

**Hwa Chong Institution**  
**Project Work**  
**Category 3 Inventions Log Book**

Title of Project: The Page-Turner
Group Number: 3-13
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## 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.

1.

- a. Dying professions. These are jobs that less people want to do over time, resulting in the job “dying”, which basically means that nobody is doing the job anymore.
- b. Overly popular professions. These are jobs that too many people want to do, resulting in the high demand but low supply. There may not be enough jobs for everyone who wants to work in the sector.
- c. Too hectic professions. These are jobs that are too rushed and fast-paced, often resulting in overworked and exhausted employees. The quality of work may also be affected.

2.

- a. Safety of kitchenware users.
- b. When using kitchenware to cook, some leave the food in the pots or woks to cook while they move over to do something to save time. When they go back and handle the pot, they might forget that the pot is very hot and might touch it with bare hands, thus burning themselves.

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

We have decided to choose problem 1.

1. The number of existing products to tackle the problem. This means that our product can help many other people who do not have a solution if the market is extremely small.
2. The severity of the problem, or how bad the problem is. The worse the problem, the more we need to solve it.
3. The impact of our solution. This is essentially how much it will affect users.

- 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

\*add more columns and rows where necessary

<b>Considerations for Selection (Out of 5 points, 5 being the highest score)</b>	<b>Problems</b>	
	<b>Dying Professions/ Too Popular/ Hectic Professions</b>	<b>Safety of Kitchenware Users</b>
<b>#1: Number of existing solutions</b>	3	2
<b>#2: Severity of problem</b>	3	4
<b>#3: Impact of solution</b>	3	3
<b>#4: Mass Appeal (Based on survey results)</b>	4	3
<b>Total Score:</b>	13	12

## 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)

We had a look at the professions that are dying and found four of them, namely the human page-turner, the postal service worker, manufacturing assembly jobs and door-to-door sales. An in-depth study revealed that the human page-turner is the worst-affected job. As a pianist, one of our group members faces difficulty in flipping to the next page when playing a long song. The human page-turner is “dying” as more people do not want to be embarrassed when spotted flipping a page while on stage. They have to be invisible to the audience and if a mistake is made, one will be remembered forever. Many professional pianists agree with the previous statement, like Anton Nel and Steven Osborne. High disaster risk and hard work combined with a low pay do not spell a bright future for the job.

We did a survey on a few people and found that many people viewed the lack of page-turners as an issue. They also felt that they needed to care for the environment. Thus, this problem is actually quite real, so what can we do to solve it?

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

1. The Electronic Page-Turner. At first this might seem ideal. It was found on Rehab Mart and has the ability to help musicians with disabilities. However, it is electronic after all. It needs electricity to work, which adds to one’s carbon footprint and contributes to global warming.
2. Page-turning Software. This can be downloaded onto one’s computer or phone and can be used both online or offline, which makes it really convenient. But it has its limits. It still needs to be swiped by hand, which totally defeats the purpose of the software. As mentioned in point 1, it also needs electricity to work.
3. Page Flip Firefly. This is slightly better, in the sense that one can step on the left pedal to go back one page or the right pedal to move forward one page. It is hands-free and can be connected to an iPad via Bluetooth. The pedal system is noiseless as well. The Bluetooth, however, is energy-consuming and may contribute to the carbon footprint.

### **3. Your BIG IDEA<sup>#</sup>**

(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 propose to have a page-turner similar to the Page Flip Firefly, but is controlled by a gear system. It can be folded and stored easily and be carried backpack-style. It unfolds into a vest and a sort-of robotic arm (removable) which holds the book and turns the page. Best of all, it is non-electric, saving energy as well.

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

We wanted to do this because as mentioned in section 2, page-turning is becoming a less well-liked job and less people will want to work as a page-turner. Users need not waste money and time on trying to find a page-turner, yet also do not need to suffer the embarrassment of the song suddenly pausing for the musician to flip the page. Bonus side use: for people with eye diseases (causing them to only be able to see far things) to read books. Pedal allows uninterrupted reading. Also, as the arm can be removed, an umbrella can be installed when the arm is not in use. Hands will be freed up to hold other things.

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

As listed earlier, many page-turning contraptions and software available in the market are run on electricity, which increases one's carbon footprint. The proposed invention uses the concept of pulleys, which is environmentally-friendly and helps save the earth. It can also serve other purposes, as mentioned in section 3 B.

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

No idea is complete without problems. Ours is no different. We expect to face:

1. Difficulty in getting the pulley system to work
2. Difficulty in obtaining necessary materials
3. Difficulty in finding ways to strengthen the arm, so that it can carry books.

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

- Late January-Early February 2018: Discovered the problem
- Late February 2018: Research on alternative solutions and existing solutions
- March 2018: Finalised on the design and the way it is to be built
- 3 April 2018: Proposal Evaluation
- April to Mid-Year Evaluation: Gather resources, start building each part
- Mid-Year Evaluation to Final Evaluation: Finish building each part, find way to put everything together, fix any problems, try to improve on the design.

*#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

- Stage I
  - Cardboard
    - For the first stage, we decided to use cardboard as it was easily available and also rather sturdy. The cardboard was used for the vest, the stand and the wheel.
  - Crushed cans
    - We used crushed cans for the pedal as we thought that it was easily flattened and also strong.
- Stage II
  - Wood
    - Since we made it to the second stage, we thought we could use a stronger product like wood.
  - Metal
    - We only used metal for the rod. Though strong, it is also heavy and may cause the structure to collapse, so we tried to avoid the use of it. However, in cases like this, we had to use metal as wooden rods could not be found easily.
- Stage III
  - Wood
    - The structure for the bookstand remains. It also is used for holding the electrical parts in place.

- Some printer parts
  - Pickup roller to move the page.
- Motors and other electrical items
  - To power the pickup roller, wheel, etc.

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

For the first stage, we only wanted to create a rough model of what the prototype would look like, so cardboard sufficed. However, the second stage brought about the aim of making sure it would work, so naturally we would want a much stronger material than cardboard. Wood was our solution. It was easily sawable, meaning that we could make the shapes desired easily.

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

Stage 1

The Wheel



The Stand



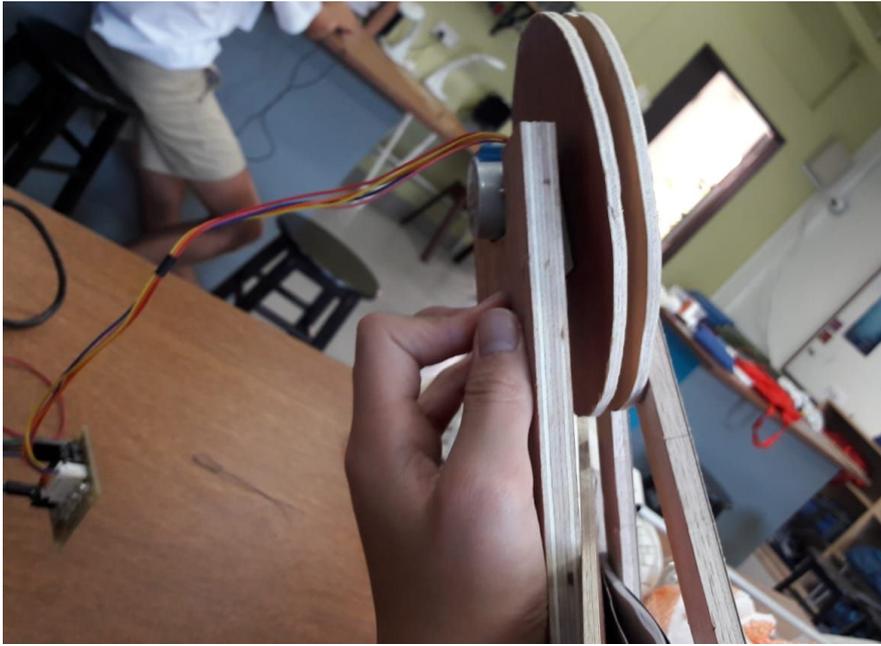
## Stage 2

Using the idea of the wheel and the stand, we have decided to use wood to make the second prototype. This is different from our previous design in the sense that we decided to use a tripod stand.

## The tripod stand



## The Wheel with Stepper Motor and a Circuit Board

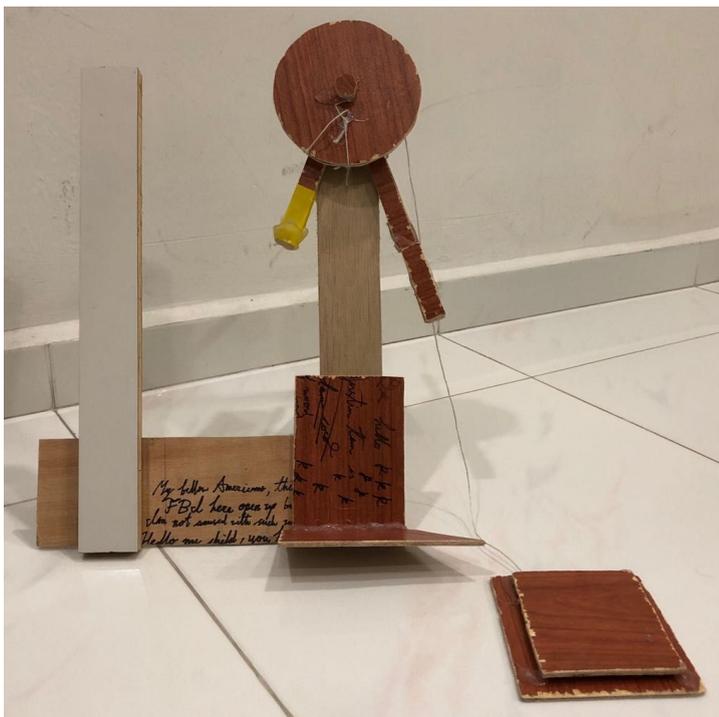


## The Mechanism with a Book (Testing)



### Stage 3

Here, we decided to ignore the electrical system altogether and work on the mechanical one as we were new to the concept of programming and coding. Also, many things went wrong while building the electrical prototype, such as the failure of the expert mentor to turn up. This resulted in a delay in the completion of the electrical prototype. We learnt that we could not rely on other people to ensure that our work is complete.



Final Prototype above



Close-up of the turning system

- Mechanical system to Electrical system
  - Prelims
    - Our prototype = Basic model of Mechanical system
    - Decided to change from Mechanical to Electric with the advice of our external mentors
  - Mid-Term
    - Our electrical system could work with the help of a stepper motor and Arduino but the wheel to turn the page was too heavy
  
- Electrical system to Mechanical system
  - Final Evaluation
    - Initially wanted to change the system which will comprise of more motors such as a servo motor and a pick up roller.
    - However we were new to coding and wiring which was a challenge
    - After brainstorming, we decided to use the Mechanical one instead as it does not use electricity.
    - The mechanical one works well and can be further improved.

**OR**

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.**

NA

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

NA

**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: 15/8/18	Pass	Fail	Potential Failure	
Can it turn the page?	✓			Cannot turn backwards though
Does it turn only one page?			✓	

\*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.)**

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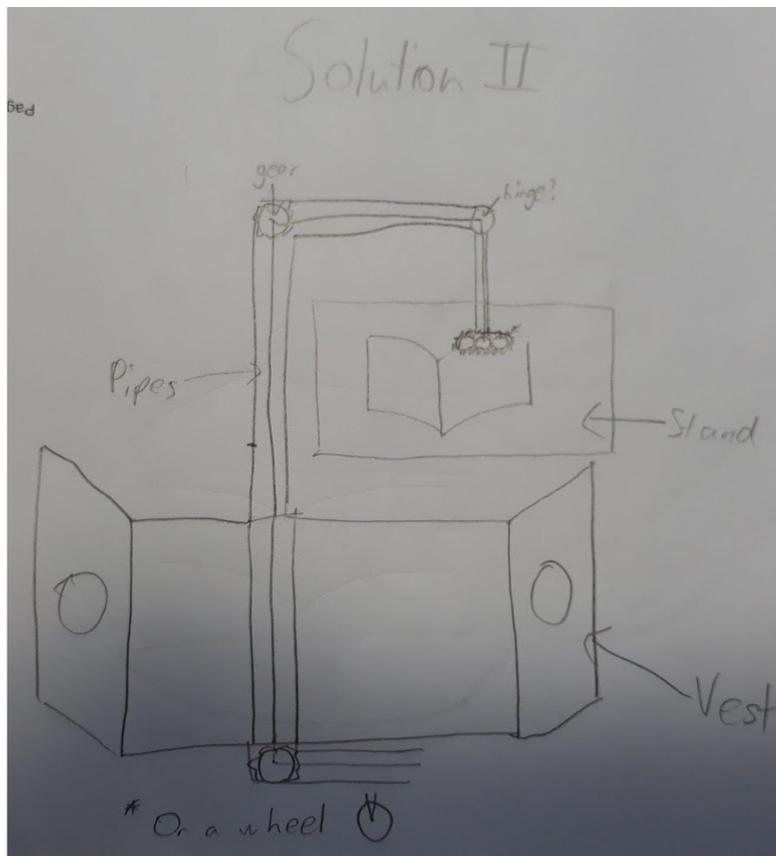
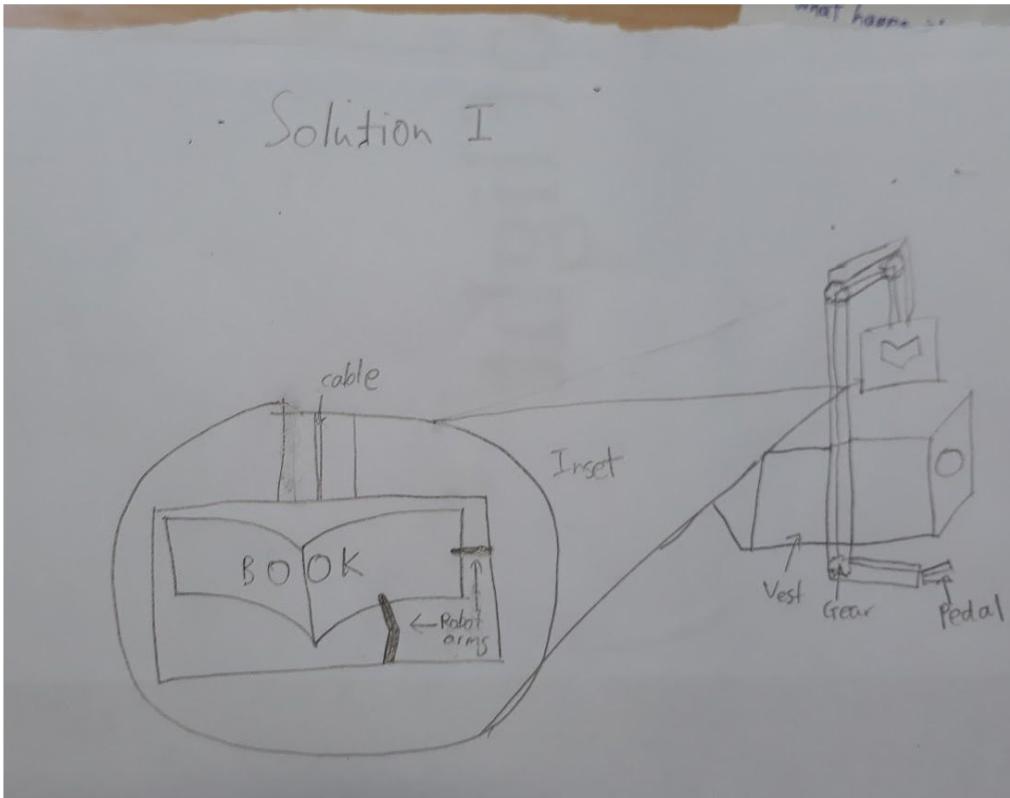
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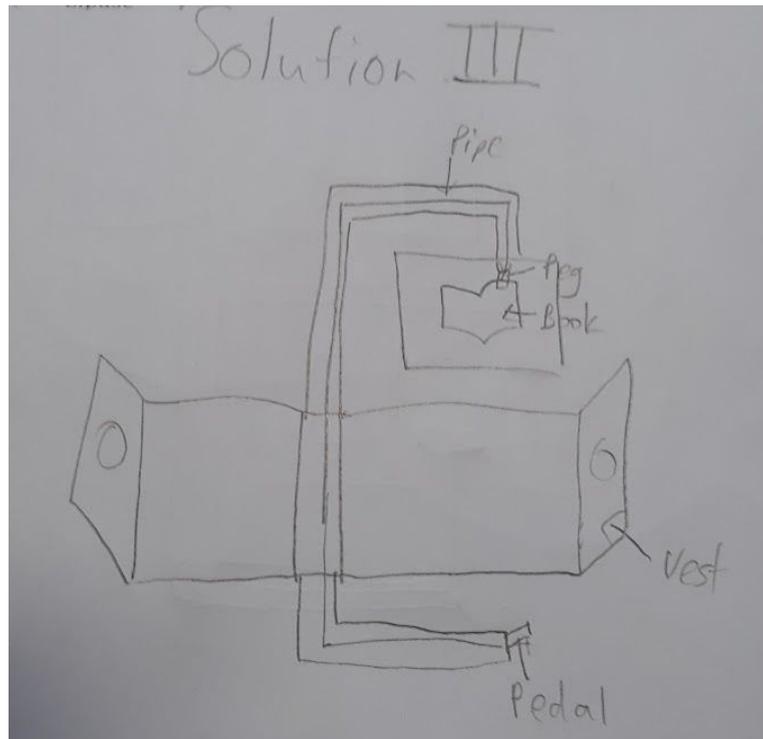
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### 3 Alternative Solutions





### HOW WE ACTUALLY PLAN TO BUILD IT

- We will use a gear system
- We could try using LEGO gears for a start
- We plan to use either:
  - Caterpillar tracks found on tanks
  - Wheels with many grooves for more friction
- The rest of the design is as before (vest, stand, pipes and all)

### NEW BUILDING PLAN

- We now intend to have a stepper motor, which will be activated by two buttons
  - One for turning the page forward
  - One for turning the page backward
- Tripod stand to be built
- Idea of vest scrapped as we thought it might be too heavy
- In fact, the whole above design is gone, with only the bookstand and the pedal remaining there
- In come the tripod stand and the modified turning contraption