Project Work
Category 3 Inventions Log Book

Title of Project: **The G.A.G.**
Group Name: **03-13**
Group Members: 1. Yan Li 2. Adriel Aw 3. Benjamin Zeng 4. Etienne Lee

(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.

We found that in trains or buses during rush hour, a lot of people who have to squeeze into the carriage do not have access to a vacant handhold..Without such handholds, people may lose their balance and fall, to disastrous results. We felt that this would be awful and preventable, so we decided to make a compact portable hook to allow for easy access to a reliable support handle on a crowded train.

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

The invention should be able to provide people with stability and also be convenient for people to bring onto buses and trains. It would also make the public transport system more user friendly and popular with the public.

1 C List some problems your group would like to solve. List also the considerations for selection of problem 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.

Considerations for Selection	Problems		
	Crutch Mobility	Problem with the fitting of shoe	Lack of handles
Severity Weight :5	4x5=20	3x5=15	2x5=10
Feasibility of solution Weight :5	2x5=10	3x5=15	4x5=20

Target Group Weight :5	3x5=15	5x5=15	4x5=20
Total Score	45	45	50

Define the Problem

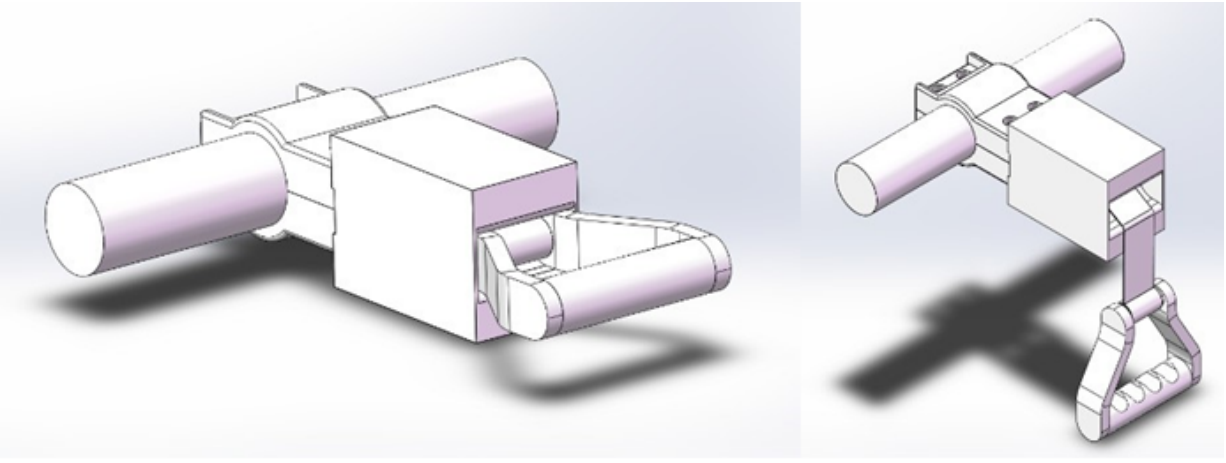
(This is one…)

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 Extent of problem (Research and discuss the problem and write down the problem statement)

In an article by the BusinessInsider, it is shown that more than 1000 people are taking the Mass Rapid Transit during Rush Hour when people are going to work/school and returning home.

There is currently nothing being done to solve the same problem as we do and only another portable hook made by students of National Technological University which solves a different problem.They have a handle which only solves the problem for tall people, and it is both complicated and bulky.However, our handle is better as it is more portable, and serves a larger audience, mainly people who take public transport, and not just tall people.



Design by NTU students that was similar to ours found through internet searches

.**Your BIG IDEA**

(Developing the idea….)

3 A Describe your proposed invention.

It is a portable handrail that will help the public support themselves on public transport during peak hours when there is not enough handrails. It will also have an extra feature to make it more useful, and it also has a stylish case which will make it more appealing to the public. To make more use of the space in the MRT, we have to use the space not occupied, in this case the ceiling. It is the most underutilized space that we can use, so we modified the handle to attach the straight surfaces.

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

Our invention is a portable grab handle which would support people when there is a lack of handles in public transport, which would make more members of the public appeal towards the public transport system now that it has improved its convenience and target group.
The handle would help students and working adults travelling in public transport during peak hours to support themselves, so they would not fall into someone else in the packed train. Members of the public would not be happy about the fact that there are not enough handles which would make them feel uncomfortable in the public transports with nothing to grab onto. They will probably not frequent the public transport system . Those with germaphobia interact less with the probably unhygienic public handles that the public transport. The portable handle will solve these problems by

providing extra support and also providing more hygiene as the handle would be cleaned by the owner.

Right now, there are no improvements made to solve this problem yet, even though there is a portable handle which prevents tall members of the public from hitting their heads on the MRT ceiling. Our solution, a portable handle, will support people of all heights and be cheaper.

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

A similar invention has been created by students of Nanyang Technological University, which is a replacement handrail. However, while theirs is a handrail targeted at tall people, to help them stand up without hitting their heads on the ceiling, our invention helps people of all heights to use the device to support themselves in public transports, lest they fall. Our invention will also have other features that will help the public with daily tasks, such as carrying plastic bags. Also, our portable handle uses a suction as a means of attachment. This is better because the main reason there is a lack of handles is because of the lack of bars. However, we cannot add more bars as that will result in additional cost to the project. Therefore, we have to change the means of attachment.

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

We would probably face problems when faced with designing and making the extension of the invention. It is quite complicated and would be difficult to achieve, but we would be taking after the extension mechanics of

an umbrella, so there will be a good reference which would hopefully ease the problem. There would be extra functions, but we would have to figure out how to fit the components in without making the inventions too heavy or too big. This will be quite a feat as we want to keep the invention portable and light, while making it as useful as possible. It is a big risk since although we would be making the invention more useful, we would potentially be making it less compatible and light, making it less appealing to the public.
Also, there may be some technical problems, due to the fact that the extension is not lockable, and is solely based on external force, so short people cannot attach the handle to the ceiling of the MRT.So, Adriel, who is in charge of the designing, made a lock-in mechanism which was simple and easy to use, so now it was better.

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

Around the month of June, we did our first 3D printing round, and we felt that it was quite amazing as we had managed to do all that modeling. Although it was not perfect, we were quite happy as this reminded us of how far we had come, considering that just 6 months ago this idea was still in development. In July, we decided to change the means of attachment from carabiners into suction cup. This was major as it heavily increased the effectiveness of our handle, and also greatly improved its efficiency and usefulness.

1. **Construction or Modelling Process**

(This first… then that…)

4 A Explain how and why the materials were chosen for the prototype/ product of your invention

Firstly, we chose the materials based on different key properties and compared different materials against each other using decision making matrix(es) and judged them. After finishing the decision making matrix, we were able to conclude that metal is the overall best material for the carabiner hook. We also concluded that foam is the softest and most comfortable material to be used for the grip.

4 B Explore these considerations that may guide the construction of your prototype/ product.

4 C Document the prototype/ product development stages. You may use drawings, photographs or videos.

We decided to use a 3D printing software called tinkercad where we were able to design the models and then 3D print them out. We discussed with our mentor the different parts and how they were meant to be printed. We printed individual parts of the handle and decided to assemble them as that would make the model more mobile and useful. However, it is still at an early stage of development and some parts do not work as planned. We are still working on it. However, we have discussed about what extra features there should be and we have a simple yet useful function, a plastic bag carrier which would help people carry plastic bags without the slings cutting into their hands.

Our materials for the product were chosen using decision making matrix(es) comparing multiple materials based on multiple important properties, such as durability and cost. We then selected the material with the highest score. Therefore, we chose metal for the carabiner since it is the most durable and actually is the most available one. We decided to go for foam for the grip as it was the softest and the lightest choice, and therefore more comfortable.

When we printed out some of the parts, we realised that they did not fit quite as well as we thought, so we will be making some modifications.
In june, we printed our first model.
However, the model was filled with problems, holes being too big, items being stuck together, as well as the extendable part being unable to extend properly. At the time, we were using an umbrella like device.Then in July, we printed again, this time making it using a telescope-like mechanism. Sadly we again encountered similar problems, and in fixing it, mixed the two mechanisms together culminating into the item we have now.

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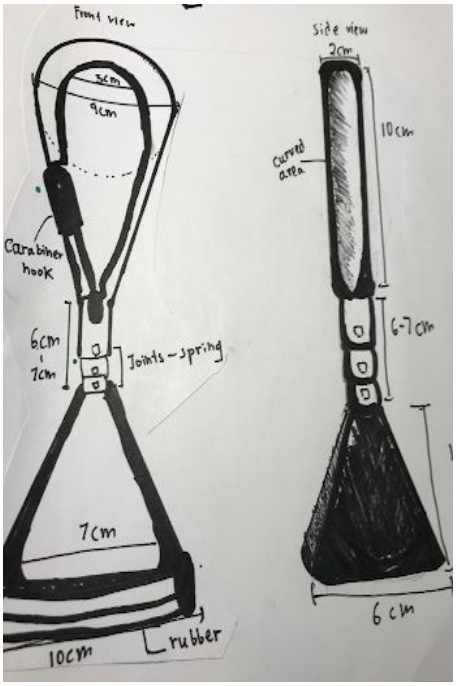
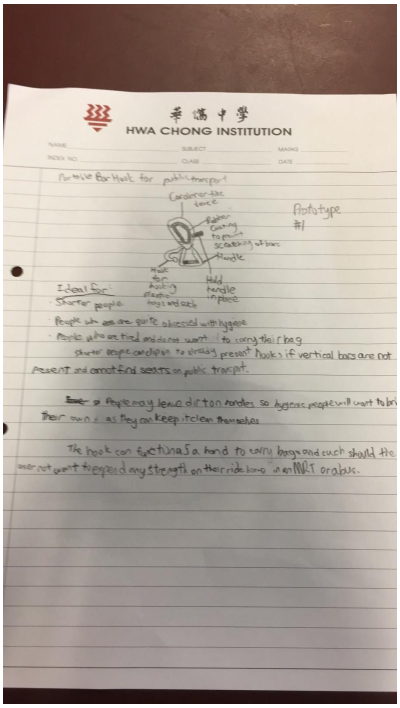


wThis picture on the right is our original diagram, and the picture on the left is a more revised version of it, featuring an umbrella like mechanism



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
Test Date:	Pass	Fail	Potential Failure	
Test Criteria 1		Fail		
Test Criteria 2			Potential Failure	

1.

References

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