HWA CHONG INSTITUTION

CATEGORY 3

LOGBOOK

Title of Project: *CHARIOT; Modu-Cart*
Group code: *3-06*
Group Members: 1) *Lee Yi* 2) *Justin Tay* 3) *Chen Ian-En*

1. Problem Finding

(The beginning...)

Identify a problem you would like to solve. You may want brainstorm for problems using different approaches eg thematic, survey or general brainstorming etc.

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

Problems: (according to ideas further below)

1. The disabled are constantly having trouble to maneuver the shopping cart while they shop in the supermarket. They struggle with pushing the wheelchair while pushing the cart at the same time. How can we solve that? Upon a personal experience at the supermarket, a group member helped an old disabled lady push the cart as she was having difficulty doing so while wheeling the wheelchair.
2. Watching his mother using a great amount of strength and effort to squeeze pear juice for the soup, a group member was motivated to create a specialised sieve that can reduce the amount of effort to squeeze the juice. He wants to help people who cook to exert less force to extract the same amount of liquid.
3. As Singapore's population swells, the government finds it hard to accommodate for the ever growing numbers of the elderly. After much thinking and developing, we thought of how to create a small yet livable space. After school on the way home, we saw that the HDB homes were all occupied as there were vibrant lights. We thought of how Singapore's population is growing and thus formulated that idea.
4. Bees are the main pollinators of plants. Nowadays, many factors like deforestation are destroying the bees habitat. How can we solve that? A group member recently discovered a small bee hive along the row of trees beside his house. When he saw that the beehive had a sickly white substance over it, he deduced that the hive was most likely attacked by a parasite and was inspired to make a beehive safe for the bees. Eventually, the idea was developed further.
5. Problems 5&6 are linked.
6. Nowadays, people seem to take cleanliness for granted and they don't put back their plates or clean up after themselves at the hawker center. After seeing this, a group member thought of how to clean up the tables easily with the help of technology.

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

IDEATION PROCESS*	Solvable?	Impact on users (scale of problem)	How practical are existing solutions	TOTAL:
Aging Population	3	4	2	9
Mobility of the disabled	*5*	*5*	*3*	*13*
CCD: colony collapse disorder	1	5	2	8

We have sieved out 3 main problems to solve, all presented in a decision matrix table.

Thus from the above table we can deduce that Problem 1, the mobility of wheelchair users or the disabled is the most solvable, can change the lives of users the most positively, and finally, it is a very practical and day-to day problem that not only we see, but the disabled face every single day. Thus this is a real problem.

However, the aging population problem is also very important, but very hard to solve. With better lifestyles than before, people are more likely able to live past the age of 60. This, in another decade or two, will double, matching up to the total number of people who are under 60. This is a serious problem, and requires our attention. As youths and leaders of the future, we have to ensure that this problem does not negatively affect Singapore, whether is in economic or social terms.

- *All of the above rankings are upon 5, with 1 being the least ideal and 5 being the most ideal.

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.

As mentioned above, our key problem is now focusing on the disabled who live independently, but cannot shop easily. We have also presented our decision matrix table, which helped us to choose the problem that we should solve. Let's do a closer analysis about out current problem.

Problem Evaluation Grid

*add more columns and rows where necessary

Considerations for Selection ● *Upon 4*	*Problems*		
	#1 [Elderly}	*#2 [Disabled]*	*#3[CCD]*
Consideration 1 *[How well does it solve the problem?]*	*2*	*3*	*1*
Consideration 2 *[How realistic is the solution?]*	*2*	*4*	*2*
Consideration 3 *[Cost efficient?]*	*1*	*2*	*1*
Total Score/12	*5*	*9*	*4*

2. 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)

According to a study, approximately 1 in 100 people use wheelchairs. Also, they might live alone and it might be difficult for them to do many, if not all things. Therefore, it is important that we improve the lives of them. The gist is that many disabled wish to be more independent, however by achieving this, they must be able to do daily things, take shopping as an example. They would experience a whole lot of difficulties like taking items from the shelves and not knowing how to store them in the small shopping trolley to unloading the items painstakingly onto the cash register conveyor belt. Plus, we must understand that it is not easy to maneuver both a wheelchair and the shopping cart at the same time. Thus, their ultimate problem is to overcome this challenge of shopping independently with minimal assistance from others. Our product must solve these problems. Let's look at our problem statement...

Case:

Uncle Tan is a disabled man who struggles shopping with a wheelchair. He feels that simply putting a basket on his lap is not effective in storing his items, and that shopping with a shopping cart does not give him enough leg room. Uncle Tan also complains that as a disabled man, he cannot reach the shopping cart, hence a lot of space is not used, and he can only put several items. However, he does not employ a helper as he dislikes others helping him as he prefers to be more independent. Thus he wishes that there is something to help him shop more conveniently.

2 B Compare and contrast the existing or similar solutions.

The following are some of the patents of existing solutions.
The Wheelchair Table
https://drive.google.com/drive/folders/0B6EX-GDclLZPcGNKUmNDSkVScXc
The Handi-chair
https://sites.google.com/site/innovationprog/archives

3. Your BIG IDEA#

(Developing the idea....)

Write down your proposed invention and why you want to do it. State also how you think your proposed invention is better.

3 A Describe your proposed invention.

We have realised that the disabled in wheelchairs struggle with pushing a trolley cart. Another problem is that many of them cannot find a suitable place to place all these grocery bags. Thus, we have decided to create a modular front basket that can be easily accessed by the wheelchair user.
This wheelchair is supposed to help the disabled who have no helpers accompanying them when they carry out shopping. Hence, we are going to change this. Some of the disabled that rely on wheelchairs to move do not have people to help them push the wheelchair, but without a person to help them, who is going to help them push the trolley carts/ carry groceries
Our product is going to consist of mainly the modular cart. It is a specialised cart adapted to fit the users needs.

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

We chose modular as we wanted this basket to adapt to most wheelchairs. We wanted to let the independent disabled to shop on their own with minimal assistance. Based on research and studies, many independent disabled wheelchair-users expressed that they had frequent troubles trying to lug the shopping cart around. **We also wanted to include different parts to upgrade the existing wheelchair so that the user can increase his maneuverability with the wheelchair (eg. an upgraded wheel) or an extendable or stackable shopping basket. We may also consider making it motorised **The user can then shop at ease and not have to worry with lugging the heavy shopping cart.

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

Current existing solutions include a modified shopping trolley to fit with the wheelchair. However, the storage space is not ideal for holding large loads. Also, most disabled are not agile enough to reach the wheelchair. Thus, they cannot put things inside easily. Our product can solve the problem by including 2 removable and stackable 'boxes'. These could maximise space and reduce the time taken to unload items, by just taking the baskets out. For heavier items, we may include a bottom section for rice sacks and toilet paper rolls etc.

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

We must make it durable and easy for wheelchair users to operate. We may not find the materials required to build this product, especially fabric to make the cart compressible. The disabled must also be convinced that this product can work. Based on the new feedback, we have to make it more practical. It could be achieved if we made the cart smaller but with the necessary features. Also, the cart may be too bulky and not turnable. We have to utilize every visit to Makerspace. Also, we are afraid that the cart (which is made of a motorised scooter) will accelerate faster than expected. Causing

3 E What and when are the major milestone (project timeline) in your invention?
Completion of the prototype is roughly around one or two months. Time is required to construct the life-sized model and we will try to complete it in the fastest time possible. After which, we can begin testing it out and continue to develop and modify it.
UPDATE: We made a 1:5-6 scale prototype with wheels. It was not the best as it was made of cardboard. We are starting on the real prototype using fabric, metal and wood. We have also finished the first life-sized prototype during the June holidays

#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.

4. Construction or Modelling Process*

(This first... then that...)

You are now onto the fabrication of your prototype/ product. You need to select material and understand how to put them together so that your prototype/ product can perform its function.

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

Metal- We had to choose a suitable material to make the prototype. It had to be of a strong material. We also used it as a sliding mechanism for the cart so that the cart can be more compact.

Wood- We had to choose a type of material that could withstand blows but it should be lighter than metal.

Fabric- Our cart is foldable and needs a durable, flexible material to wrap around the cart such as high quality cloth.

Plastic[Wheels] and for waterproof covering to act as a shelter to prevent groceries from getting wet.

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

After exploring, we decided to put less metal and lightweight wood to make it easily maneuverable, as the judges did not like the idea of the super bulky cart. We have also decided to make the cart foldable/ more compact in order to fit into the narrow passageways of isles and lifts.

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

Our original idea was actually too hard to built. Our group members had no prior experience thus we changed the design.

16 June: Prototype I was completed. It featured a storage system made up of quality wood. We decided that wood was the best option.

17-19 June: Modification (adding of the hook to the wheelchair, securing the motorised scooter firmly to the cart.

Mid-July: A meetup to work on logbook and touch up on first prototype.

10 August: 2nd meetup. Folding mechanism installed. Minor problems encountered like the stability was affected.

<u>OR</u>

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 in a bigger scale.

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

Nil

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

NiL

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.*

5. 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
Test Date:	Pass	Fail	Potential Failure	
Test Criteria 1 Easy use for users	✓		5/10	NIL
Test Criteria 2 Easily Maneuverable	✓		6/10	Still a little bulky and heavy, modifying
Test Criteria 3 Does it provide comfort and allow users to shop easily	✓		9/10	Have not tried in supermarket but asked several people to manoeuvre it and there was no problem

*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.

6. References

Read http://www.bibme.org/citation-guide/apa/ on how to cite references.

6 A Cite the references you have used for your project work. Your source of reference should come from different types (eg books, magazine, websites, journal articles, interview, photographs, product brochure, reviews etc.)

- (Karman) Daily-Problems-and-Challenges-of-using-a-Wheelchair [Time and author not stated]
  - https://www.karmanhealthcare.com/daily-problems-and-challenges-of-using-a-wheelchair/
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7. Reflections

LEE YI : Working with a team comprised of individuals with great talent was really an eye opener for me. This was my first time participating in a project that required lots of effort, dedication and teamwork to get the task done. Overall it was an enriching experience as I gained many insights and that experienced first hand how troublesome and tiresome the entire process of actually creating an idea was. However, I am glad that I have such capable groupmate that could get the job done as a team together. Many hours were spent working on our idea, perfecting and building it. it was really a joy to see our product being put together and it was a fulfilling experience. I also learnt a lot from both the projects and the process of iVP. I was thankful to be able to work with such teammates. We had several disagreements on ideas and certain things but I am glad that we pulled through as a team. At the end of the day, I look back and think that the project would not have succeeded without our team's effort and dedication to the part. The teammates were really bonded and we could communicate efficiently. Being a part of the group was an honour. For the hours that we put in, for the moral support my teammate gave, and for the ideas that we thought of, it was one of the best projects I have ever worked on. I am mostly relieved that we managed to complete the wooden cart despite

JUSTIN TAY : iVP has been a very enriching experience for me. I have gained a lot of knowledge on construction from both my teammates Ian En and Lee Yi. This is my first time even building something, much less something so huge and massive. I experienced the pain of putting wood together, the pain of working till 11 to perfect the logbook, and the pain of creating a feasible idea for our project. Even before iVP, I have learnt much from the skills taught. For example, how to cite evidences. While it was tiring, it was still fulfilling to finally put together a project from scratch. I am relieved to have such wonderful teammates like my group leader who takes responsibility and a teammate who gives immense amounts of moral support to cheer us up. It was a joy working together with them despite several disagreements. However, we also learn how to compromise with each other. All in all, the effort we have put into this project is immense, and I would like to thank my mentors and teamates for helping me along this learning journey.

CHEN IAN EN : Embarking on this project has been a wonderful experience for me. Not only do I have good group mates that are responsible, they are also very hard-working. Despite having almost no feasible ideas to work on at first, our project soon blossomed into a brilliant one. I think that learning how to create and improve the cart has taught me how to think outside the box. Now, I can think of more innovative ways to improve our project. This year-long project has improved teamwork and cooperation between the three of us. Even though we may have had our fair share of disagreements, we learnt to be

congruent with our opinions. I think that for each member to contribute so much effort into this project is astounding.