Smart Mat: SMAT

Final Proposal

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Abstract

Name of Product	SMAT(Smart Mat)
Main Title	Smart Living
Team Name	Captain 11
Introduction	The pursuit of smart living technology is a recent trend in which technology is applied to daily life to increase efficiency, affordability and sustainability. The principle behind smart living technology is that technology should be used to advance the needs of human beings and to increase the quality of life by the power of human creativity while at the same time sustaining the environment for future generations. So, we propose SMAT, Smart Mat. This product consists of two main component which are the smart floor mat and the LED screen.
Differentiation, Strategy, Competitiveness	It is our motto to "Help in a small part of life". So we have added more convenience to our ever-rising smart products.
Main Function	1. Alarm Control 2. Weather Information with. Voice Guidance 3. Schedule Information on Display 4. BMI measurement
Benefit	- Satisfaction : giving information and satisfaction to the blind and normal people. - Reducing mistakes in daily life : preventing we close the alarm accidentally and overslept situation happened

Team Member

“Captain 11”

We are students of team “Captain 11”

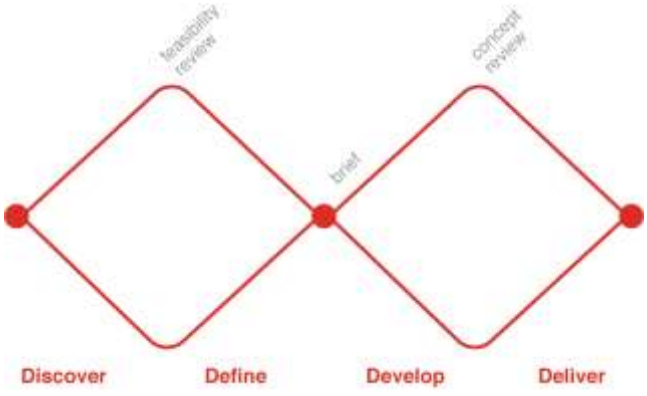
from Mechanical Engineering, Quantum Systems Engineering,
Chemical Engineering, and Software Engineering.

Introduction

The pursuit of smart living technology is a recent trend in which technology is applied to daily life to increase efficiency, affordability and sustainability. The principle behind smart living technology is that technology should be used to advance the needs of human beings and to increase the quality of life by the power of human creativity while at the same time sustaining the environment for future generations.

As such, intelligent networks should be adopted to provide humans with full information to control an individual's personal environment. Wireless technology can play a key role in enabling smart energy monitoring by allowing consumers to make more informed choices and to connect products and devices to a coordinated management system.

The development of smart living technology is based on the concept of user driven innovations. Various living labs have been established around the world as development centers for extension of this smart living technology.



In designing this smart living technology, we used the Double Diamond model approach. The first quarter of the "Double Diamond" model covers the start of this project. We tried to look at the world in a fresh way, noticed new things and gathered insights. We looked into all the problems or restraints that occurred in our daily life with a new perspective. The second quarter of this model represents the definition stage, in which we tried to make sense of all possibilities identified.

We started to question ourselves, which matter most? Which should we act on first? What is feasible? The goal here is to develop a clear creative brief that frames the fundamental design challenge. The third quarter marks a period of development where solutions or concepts are created, prototyped, tested and iterated. This process of trial and error can help us to improve and refine our ideas later. The final quarter of the

double diamond will be the delivery stage, where the resulting project will be prototyped and finalised.

The product that we proposed to be designed in this proposal is called "SMAT: Smart Mat". This product consists of two main component which are the smart floor mat and the LED screen. The LED screen will be connected wirelessly to the floor mat. SMAT have certain special features which are, floor mat, alarm clock, weather forecast display, air pollution index display, schedule display, and also potentially can be included is Body Mass Index display for a person.

How it works? Basically, a person will be wakened up from their sleep after hearing the alarm from SMAT. Then, they have to move out from their bed to step onto the smart floor mat for a few seconds to stop the alarm. This action will force them to extract out themselves from their sleep inertia state. At the same time, the person can see the weather forecast, air pollution index and their daily schedule on the LED screen while still standing on the smart floor mart to start their day in the morning. If possible, the Body Mass Index can also be inserted in the display. Hence the person can monitor their BMI daily and they can plan their diet throughout the day. Thus, promoting a healthy lifestyle that will become beneficial its user.

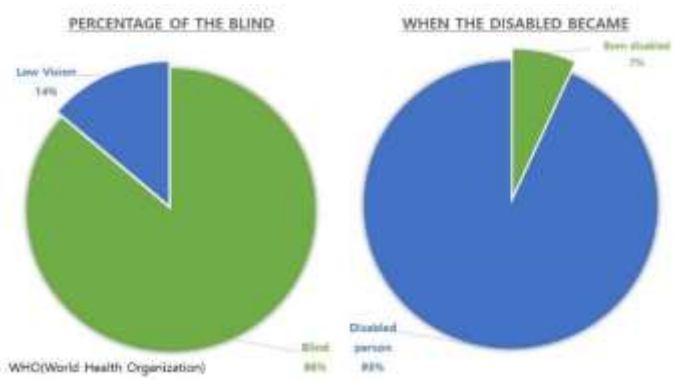
Market Analysis

The market that I thought was the handicappped good market, According to KOTRA, the market for handicapped goods is getting attention from 2015.90% of the blind people are the cause of blindness, and blindness of both blincds is about 5%, which will be helpful for the visually impaired to go out frequently.

The number of blind people worldwide will triple in the next 40 years.

According to a study published in the medical journal Lancet Global Health, the number of people with visual impairments worldwide is projected to increase from about 36 million to about 115 million in 2050.

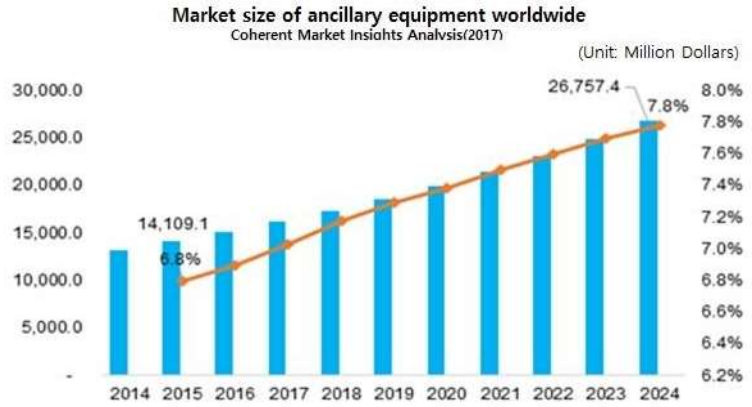
Blind people are divided into low vision and blind. Low vision refers to visual impairment that can not be improved by medical or optical means due to birth defects or acquired eye disease.



According to the World Health Organization (WHO),
there are about 285 million visually impaired people worldwide in 2014.
Of these, 39 million are blind and 246 million are low vision.

Market size of assistive devices for the visually impaired

According to Gallup, One of the most feared diseases, the 'illness that causes vision loss' is the third delegation follow by cancer, AIDS.
In addition, according to the research institute of Yonsei University Severance Hospital, the suicide rate of the low vision is twice the normal level, and the psychological stress due to the low vision is large, and the need for the auxiliary device for supplementing the low vision is increasing.



Aids for blind people with IT technology being sold in the US

Ancillary equipment for the visually impaired began by simply using optical technology to enlarge the text, and then simple IT devices were introduced that enlarged the screen using scanner technology. In recent years, the market has been expanding with the use of cameras, sensor technology, smart phones, and other IT accessories that blind people wear glasses and explain them with words. In 2017, Coherent Market Insights Analysis announced that the world market for assistive devices will grow to US $ 14 billion in 2015, with a CAGR of 7.4% by 2024.

Globally, the population of elderly people aged 60 or older is steadily increasing, and demand for ancillary equipment for low vision is expected to increase, making it a suitable market for small and medium-sized companies targeting the silver market. So far, there are consumer complaints that the price of auxiliary equipment is high because it is a limited market. It is easy to use for consumers, and it is likely to be successful when entering the market with reasonable prices. Ancillary equipment for the visually impaired is a market where ICT technology is introduced to make new products more convenient and sustainable, and can be sold through the entry into the US-supported I Can Connect program. Sensor technology, which is the center of the 4th industrial revolution, and robot technology using artificial intelligence are technologies that are useful for all people with disabilities including the blind. It is a field.

Problem Statement

Oversleep : People tend to overslept and have a stressful and very rush morning

Time - inefficient : It is difficult to check several during the busy morning routine.

Solution

1. The value that discomfort makes : Alarm with Real Wake up System

For those who turn off cell phone alarms in sleep, it is characterized by the ability to turn on the alarm to turn on the mat. It is creating "The value that discomfort makes". It consist of a system where you have to wake up and turn off the alarm. You must step on the mat device to shut down the alarm. I wanted to be useful to people who had to get up but could not get up. As Smart home evolved, we know that in a recently built apartment it provides the weather on the home pad, but it needs to be checked by manipulating the pad directly. In the case of alarms, there are a lot of unique alarms as well as various mobile applications, but we have not seen alarms like our idea yet.

Developments that make it convenient for people can be more uncomfortable for some people.

While touch-based appliances can be a very comfortable tool, someone near us may be having a hard time. They say, "Smart era, we seem to be stupid." We wondered if everyone could enjoy a smart living. It is our motto to "Help in a small part of life".

It would be nice to include it. Most of the products on the market are screen devices named "Smart mirror". Our distinction is that there is a function that is linked with the foot mat.

2. Weather Notification

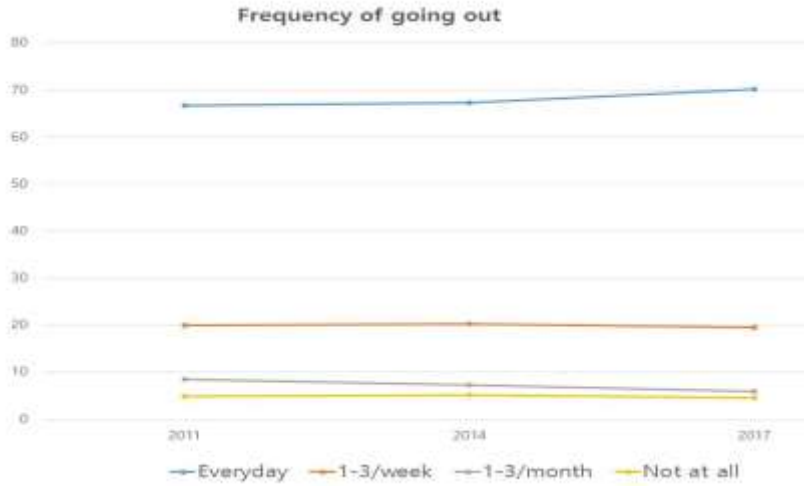
We sometimes go out without knowing the weather. In this case, We wil in the rain when we don’ t know it’ s going to rain.

But this mat and devices solve this problem. Mat recognizes people, and the devices connected with the mat bring in weather information of today. The weather information is available on screen and voice.

Even in the case of the general public, the rain that can not be prepared is confusing. However, it can be more embarrassing for visually impaired people who need to pay a little more attention when going out. So if the device automatically provides weather information to the user, it will be useful for everyone's out of the way.

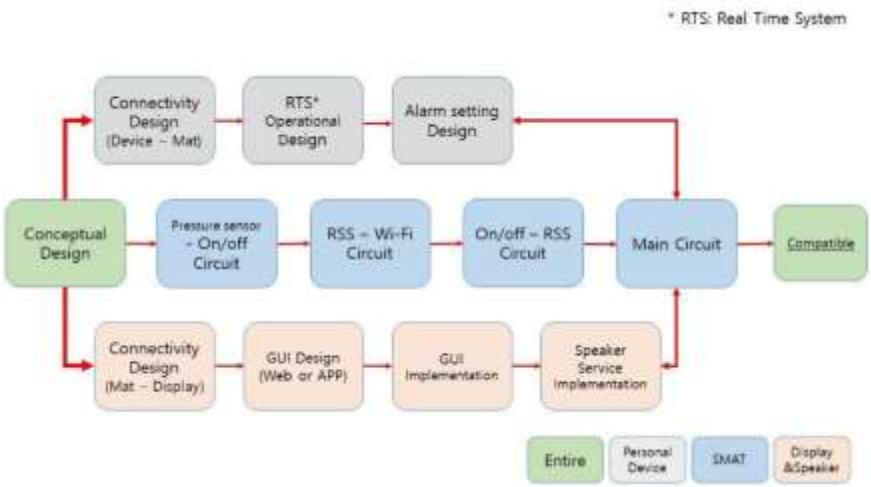
The display on the display appears in the form of a high-contrast screen, making it easy to use for low vision.

Finally, one way to get closer to a user who is commonly referred to as a visually impaired is to make the display larger and the screen content itself larger.



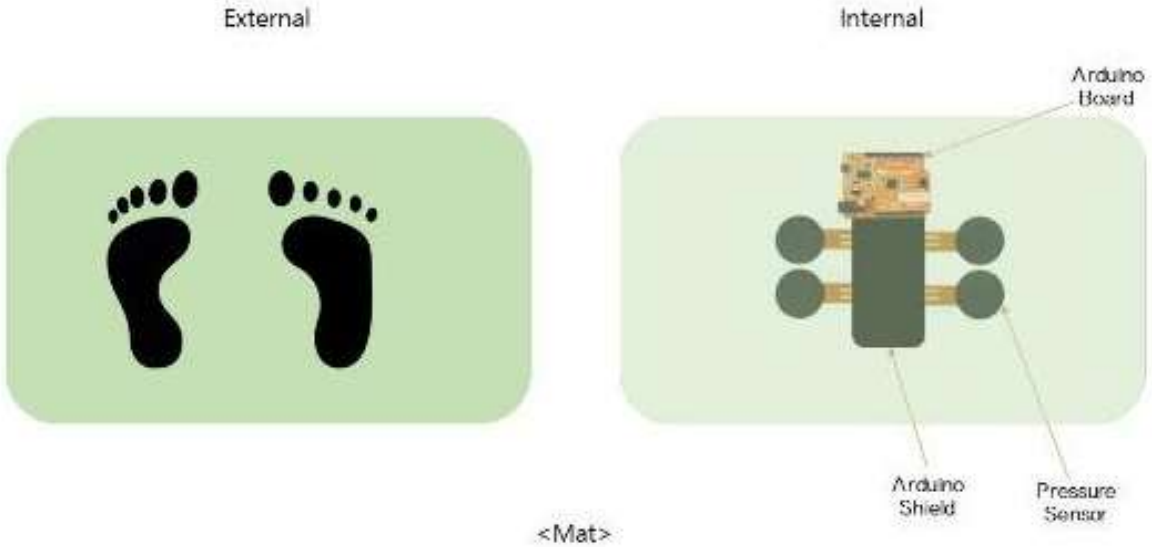
<Frequency of going outside of blind person>

Technical design detail



<Progress Sequence>

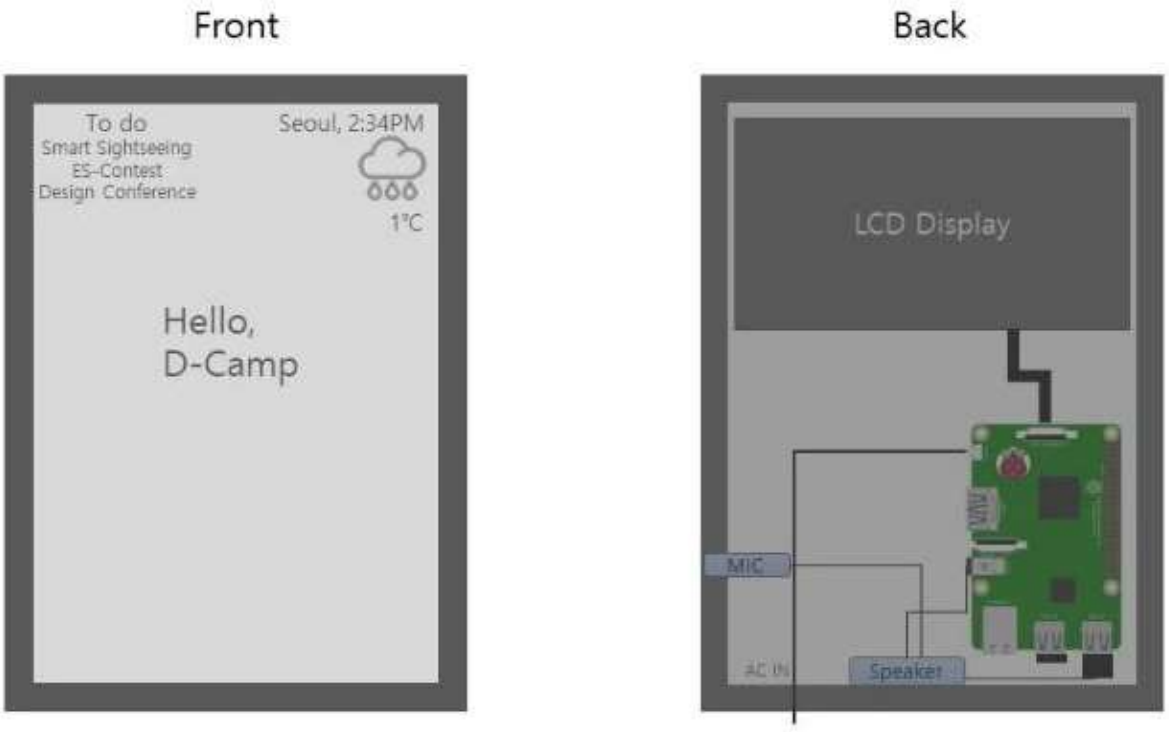
This is a project progress from a technical point of view.
The total is divided into three parts: mat, display, personal phone.
It will gradually expand, and the section are as follows.



<Mat>

There is a secret on the seemingly ordinary foot mat. It is just that there is a pressure sensor. This pressure sensor is used to turn off the alarm. And if our idea expands, we want to implement the BMI measurement through this foot mat.

Inside the mat there is a pressure sensor and an Arduino board to receive the signal. This Arduino board works with Raspberry Pie to provide convenience to people.



<Display Device>

Raspberry pi is a very small computer.
This is the source that makes the display and mat of the product smarter. It acts as a brain and controls and performs all functions. Raspberry pi is mounted on the display device part. A monitor directly connected to this shows the weather, time, etc. on the screen and greets the user with the words: "Hello D-camp".

It is also connected to a microphone and speaker, which will help recognize the voice of the micro user and provide voice guidance through the speaker. The operation is with 220V home phone charger.

The front part is about 25 ~ 35% half-mirror. Since letters appear in a high contrast form, they will be less burdensome to use with eyes, and can also be used as mirrors.

Function

1. Alarm Clock
2. Weather forecast display with. Audio Guidance (air pollution)
3. Schedule Information
4. Body Mass Index display

The operating mechanism is as follows.

1. When the set alarm sounds, the person should turn off the alarm by stepping on the foot mat. The foot mat has a built-in pressure sensor.
2. The weather information is displayed on the display, but the user is notified by voice guidance too. This means that the blind and low vision do not have to worry about the eyes.
3. The display synchronized with your Google account will show the events on your calendar. Our display is similar to a mirror, so you can check the time using that a short amount of time when you are looking at your face or when you are dressing up.

Feedback and improvement planning for our product

Feedback from the lecturer

1. Maybe can have some personal schedule in the display panel
2. Display the weight and keep the data recorded for the future reference
3. Adding a foot print sensor into the floor mat to indicate the standing posture of the user

Improvement for the product

1. A timetable setting function and personal sticky note function was included in the setting application. Therefore an application is currently improving to act as the platform to set for all three functions instead of being the alarm clock input only. The three functions will be in the newly development are the alarm clock function, routine schedule function that indicate the task needed to be do it in a daily or weekly basis and the sticky note function to reminds the user that there are something special the user should do or happened in some particular day.

   By using the improved application, the user can set his or her daily school or working schedule in the setting section and the application will send the respective info or timetable to the display screen just like the weather forecast announcement to remind the user that what is the activity the user need to go through on that day and how the user should plan for the day. In this section, the user should set the activity that is repetitive that he or she needs to do the same for everyday or every week. Therefore, the system will auto generate the response for everyday or every week according to the setting and the user don't need to repeat the setting action a few time if he or she has a quite constant or similar schedule within a short period of time.

   For the sticky notes function, the user can insert some special occurrence into the system and the system will inform the user in the morning of that day, so that the user wouldn't missed out something important to them or messed out their daily activity due to the special occurrence they planned or expected to have.
2. A weight scale is also added into the smart floor map of the new generation to help the user to indicate the weight and keep it in record for the future reference. The

weight data will display on the screen and send back to the phone for record purpose. The application will also calculate a BMI for a user using their pre-set height. Due to the body weight can fluctuate quite significantly from day to day and the height of a human being will stay almost similar for months, the BMI calculate by using this innovation is quite promising. A BMI chart will also draw and show in the application to let a user know the current situation they have compared to the past. A BMI alert will also set into the application and will be triggered if the user at high risk BMI category and didn' t have any significant improvement or have a significant drop to a unhealthy in a sudden.

3. A footprint sensor also installed into the smart mat we proposed to help the user to indicate whether that they have a healthy standing posture or not. This indication can help the user to have early awareness about their bone health problem. According to the World Health Association, most of the osteoporosis disease and bowleg syndrome become untreatable or cause the inconvenience to the patient is because of the patient didn' t consult a professional in their earliest moment and get the correct treatment to recover or to prolong the symptoms become worse or more severe. Therefore, the footprint sensor installed will help the user to realize the bone problem they have in the earliest moment and warn the user to consult the professional if the application indicate that the bad posture footprint exist for more than 3 days. As we all know, the prevention is always better the cure. Getting the earliest possible treatment will definitely improve the living quality of the user as they can be free from the mobility problem in the future. This is because both disease can be indicated by using foot print will affect the mobility of a human being or the patient need to be in the wheel- chair for the rest of the life if the case go worse.

Business Model and Plan

Customer segment

1. Visually impaired and his family
2. People who want to make life more convenient with regard to weather information and wake-up

Value Propositions

1. The value that discomfort
2. makes Help in a small part of life

Channels

We are not a big company, nor are we investing huge amounts of resources. Therefore, advertising must be done at a minimal cost. So, the way to think is to use advertising and SNS through YouTube video. For SNS Instagram, the hash tag index considering search algorithm can expect efficient advertisement.

Custome Relationship

We will be more and more interested in the function of the alarm. You should approach the rhythm by stepping on the step, or inducing the user to do the gymnastics.

Revenue Streams

One way to get to the global market is through a program called I Can Connect. This is a social welfare program that supports the purchase of IT ancillary equipment such as smart phones, tablets, and computers to enable communication with family and friends to visually or hearing-impaired people in the United States with a different character than Social Care, which economically supports people with disabilities. Also known as the National Deaf-Blind Equipment Distribution (NDBED) program. If we develop further as a product for the visually impaired, we will try to improve the display device through this system.

Key Resources

We have "engineering" that covers mechanical engineering, chemical engineering, quantum system engineering and software engineering.

Mostly, there are technical resources of hardware technology and software using mechanics.

Key Acitivities

In order to deliver our value, we need to know not only comprehensive people but also our main target, the blind, who wants to improve our lives. Improving the function of the product is the most important activity.

Key Partners

Federation of the Blind

: We want to hear about their troubles through related organizations.

Cost Structure

The cost of making a business model is the cost of production. Detailed production costs can be seen in cost breakdown..

Conclusion

In term of smart living, the smart floor mat, SMAT we proposed to create is fulfil the criteria as it able improve the life quality of the user in terms of helping them have a well planning, preparing the user for the unexpected circumstance, monitoring their health condition and giving some health advice or warn to the user whenever is necessary. This is because the smart map we produced able to make the user left their bed on time and this innovation prevent the user' s overslept condition happened. Besides, this innovation also can help the user to plan their day or prepare whatever needed for the day easier. This is because the innovation will display the weather forecast and your daily schedule to you when you wake and you can direct plan the day without surfing to the internet or finding your timetable in the morning.

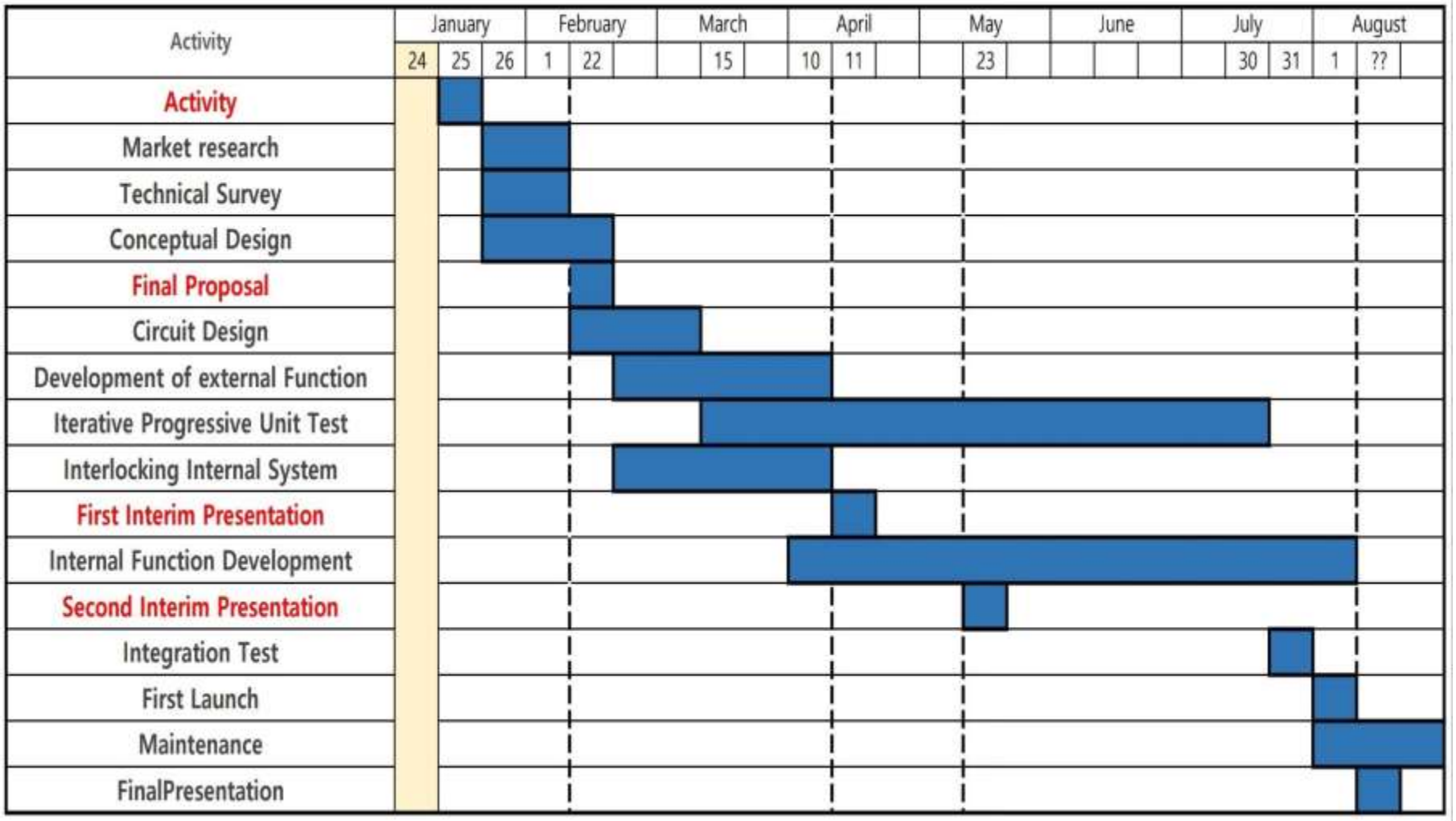
Besides, the innovation also helps to improve the lifestyle we have helping us to monitoring our health condition through the weight and foot print record A BMI is calculated based on the weight data the system get every morning and a analysis of the BMI for last 30 day will be displayed in the application. Therefore, the user can have a better awareness for their recent living lifestyle. Furthermore, a footprint is also obtained and analysed to indicate whether the user have the osteoporosis and bowleg problem and get the appropriate treatment soonest when a symptom is realized.

Lastly, the product also blind people friendly as we also included a speaker around the display screen, Therefore, the blind people can heard their weather forecast and daily schedule generated from the application. The inclusion of a speaker in our system also let the under-privileged people to have a chance to have a same enjoyment of having a smart living just like what the normal person have. In a nutshell, this innovation not only help us to enhance our living quality or make our living way smarter, but also provide the convenient to the underpriledged people such as the blind a more convenient way to undergo their daily life.

Cost Breakdown

No.	Materials	Version	Purpose	Needs	Price	Total(KRW)	Total(USD)
1	Raspberry Pi	3B+	Main Controller	1	43,000	43,000	37.68
2	Micro SD card	32GB	Memory	1	12,000	12,000	10.52
3	Diplay	7Inches	Output Device	1	86,000	86,000	75.36
4	USB Microphone	-	Input Device	1	10,370	10,370	9.09
5	Speaker	-	Voice Guidance	1	33,400	33,400	29.27
6	Heat sink	-	Helper for raspberry pi	1	600	600	0.53
7	Charger	-	Charger	1	6,000	6,000	5.26
8	USB Micro 5Pin Cable	Micro 5pin	Connector	1	2,100	2,100	1.84
9	AUX(Auxiliary Audio Connection) Audio Cable	-	Connector	1	4,500	4,500	3.94
10	Mouse And Keyboard	-	For Setting	1	9,840	9,840	8.62
11	Tempered Glass 5T	5T	Frame	1	7,000	7,000	6.13
12	Half Mirror Film	25%	Mirror Effect	1	18,000	18,000	6.13
13	Case	-	Frame of Display	1	3,000	3,000	15.77
14	Horizontal bracket	-	Helper for Frame	4	150	600	0.53
15	Mat	Cover	General Mat	1	7,900	7,900	6.92
16	Force-sensing resistor	FSR, QA3040P	Pressure Sensor	4	12,000	48,000	42.06
17	Arduino Shield	32Channels	Built-in Mat	1	9,900	9,900	8.68
18	Orange Board	-	Arduino Board	1	22,000	22,000	19.28
						324,210	287.61
						≒ 284.12USD	≒ 328,188KRW

Schedule


Activity
January
February
March
April
May
June
July
August
24
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26
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23
30
31
1
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Activity
Market research
Technical Survey
Conceptual Design
Final Proposal
Circuit Design
Development of external Function
Iterative Progressive Unit Test
Interlocking Internal System
First Interim Presentation
Internal Function Development
Second Interim Presentation
Integration Test
First Launch
Maintenance
FinalPresentation