

# Hwa Chong Institution

## Project Work

### Category 3 Inventions Written Report

Title of Project: Smart Chair
Group Name: 3-14
Group Members: 1)Steven Zhou (Group Leader) 2)Brendan Kong 3)Tan Jun Huan 4)Maximus Chay

### Problem Finding

This is the first and the most important step to making any project. Then we start brainstorming on ideas for our project, to make it easier for us to choose something to do, we decided to narrow our scope down to the theme of helping those who have difficulty with walking. We discussed and agreed on the problems. Our first problem we thought about is how the elderly have trouble moving about. Our second problem is that sometimes when they are outside, rubbish bins are located too far away from them. Our third problem is that they may also have difficulties switching on fans and lights at home. We then considered the feasibility of each problem and

so using a graph we decided on helping them switching on lights and fans at home.

## Define the Problem

First, we observed and see what are the exact problems that they have with it. Then we noticed most switches are located around corners and it is inconvenient for them to reach it. Those who have difficulty with walking sit down most of the time and very difficult for them to move about. We empathised and decided to make something to help them.

## Our Big Idea

So the key points are those with difficulty walking tend to sit down most of the time. They also cannot access the electronics and switches in the house easily. They are very inconvenienced by this.

We thought about it and realised that if we changed the chair that they sit on, we can help solve their problem. Normally switches give people access to lights and fans, so that is what we are going to implement on to it. They can be controlled by buttons and powered by batteries. After this stage, we decided to do a survey on how much people would actually use our product. We did it now as we have solid idea and it is not too late to change our plans.

## Our survey results

**This is a survey we took to find out how many people wanted a smart chair like ours.**

**[FIG 1]**

**[FIG 2]**

**[FIG 3]**

**[FIG 4]**

\*The figures will be shown in the appendix below

## Construction or Modelling Process

Our first step is to come up with what material to use for the chair. It has to be strong enough to support the weight of the people who sit on it. We also want it to be more eco-friendly, so cardboard is used as the material to make it. Cardboard is strong enough if we can fold it the right way, after we made the chair itself, we did a few test runs to see if it will take the weight of an adult and it indeed does. Next is the circuitry for the chair. At first we thought is part may be the most difficult as we have to get a chip, wires and other things. Luckily, one of our group members, Brendan, remembered that he had a Microbit kit in his house, which is very fortunate for us. He used the Microbit and programmed the chair for us. We also helped getting the lights and fans that we are going to use for our project. To power the Smart Chair, we thought of using a power socket at first, but then we thought against it as those who cannot walk well may trip and fall. We used batteries instead and hid them within the chair. For the lights, we used an LED strip of light so that it will be more power saving and we do not need to change the batteries that often. The actual design of the chair will be based on an origami design that will make the chair more stable and able to support more weight. To test the chair out and see if it will hold up when we sit on it, each of us took a turn and sat on it. Then we invited our parents to try it out, in both of the test it held. After that we went to look for any signs of stress or fractures on it, we were quite amazed when we found none. So the chair is able to support our weight, the next step is to assemble the electronics. The first step is to successfully code the Microbit processor, and using Brendan's knowledge on coding it was done. Then we wired up all the parts together, like the buttons, lights and fans, we finished the electronics part. We then had to put everything together. This part took

some time as we have struggled to put everything together due to having to hide the circuitry and make it as compact as possible. We also have to ensure that everything works when we put it in as it is hard to repair it when it has been put in. After all of that, we put the project through some test to see if it works and fortunately it does.

After meeting our mentor with our current design, we talked and discussed about the design of the chair. This is our original design:

**[fig 5]**

However, after talking to our mentor about the design of the chair, we thought that it could be improved on. The chair is too big so it is hard for the chair to be moved around. So we then decided to make it into a mobile pad for reasons later you will see below. That way, the pad can be moved around when needed and it is more convenient that way.

**[fig 6]**

## Modifications or Evaluation

During the evaluation rounds, they were very useful as the judges provided many valuable feedback for our project. One of the judges commented for us to include mobility into the chair, we thought about it and decided that helping people move around is not our priority, we want to help convenience the people by allowing them to access the lights and fans more easily. Another judges said that our invention is similar to attaching a remote to a chair, but ours is not like that. We will have buttons and the lights and fans will be attached on the side of the chair, so the lights and fan is a part of our chair, and not an external one. Therefore our invention is not just a remote control attached to a chair.

After the evaluation, we thought about what the judge said about making it mobile for the person to use. We discussed with our mentor the possibility of making it more mobile for the user. In the end , we all agreed that if we

include mobility into it, the people will have more convenience. We then started brainstorming on ways to make it able to move around, we thought about something similar in design to a wheelchair but we decided that is too difficult to accomplish. Our mentor suggested that we made it like a seating pad that could be moved about easily. Everyone agreed that that is the most feasible idea so we decide to modify that. It did not take long as we have already put the circuitry in a box and was preparing to install it into the chair already.

After the mid-term evaluation, the judges said to improve on the buttons, so that they can turn on and off at one touch. This will be a major improvement as of right now that cannot work.

## 6. References

FalconMobility Pte.Ltd KC Electic Wheelchair. Correct as of 7/2/19 9:33

Link to site: <https://www.falconmobility.com.sg/products/kd-smart-chair>

Hacuhodo Inc. Intelligent Parking Chair. Correct as of 7/2/19 9:38

Link to site: <https://www.hakuhodo-global.com/work/intelligent-parking-chair.html>

SeniorCare © 2016-2019 Price of KD portable chair. Correct as of 7/2/19 9:43

Link to site:

[https://seniorcare.com.sg/shop/mobility-aids/kd-portable-electric-wheelchair/?attribute\\_type=KD+Smart+Chair+Heavy+Duty&attribute\\_joystick-position=Left&gclid=EAlaIQobChMI27nEwJ2v4QIVwhuPCh2ZaQf4EAYYASABEgKukvD\\_BwE](https://seniorcare.com.sg/shop/mobility-aids/kd-portable-electric-wheelchair/?attribute_type=KD+Smart+Chair+Heavy+Duty&attribute_joystick-position=Left&gclid=EAlaIQobChMI27nEwJ2v4QIVwhuPCh2ZaQf4EAYYASABEgKukvD_BwE)

© Priceprice . Price of Intelligent Parking Chair. Correct as of 3/6/19 9:50

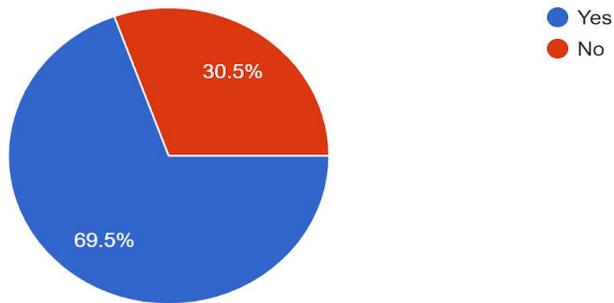
Link to site: <https://ph.priceprice.com/cars/news/Self-Parking-Chair-849/>

# Appendix:

## Fig 1

When you are seated, are your fan and light switches far away from your seat?

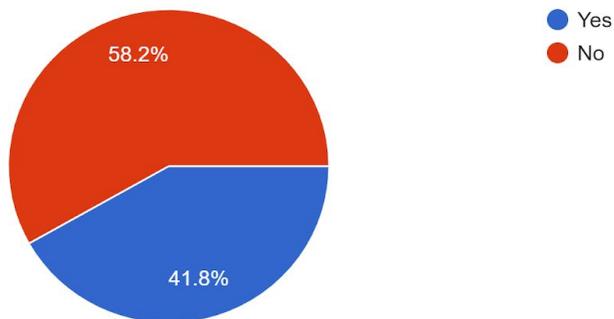
354 responses



## Fig 2

Is it convenient for you to turn on the lights and fans in the house when you are seated in your favourite chair at home?

354 responses

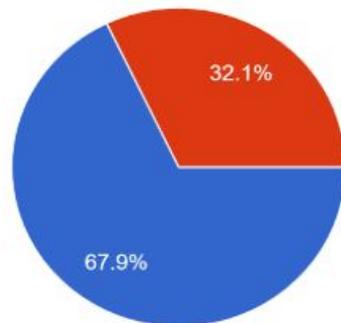


## Fig 3

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Would you like to have a rocking chair that is light, sturdy and is able to turn on the fans and lights ?

352 responses



● Yes  
● No

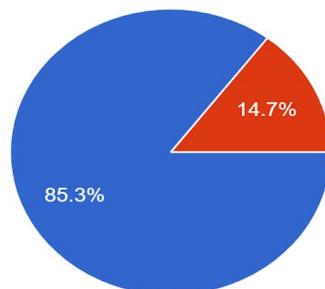
**67.9% said Yes**

Information is accurate as of 30th of March 2019

**Fig 4**

Do you think making a rocking chair that can allow the elderly to get access to fans and lights would make life more convenient for them?

354 responses



● Yes  
● No

**Fig 5**

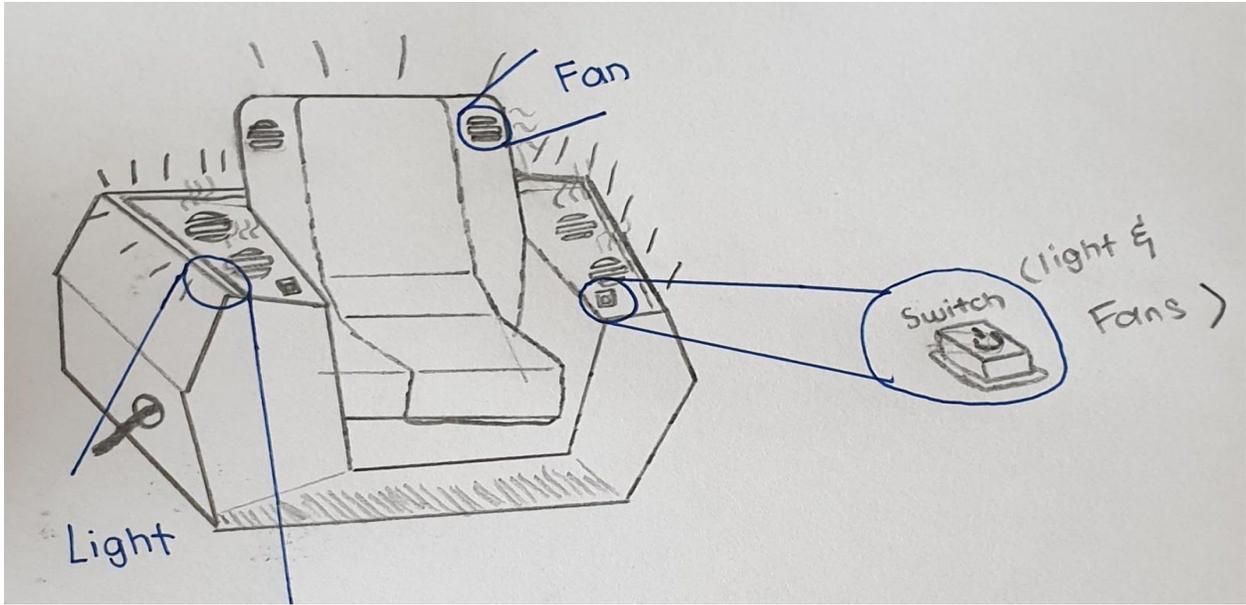


Fig 6

