started to design our 3D designs using Blender. We turned a model of a cube into the shape of a shoe. We took around 12 hours just to build the mock up, as well as to think of where to add which feature onto what part on the shoe itself.



Figure 1.4 Mock up of shoes in 3D using Blender 4.0

On another day, we started rendering our mock up by adding some features like air ventilation at the tip front of the shoe. We are also starting to colour our shoes and put some shading into them so it looks presentable and is eye-candy to the eyes of the customer.



Figure 1.5 Shoes after render with colour and shading

Lastly, we came up with our final design and that's to be our prototype for our project to be presented in the class Technology and Information System lecture by Dr Haswadi.



Figure 1.6 Final Prototype made using software Blender 4.0

Phase 5 : Testing

After our prototype is completely developed, now is the testing phase for our innovation. Our team has conducted a test for our shoes to demonstrate its features.

The progress began with testing our own software that functional with the footwear through Bluetooth. To activate the connection, the first step is holding a button behind the shoe for approximately 3 to 5 seconds and it will be connected with the user's device. The software will be recording accurate data such as steps taken, calories burned, walking time and the pace per km from time to time. Whenever an emergency situation occurs, such as injuries during jogging, the shoe will vibrate and transmit a signal to the device and it will advise the user to seek immediate medical assistance.

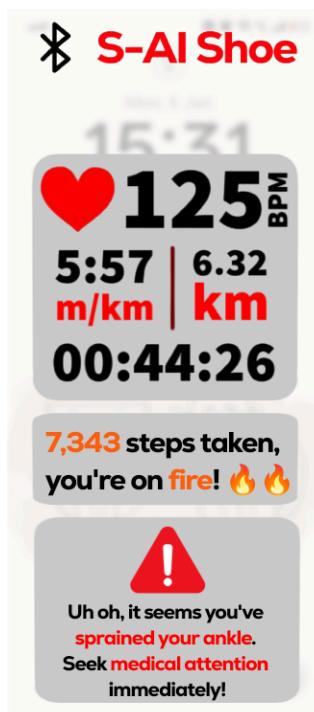


Figure 1.7 Example of warning for an injury

The testing progress continued by testing our next feature which is autonomous fitting. When the shoes have been worn, the feature will autonomously adjust itself. The size of the shoe will be adjusted to a most comfortable position for the feet. Thus, giving users a good user experience by the feature will help users to adapt mostly to the challenging environment and minimize the injuries rates.

Last but not least, the last feature which is waterproof technology will be tested. The hydrophobic material will prevent the water from infiltrating into the shoes. This feature helps users to adapt to mostly all challenging environments such as rainy days and mud paths and keep the shoes dry and clean.

Reflection[3]

At first, our goal seemed unclear, but as we worked together, things began to fall into place. We developed a shared understanding of what we wanted to achieve, and it was rewarding to see how we supported each other in growing and improving.

Working with my team had a significant impact on me. I learned a great deal about teamwork, communication, and how to collaborate effectively. These skills were not only important for the project but will continue to be valuable in future endeavors.

We also realized that, in order to succeed, we needed to be open to learning and adapting. The world around us was changing rapidly, and it became clear that this pace would only increase in the future. As a team, we understood the importance of being flexible and embracing new knowledge, so we could stay prepared for whatever came our way.

Member Tasks (Report)

Name	Task	Description
YOONG KAH QUAN	Introduction	This part is the background and objective that we determined to choose this topic. Other than that, we will be simply briefing about our product.
	Empathy	Before we started to develop a prototype, it is required to understand the problem and opinion from the public so that the prototype development is necessary to interview from the public
	Define	To develop a prototype that could solve users problem, we need to define the core problem from the usual product, by defining the key problem, we can develop our products features by solving the problems
DANIEL IMAN HAQIMIE BIN YUSOFF	Ideate	Through defining the problems, We are required to ideate a few ideas for the features of our product. This phase is important as this phase can make our product better and different from other usual products.
ABDURRAFIQ BIN ZAKARIA	Prototype	After we ideate some features for a product, some of the ideas have been chosen to be features of our product, then we need to start to prototype our product, from designing the software and the product itself.
AHMAD MUNIF BIN BAHARUM	Testing	This phase would be the end of the progress by testing the features of our product, from the software to the product itself must be conducting the tests to make sure the product is used functionally and can really give an overall good user experience.
NAJMUDDIN BIN KAMARUDIN	Reflection	This part is to give our team to motivate ourselves to work consistently on this report by determining our direction with regard to the course. Moreover, we could understand the importance of design thinking and improving our potential in the industry.

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