

# Hwa Chong Institution

## Project Work

### Category 3 Inventions Log Book

Title of Project: <b>The New Walking Stick</b>
Group Name: <b>The Helpers</b>
Group Members: <b>1) Huang Zhirui Ray</b> <b>2) Chew Gin Ray Kevin</b> <b>3) Justin Ng Yong Shun</b> <b>4) Wang Peikai</b>

### 1. Problem Finding

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.**

**We came up with three different types of problems:**

- ❖ **Crimes** - Valuables were stolen
- ❖ **Safety** - Falls were common among elderly persons
- ❖ **Convenience/ Liking** - Singapore was very warm

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

**Why we chose to address these problems:**

- ❖ **Valuables were stolen** - Many have phones, wallets and etc.
- ❖ **Falls were common among elderly persons** - Aging population, elderly were more frail
- ❖ **Singapore was very warm** - Many dislike the heat

**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.**

**Problem Evaluation Grid**

Considerations for Selection	Problems		
	Stolen Valuables	<b>Common Falls among Elderly</b>	Warm Singapore
Feasibility of Solving	3	<b>3</b>	4
Scale of Problem	3	<b>4</b>	2
Unavailability of Solutions	3	<b>3</b>	2
Total Score	9	<b>10</b>	8

Hence, we chose to solve the problem of common falls among elderly persons.

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

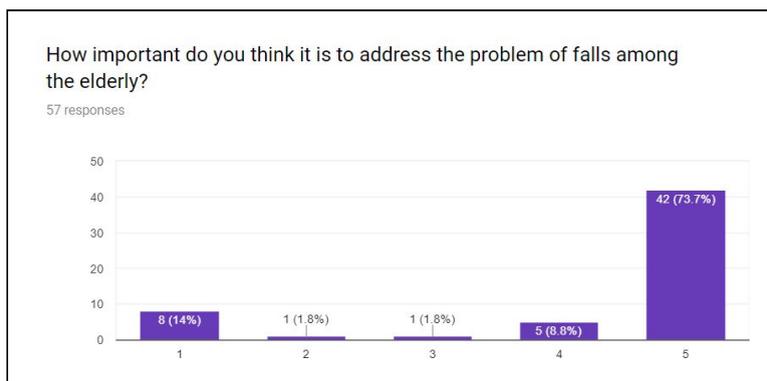
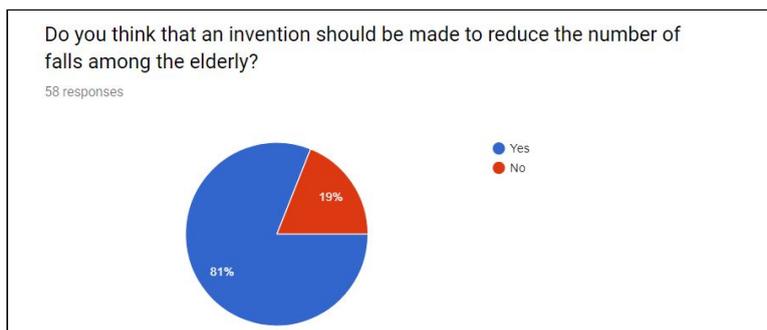
**Research (what about this problem?):**

- ❖ Studies have shown that elderly persons are more prone to falls and injuries. Falls are more prevalent among older persons with approximately 28-35 percent of those 65 years and older falling each year. In Singapore, about one-third of older persons aged 60 and above has fallen more than once. [2]
- ❖ **Many falls occur when the independent elderly experience postural instability in the form of increased sway during the activities of daily living which include walking or moving around, carrying one's groceries and etc. [6] Their balance is also worsened as their age increases. [5]**

About one-third of the older population reports difficulty with balance or walking; the numbers increase significantly after age 75. [1]

❑ **Discuss the problem (why is there a need to solve this?):**

- ❖ Falling is common for older persons and reports have showed that **it can have dire consequences for them**. These consequences include serious harm such as head trauma and fractures commonly in the hip which can affect the spine, arms, ankles or legs. As extracted from an article [4], it was said that among all injuries sustained by the elderly during falls, hip fractures are of particular concern and according to the American Academy of Orthopaedic Surgeons [4]: 20 percent of elderly hip fracture patients die within one year after their fall, 50 percent become dependent on a cane or walker, 40 percent will need to be admitted to a nursing home due to an inability to perform daily activities such as eating, bathing, getting dressed and toileting and only 25 percent of older adults who suffer a hip fracture from a fall actually make a complete recovery.
- ❖ **Singapore society is undergoing rapid changes and it was observed that more elderly people are living alone or as a couple; hence, the independent elderly persons need to carry out daily activities by themselves. As an ageing population with the increasing healthcare cost, it is thus vital to reduce falls caused by daily activities and we hope to come out with an invention that would prevent or reduce falls amongst the elderly people during their daily walking and carrying of heavyweight grocery bags.**
- ❖ A survey was also made to further confirm that this problem existed. **Most of the respondents agreed that the problem needed to be addressed.**



❑ **Problem Statement (what is the conclusion?):**

- ❖ **We aim to reduce falls amongst the elderly persons during their daily walking and carrying of heavyweight grocery bags.**

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

❑ **Sensible Shoes** - properly fitting, sturdy shoes with non-skid soles [3]

- ❖ Reduce chances of elderly persons falling
- ❖ However, **it still does not solve the problem of the elderly having to carry heavyweight grocery bags while moving around**

- Online Purchase** - purchase groceries or food through online delivery systems
- ❖ Reduce daily walking and carrying of heavyweight grocery bags
- ❖ However, **elderly persons are not IT savvy and do not feel comfortable with paying online** (presence of online scam)
- Hence, **we need to come up with a better solution to our stated problem.**

### 3. Your BIG 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.

- Pole with height-adjustment mechanism** - to make it user friendly
- 2 Tri-wheels** - to go up stairs easily
- Suction base** - to provide good weight-bearing support
- Door stopper (able to move up and down, activated with foot)** - to change from the suction base to the tri wheel, that is coming into contact with the floor
- Hook** - to hang grocery bags on

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

- Purpose:**
- ❖ Our invention of a new walking stick will **ease the elderly persons' movement when carrying heavy grocery bags and provide a good support for them to rest. Our invention also allows easy movement up stairs or slopes when carrying heavyweight grocery bags.**
- Potential Benefit:**
- ❖ **Our invention can reduce the number of falls among elderly persons,** thus reducing the number of injury cases among elderly persons and the need for expensive healthcare treatment. It can also allow them to recover from a walk.

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

- Comparisons were made against some products out in the market,** such as walking sticks and tri-wheel trolleys. The comparisons were tabulated in the table below.

**Comparison Grid**

Features	Conventional Walking Stick	Conventional Tri-wheel Trolley	The New Walking Stick
Adjustable Height	✓	✗	✓
Not easily stuck in cracks (in the ground)	✗	✓	✓
Functional on stairs	✗	✓	✓
Acts as a weight-bearing support	✓	✗	✓
Acts as a carrier (for grocery bags)	✗	✓	✓
Not cumbersome	✓	✗	✓

- ❖ Based on the comparisons above, a tri-wheel trolley would ease the elderly persons' movement, especially when they are carrying heavyweight grocery bags. **However, it cannot stay as stationary as our invention when bearing weight. Moreover, it is cumbersome and inconvenient to bring along when going out.** A walking stick can provide support for the elderly persons, but **it does not work on stairs and cracks, and cannot help the elderly**

persons when carrying heavyweight grocery bags. To overcome these gaps, we need to invent a walking stick which solves these problems. Our invention of a new walking stick will ease the elderly persons' movement and provide a good support for them to rest. Our invention has also taken into consideration of the current market tri-wheel trolleys that are bulky and cumbersome.

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

#### ❑ Problems:

- ❖ We might meet obstacles and challenges during the construction process (e.g.: time constraint, cost, etc.).
- ❖ We might not be able to meet up very frequently.

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

#### ❑ Major Milestones:

- ❖ **Proposal Evaluation** - 3rd April 2018
- ❖ **Mid-Term Evaluation** - 12th July 2018
- ❖ **Final Evaluation** - 17th August 2018

## 4. Construction Process

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.

#### ❑ Considerations:

- ❖ Our invention had to be user-friendly, functional and not too expensive to construct.
- ❖ **Hiking stick** - We chose to purchase a hiking stick made of aluminium, as aluminium is a light and strong material, making it easy and convenient for elderly persons to bring along and lean their weight on. It also has an adjustable height mechanism, making it suitable to many users of different heights. At its cheap price, it is cost-effective and provides great functionality.
- ❖ **Tri-wheels** - We bought the cheapest and most durable tri-wheel trolley we could find online. We planned to use only the tri-wheels (and the rod connecting both of them) after receiving the tri-wheel trolley. We could not find any individually sold tri-wheels.
- ❖ **Suction base** - We researched about the type of suction needed for our prototype and found suction pads to be an efficient one. Hence, we bought sponge-holders and detached the suction from it. It was the best suction pad we could find available.
- ❖ **Door Stopper** - The door stopper was going to be frequently used by the elderly to change between the modes. Hence, it had to be made of a strong material. Therefore, we chose to buy an affordable door stopper made of metal.
- ❖ **Hook** - The users were to hang their grocery bags on the hook, so it had to be strong enough to withstand the weight. Hence, we chose a hook made of metal.

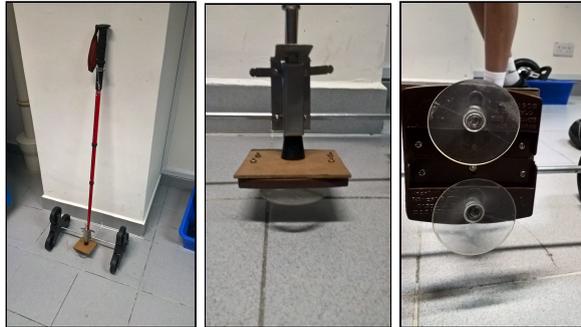
### 4 B Explore these considerations that may guide the construction of your prototype/ product.

#### ❑ Explorations:

- ❖ To make the walking stick light and compact so that the elderly can bring it along with them conveniently, the materials chosen were mainly thin and thus weak. Hence, during the construction of the prototype, the joints need to be strengthened to withstand the weight of the elderly and the grocery bags.

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

- ❑ **Objects:**
- ❖ **Tri-wheels - [how it goes up stairs](#)**
- ❖ **Final product/ Door stopper/ Suction base**



### 5. Modification and Evaluation

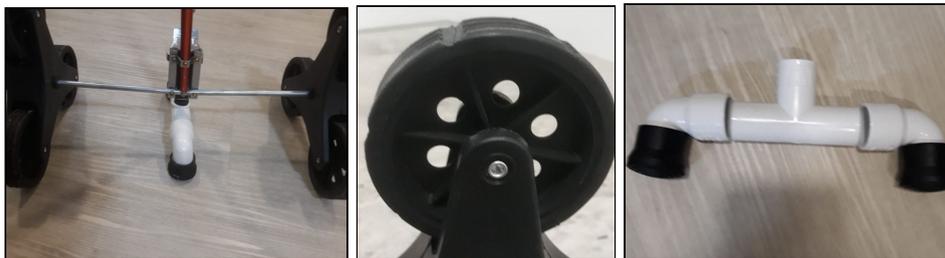
Upon the completion of your prototype/ product, you would need to see if it is working the way you want it to work. Check if your product has met the identified purpose and the user's need; and implement necessary modifications and improvements. This process may take several rounds.

**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: 1	Tick			Remarks
Test Date: 20/7 (Before modifying)	Pass	Fail	Potential Failure	
Ability to walk up stairs			✓	Possible to move up but the wheels may roll backwards.
Ability to move down stairs		✓		Suction base would interfere with the movement.
Ability to act as a weight-bearing support		✓		Able to sustain but suction base cannot stick to all types of surfaces (e.g.: rough surfaces).

❑ **Modifications:**

- ❖ The suction was removed as it was inefficient and was replaced with a wider base. This allowed the walking stick to stand on its own and further support the weight of the user.
- ❖ Grooves were cut in the wheels to help it gain more friction. The walking stick will thus not roll backwards and cause the user to slip and fall.



Test Iteration: 2	Tick			Remarks
Test Date: 10/8 (After modifying)	Pass	Fail	Potential Failure	
Ability to walk up stairs	✓			Wheels are able to roll upwards and grooves prevent the walking stick from rolling backwards.
Ability to move down stairs			✓	Support has chances to interfere with stairs (but very low chance)
Ability to act as a weight-bearing support	✓			New base is able to provide support when stick is leaned on fully.

## 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.)**

### References:

- [1]HealthinAging.org. (2016). *Balance Problems*. [On-line]. Available: <http://www.healthinaging.org/aging-and-health-a-to-z/topic:balance-problems/>. Retrieved 8 May 2018
- [2]Ministry of Health, Singapore. (2018). *Falls Prevention Programme*. [On-line]. Available: [https://www.healthhub.sg/live-healthy/12/falls\\_prevention\\_programme](https://www.healthhub.sg/live-healthy/12/falls_prevention_programme). Retrieved 6 April 2018
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- [5]OrthoInfo. (2018). *Guidelines for Preventing Falls*. [On-line]. Available: <https://orthoinfo.aaos.org/en/staying-healthy/guidelines-for-preventing-falls/>. Retrieved 20 July
- [6]Erin et al. (2013). *MINIMIZING POSTURAL INSTABILITY WHEN CARRYING LOAD: THE EFFECTS OF CARRYING GROCERY BAGS ON THE ELDERLY*. [On-line]. Available: <https://limbs.lcsr.jhu.edu/wp-content/uploads/2013/06/ASBGroceryBag-.pdf> Retrieved 20 June