

# Hwa Chong Institution

## Project Work

### Category 3 Inventions Log Book

Title of Project: Smart Charger
Group Name:
Group Members: 1) Xavier Loh Yu Sen 2) Teo Chee Le 3) Lin Hantao

#### 1. Problem Finding

(The beginning...)

**1 A Document a list of problems you have identified. Your documentation should show clearly how your group came up with the problems.**

1. Elderly people living alone and it might be dangerous for them
2. The inefficiency of having to open a packet and boiling water to drink a cup of coffee
3. Overcharging

Most people leave their phones to charge overnight. This causes the phone to overcharge and in turn spoil the battery.

**1 B You should have selected a problem based on some considerations. Identify and justify these considerations.**

Overcharging is very harmful to a phone as it might severely damage the battery health of the phone. With a low battery state of charge, a higher chemical age, or colder temperatures, users are more likely to experience **unexpected shutdowns**. In extreme cases, shutdowns can occur more frequently, thereby rendering the device unreliable or unusable.

**1 C** List some problems your group would like to solve. List also the considerations for selection of problems in the evaluation grid below. Score the considerations, against the problems, with points 1 (least significant) to 4 (most significant). Sum up the total points for each problem. Identify that problem you would like to solve.

Problem Evaluation Grid

\*add more columns and rows where necessary

Considerations for Selection	Problems		
	Overcharging	elderly people living alone	Inefficiency of having to open a packet to drink a cup of coffee
feasibility	3	2	3
need	4	3	3
Total Score	7	5	6

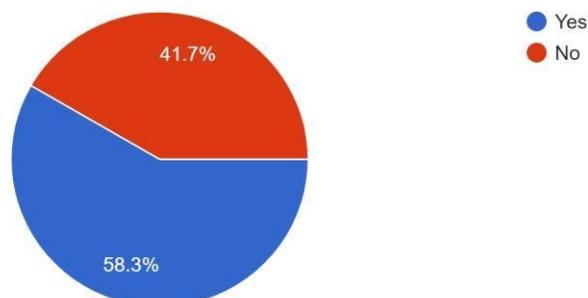
## 2. Define the Problem

Now that the problem has been identified. It is important to gather information on the extent of the problem and/or evaluate the usefulness of existing solutions based on *some criteria*. You may need to conduct surveys and research on existing solutions.

### 2 A Needs analysis

Do you face overcharging issues with your phone?

36 responses



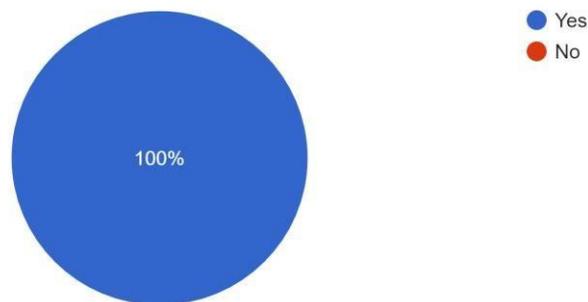
Would you purchase a charger that switches off and cuts electrical supply when your phone is fully charged?

36 responses



Do you wish to have your phone at 100% charge each morning without affecting battery health?

36 responses



As seen from the graph above, the majority of the people who did the form face this problem of overcharging their phones. Most of the participants, when asked, wrote that they did in fact, purchase a device like ours that helps to make their lives easier. All the participants wrote that they would wish to have their phones at 100% battery without it affecting the battery health. These show that there is a demand for products like ours.

## 2 B Compare and contrast the existing or similar solutions.

There are many apps that help alert you to stop charging your phone, such as the Battery 100% Alarm, the Battery Full Notification and other such apps. However, there are products that are similar to ours, and none that actually stop the current automatically, instead of just alerting you to turn it off.

### 3. Your BIG IDEA

#### 3 A Describe your proposed invention.

It is a charger that cuts the supply of electricity to the phone once the phone is fully charged. This will prevent overcharging your phone. There are multiple components that make up the smart charger, but the mechanism that disrupts electrical flow is a servo that disconnects the wire, and it is done via a raspberry pi that connects to the charging phone via the wire. This allows for convenience for one's phone battery percentage would not require to be constantly monitored.

#### 3 B Explain the purpose of your proposed invention and the potential benefits to users.

The charger will make it more convenient for the users, since this will allow them to leave their phones plugged in, without worrying about overcharging their phones. Also, the users can have a peace of mind when charging their phones through the night, for they would not have any worries about overcharging the phones.

#### 3 C In what ways would your proposed invention be different and/or better than existing solutions, if any?

The existing solution, which is software-based systems, only limits the voltage of electricity flowing into the phone. However, this does not protect the battery fully. Instead of regulating electrical flow, cutting it off helps ensure that no electricity is flowing into the phone at all, which is something that software-based systems cannot do. No human intervention is required either, as there will be no need for one to stop the flow manually.

#### 3 D What are some problems you expect in the course of your proposed invention?

Us unable to meet due to COVID-19 restrictions, and us not being able to get enough resources for our project to be able to work.

#### 3 E What and when are the major milestones (project timeline) in your invention?

Our ideas had been rejected twice. Coming up with a third idea having to try to get one of our members to do work Producing the animation of our invention.

**#must be able to be constructed based on current / emerging technologies, must not violate the laws of Science or go against the laws of nature.**

If construction of the prototype is not possible, then you have to create an animation / as a proof of concept that it can be applied on a bigger scale.

**4A Explain why construction of a prototype is not possible and the proof of concept is needed in your case.**

CB and SMM has made it incredibly difficult to get items delivered, things soldered etc etc. After we had thought of the idea fully, Makerspace was already closed and we were not able to go to others' houses that had the required materials. As such, building a prototype was very very difficult and rendered impossible for us.

**4B Briefly explain how the video / animation can effectively show how your invention will work and the different considerations.**

It will give an in depth look at how the components work together.

**Warning:**

- *Video / animated simulation only if prototyping is absolutely no possible.*
- *Video / animated simulation must be logical and convincing that the invention works.*
- *Constraints must be clearly included in the logbook or the project will be heavily penalized.*

### **4. Modification and Evaluation**

Upon the completion of your prototype/ product, you would need to see if it is working the way you want it to work. Check if your product has met the identified purpose and the user's need; and implement necessary modifications and improvements. This process may take several rounds.

**5 A Write down your prototype/ product test criteria and check against it if it works. Identify areas of weakness for modification. Indicate the test iteration and date of test.**

Test Iteration:	Tick	Remarks
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Test Date:	Pass	Fail	Potential Failure	
Test Criteria 1				
Test Criteria 2				
Test Criteria 3				

\*Add more rows for more criteria

\*\* Repeat table for next test iteration

**OR** if you are creating an animation / video to show how your invention will work, write down the different possibilities / outcomes [success or failure) if a full-scale prototype is to be constructed.

The prototype might be able to perform the task we made it to do, charging, then we would have failed.