Hwa Chong Institution

Project Work

Category 3 Inventions Log Book

Title of Project: Sort-a-bles
Group Name: 3-32
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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. Decreasing landfills.
2. Increasing amount of food waste generated by first world countries.
3. Inefficient recycling.

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

1. The solvability of the problem, which is whether or not this problem can be easily solved through an invention and the scale of the problem.
2. The availability of resources to solve this problem. Is the solution large scale? Is the resources to build easily found?
3. The scale of the problem. How big is this problem in the society/world?

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

Considerations for Selection	Problems		
	Decreasing landfills	Increasing amounts of food waste in first world countries	Inefficient recycling even with a large amount of recyclables
Solvability	3	2	4
Availability of resources	3	4	4
Scale of the problem	4	4	4
Total Score	10	10	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)

The problem of inefficient recycling wastes the effort of others who have contributed to recycling.

Amount of recycled waste is dropping, from 4.77 million tonnes in 2016 to 4.72 million tonnes in

2017, approximately 50,000 tonnes.

This problem greatly reduces the amount of recyclables going into the recycling plant.

Singapore's largest landfill, Semakau Landfill, is expected to be full by 2030.

On average, 8,559 tonnes of rubbish are sent to Tuas Incineration Plant everyday.

In 2017, the amount of refuse sent to Tuas Incineration Plant reached even 500,000 tonnes a month.

All 4 Incineration plants in Singapore are busy all year round just to help us to dispose our waste.

2 B   Compare and contrast the existing or similar solutions.

Sorting machines at recycling plants
- Only on a large scale
- Does not tackle the problem at its root

Regular recycling bins
- Only 'similar' solution
- Relies on people's knowledge of what can and cannot be recycled

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.

- Smart self-sorting recycling bin attachment
- Uses Raspberry Pi and Arduino
- Uses sound to separate recyclable and non-recyclable materials

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

- To allow for more efficient recycling, decreasing the amount of contaminated bins greatly in schools.

- Our product would :
    o Increase convenience of recycling materials
    o Prevent recyclable material from being contaminated by food
    o Help sort out recyclable materials from non-recyclable materials
    o Ultimately reduce the waste generated

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

Products	Georgia Tech's Smart Trash Can	Sort-a-bles	Regular manual recycling bins
Portability	1	4	3
Effectiveness of sorting	4	2	1
Cost	1	4	4
Durability	2	3	4

Our plan to improve durability and effectiveness of sorting is to make the prototype waterproof, and add machine learning to it, so it learns more as more trash is thrown into it.

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

1. Cost of materials and components

2. Difficulty getting materials

3. Difficulty assembling the components

4. The technology was much pricier than anticipated and shipping costs added to it even more.

5. Initial confusion as to how to operate the tech and input all the codes.

6. Trouble finding an appropriate and suitable motor.

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

Brainstorming and research done before first proposal evaluation. (April)

Visited an incineration plant before the first proposal evaluation to understand more about the problem of wasted recyclables due to contamination.

Visit a recycling plant to understand further about the problem of inefficient recycling before mid term-evaluation (end April)

Building of prototype starts in May.

Prototype to be done by July.

Coding should be done before Final Evaluation.

#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

Cardboard was chosen for the recycling bin (prototype) as it was light and portable, and it allowed us to easily make modifications on the prototype. We plan to move towards tupperware or acrylic materials for our final prototype to make it more durable and portable.

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

- Whether the raspberry pi can accurately tell a recyclable from a non-recyclable.
- Whether other external sounds would affect the system from functioning the way it should.

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

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.

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

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	
Waterproof	Yes			Able to hold liquid substances.
Portable	Yes			Lightweight and easily movable
Durable	Yes			Tupperware does not break or dent when dropped.

*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.)

7 Surprising Things You Should Not Recycle. (2012, November 02). Retrieved February 28, 2018, from https://planetsave.com/2012/11/02/7-surprising-things-you-should-not-recycle/

8 Surprising Facts And Misconceptions About Recycling (April 22, 2015). Retrieved 21/3/2018 from http://mentalfloss.com/article/63240/8-surprising-facts-and-misconceptions-about-recycling

How Safe is Sound Recognition and Touch ID? (19 February 2016). Retrieved 21/3/2018, from https://www.theguardian.com/technology/2016/feb/19/how-safe-is-voice-recognition-fingerprint-id-hsbc

Waste Management Statistics and Overall Recycling In Singapore. Retrieved 21/3/2018 from http://www.nea.gov.sg/energy-waste/waste-management/waste-statistics-and-overall-recycling