Group 5

Introduction to Engineering principles, design and communication

Report

Group Members

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4.1 - Tools to identify the problems and needs

Tools	Description
Research articles	**Following research article was published regarding the problems in waste management** **https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Waste+spill+around+the+grabge+bin&btnG=#d=gs_qabs&u=%23p%3DJUXS93UuX58J**
Television documentaries	We identified several problems that occur when tying a trash bag and it takes a quite long time. When using hands to tie a trash bag it will occur risk of infection **https://www.youtube.com/watch?v=P2RhkgwMHm8**
Magazine articles	There were several magazine articles published with regards to problems in current garbage management
Government publications	Rules and regulations in our country have been tighten in urban areas due to littering in surrounding. **Democratic Socialist Republic of Sri Lanka - Achieving sustainable waste management that is compatible with local characteristics - Passing On a Rich Natural Environment to Future Generations by Reducing Environmental Impact | Publications | JICA**

Brainstorming	Personal experience of our group member helped us to identify problems in garbage disposal.
Survey from minor staff (hospitals)	After conducting an insight survey with the hospital minor staff, we identified the problems in the hospital clinical waste management.
Feedbacks	After conducting a public survey, we have identified several problems in garbage management.

4.2 - Needs

Identified Needs

- **Eco friendly**

  Overflowing trash bins can cause animals to drag garbage everywhere and excessive odor of the garbage cause air pollution.

- **Reduce Infection**

  When opening the trash bin and tying the trash bag, there's a risk of getting infected.

- **High efficiency**

  Time is wasted when operating the lid of the trash bin manually.

- **Reduce manpower**

  When putting a knot in the trash bag and opening the lid of the trash bin man power is lost.

- **Easy implementation**

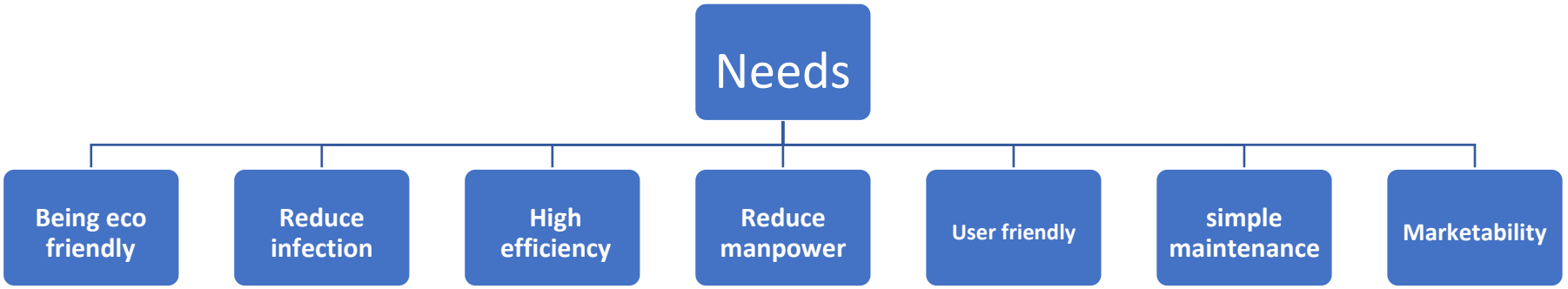
  Difficulty doing manual work, such as paddling the trash bin by foot or open it by hand, tying a knot in the bag by hand and cleaning the bin.

- **Simple maintenance**

Overflowing garbage is difficult to clean and maintain.

- **Marketability**

Needs Hierarchy



- **Reduction of pollution**
- **Improve waste management**

Reduce of bad odor (From the trash bin)

Stop Trash spilling out (From the dustbin)

- **Medi waste**
- **Improve Hygienic conditions**

- **Time saving**
- **Automation**

- **Effortless (zip tie)**
-

- **Easy to use**
- **Easy to assemble /replace**

- **Trouble-free**
- **Easy service/ dispose**

- **Vendible**
- **Portable**

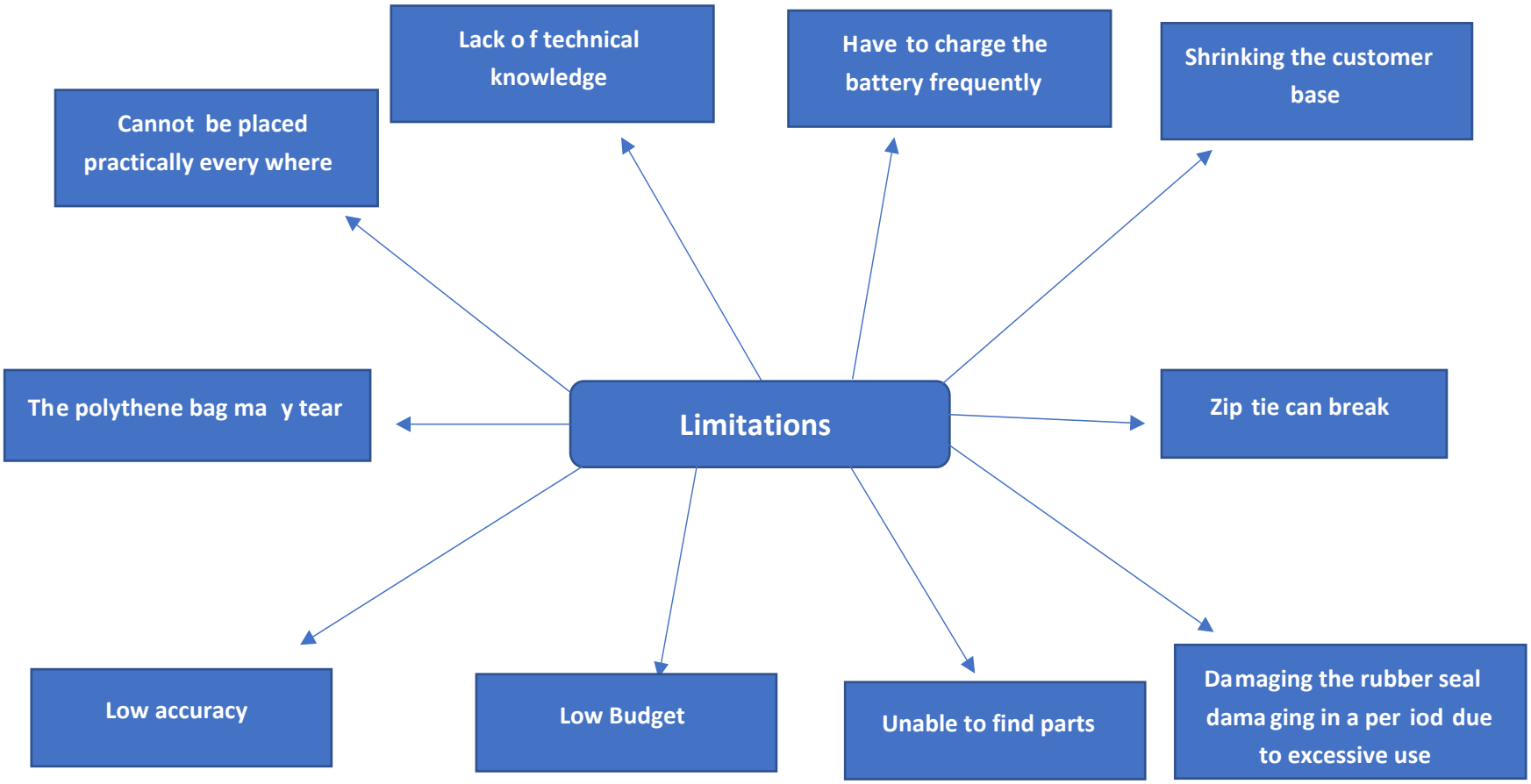
4.3 - Objectives, Constraints & Limitations

Objective	Constraints	Limitations
Time saving (automated lid)	• Low quality sensor	• Low accuracy
Automation (automated lid, automatic level measure, automatic zip tying)	• Government rules and regulations	• Low budget • Unable to find parts
Properly managing waste (automated lid, rubber seal, automatic level measure)	• Government tax	• Unable to find parts
Reduction of bad odor (Rubber seal, automated lid)	• Low quality rubber seals	• rubber seal damaging in a period due to excessive use
Spill level controlling (automatic level measure, automatic zip tying)	• Negligence of people	• Cannot be placed practically everywhere
Easy to service	• Lack of skill labors	• Lack of technical knowledge

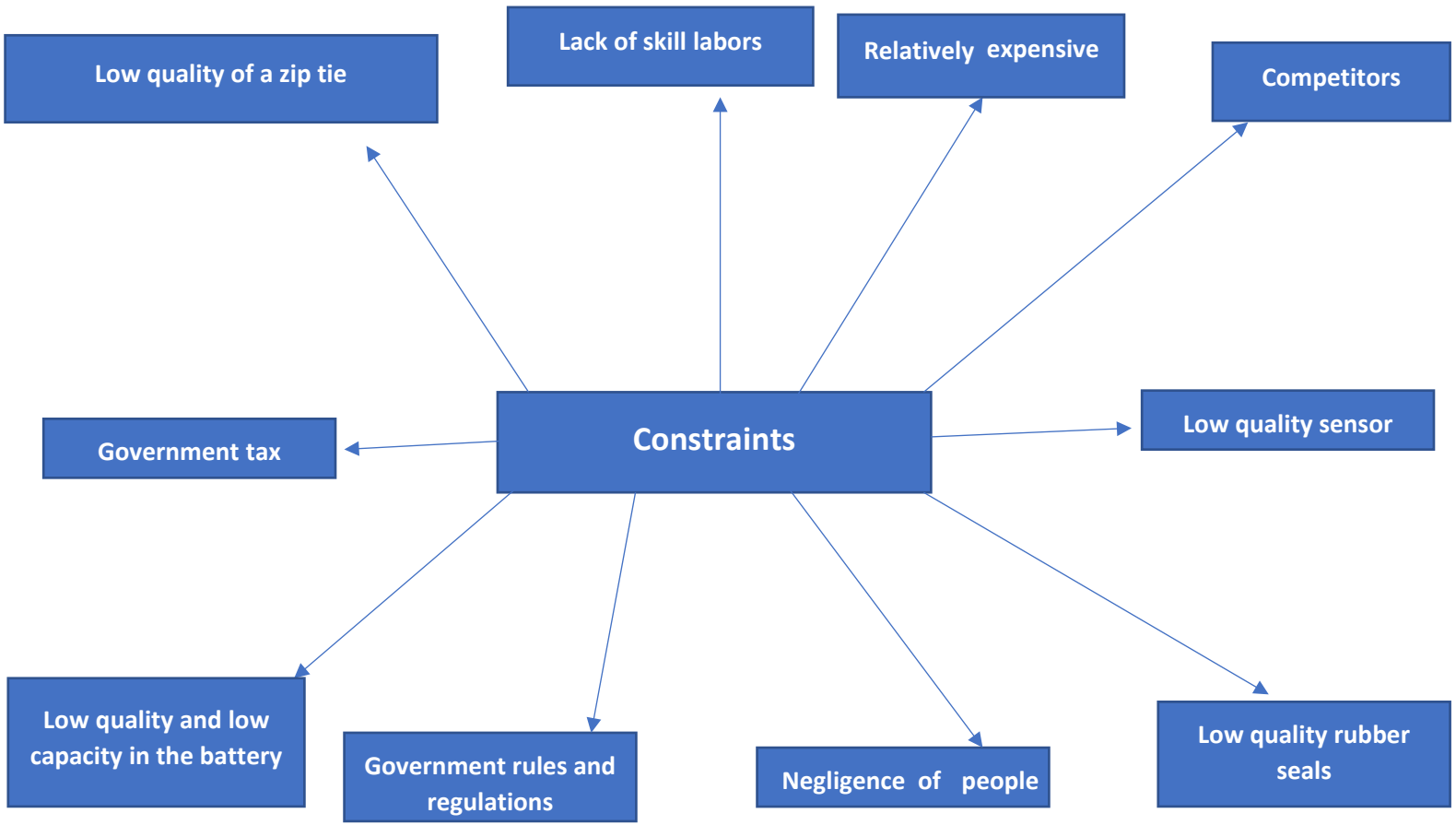
Easy to use (readily available parts)	• Low quality and low capacity in the battery • Low quality of a zip tie	• Have to charge the battery frequently • Zip tie can break • The polythene bag may tear
Easy to assemble/ replace	• Relatively expensive	• Unable to find parts
Marketability	• Competitors	• Shrinking the customer base

4.3 – Comparison

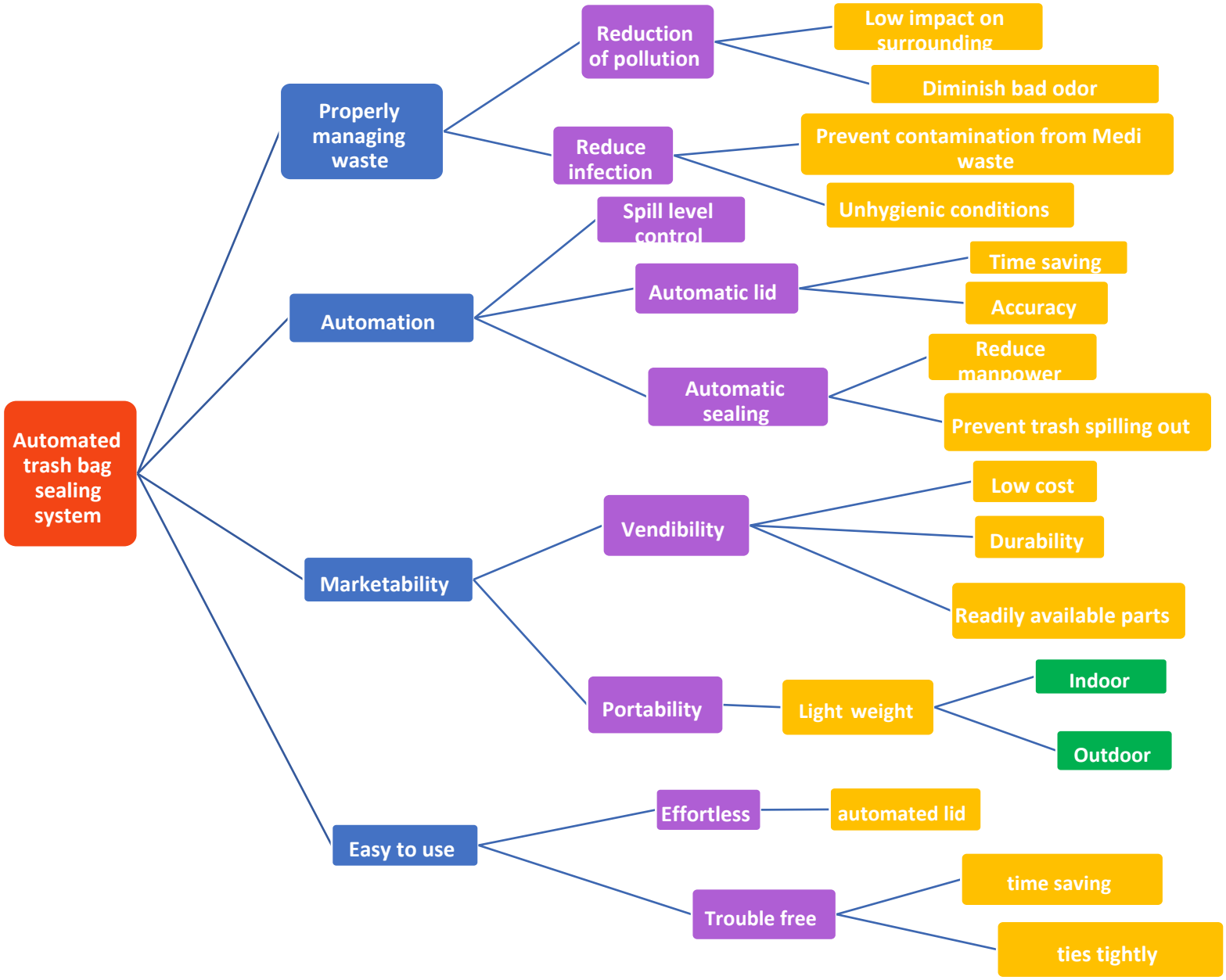
Limitations



Constraints



4.4 – Objective tree



Description about the above objectives

- **Time saving**

We currently have trash bins that can be manually operated by hand or foot. Also, when the bin is full, the trash bag must be tied by hand. We must spend extra time to do these things and it is difficult to do them manually.

Therefore, we are introducing an automated lid as a method of facilizing work. As a result, the lid of the trash bin will automatically open and close. So do not have to waste time there.

- **Automation**

As we are living in a busy world, open the trash bin lids, remove the trash bag after it is full, clean the trash bin if it is overflowed and maintain the trash bin, are very difficult to do daily.

So, we came up with the idea that it would be very easy if we could do all those tasks automatically. That is why we introduce this dust bin with automated lid and facility of tying a knot automatically.

- **Properly managing waste**

We have seen litter bins on the road and the rubbish bins, which keeps outdoors are scattered everywhere. Also, the garbage bags are left untied on the road for taken to the municipal council by the waste disposal trucks. If the trucks do not arrive on time, the garbage will still be on the road. On rainy days, all the rubbish can be wet and scattered, or animals could have been dragged away. Those things can create an unpleasant and polluted environment.

We presented our ideas as a solution to this. We can use our method to dispose garbage properly. It may help to keep environment clean. It makes easier to the labors who is going to collect those garbage bags.

- **Reduction of bad odor**

We can feel a strange smell coming from the garbage dumps. Anyway, the stench from the dirt keeps on rising day by day. If we can prevent odors from coming out of the trash bin, can avoid this problem.

By considering this matter, we are willing to add a rubber seal around the bin to sealed with the lid when closed.

- **Trash not spilling out**

We have seen leftovers from trash can /bins scattered everywhere. Reasons for this situation are using dust bins without lids and leaving lid open after using it this occurs due to laziness of people.

In our smart dustbin we have introduced the automated lid and zip tie which automatically tightens.

- **Easy to service**

With people being busy, a lot of has problems arise when cleaning bins. because trash bins take a considerable time to clean. Even though we use trash bag in the bin

By using our new smart dust bin which automatically control this situation (use of a zip tie), as it has an automatic system to close the lid and seal the trash bag.

- **Easy to use (readily available parts)**

We have to do all the chores manually such as cleaning the garbage bin disposing trash bag once they are full. It wastes manpower and also time.

As a solution we are designing a lid to open and close garbage automatically. Also, we suggest an automatic knot tying methord.by using our this, we can remove the problem which happen removing the trash out of the bin.

- **Marketability**

  Our aim is to present a competitive design to the market by using zip tie , rubber seal , automatic lid as new accessories that are superior to the existing solution for the dust bin.

4.6 – Establish metrics for objectives

Objective	Metrics	Targets
Time saving	Time (Time duration for tying a zip tie)	Less than 10 seconds
Diminish bad odor (Sealing the bin with a rubber seal)	Durability of the rubber (time span)	3 years
Automation	Cost (For parts)	10,000LKR
portability	Weight of dustbin	Less than 3 kg
Accuracy (Automatic lid)	Customer feedback	Success rate above 90%

4.7 – Problem statement

In the present day's garbage has become a significant problem due to the increase of population. Many countries in the world face to this problem. Many people throw away garbage without any responsibility, carelessly or without any hesitation. Nowadays, people have become selfish and unwilling to throw away trash appropriately. It is common to see people discard trash out of everywhere. Carelessness has also made people just throw rubbish in anywhere without even thinking about it. And we can find garbage bins overflowing at various public places. So that breeding various animals near the trash bins and it creates unhygienic surroundings, lousy odor which leads to the spread of deadly diseases and human illness. Smart dustbins help to create a cleaner, safer, more hygienic environment and enhanced operational efficiency while reducing management cost, resources, and roadsides emissions. The smart bin is ideal for busy locations such as campuses, airports etc. And nowadays dustbins are usually used in hospitals.

Presently there are some kinds of available solutions like swing dustbin, dustbin with a lid (which is manually operated) and dustbins operated with the help of the leg. But they are not good enough because some people with neurological and skeletal disorders get trouble when they open it by using their leg. According to our one of the group members experience, also factor to make a smart automated dustbin concept. His grandfather who was suffering with arthritis for a long period. When he was admitted to the hospital and he found it hard, when opening the lid of the dustbin using the paddle because of the arthritis pain.

So, we need to develop a trash bin that can tie trash bag with a zip tie. This will reduce manpower and save the time. The sensor placed inside the bin will measure the level of trash. So, this system is our solution for monitoring the status of waste bin fill level. Sealing the dustbin with a rubber seal is relatively easy to make sure that everywhere looks clean and smell good. It can minimize bad smell and potential spread of germs from the food waste in garbage bins. This automatic sensor dustbin trash can touch free. Lid of the trash will automatically open the lid will be automatically closed after the garbage is throw, and whole process of throwing garbage no need to use our hand and feet. And also, you can avoid the bacteria in the trash bin. Current available automated solutions average prices range in between $50 to $500. So, we are planning to develop a smart dustbin addressing the above identified weaknesses within the budget of 10,000 LKR.

References

1. Public survey – survey on smart trash bins concepts.

e https://forms.gle/a9ecnBkNzoSk9K48

2. Research articles

Solid waste management in Kolkata, India: Practices and challenges (Tumpa Hazra, 2009) (Tumpa & Sudha, 2009)

3. Television documentaries

https://www.youtube.com/watch?v=P2RhkgwMHm8

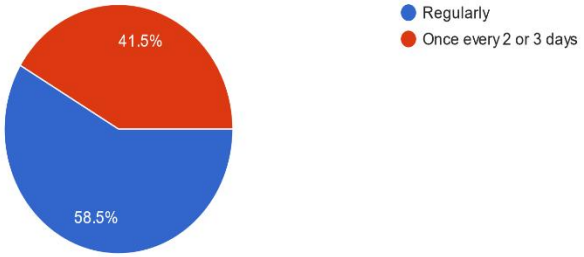
4. Government Publications

Democratic Socialist Republic of Sri Lanka - Achieving sustainable waste management that is compatible with local characteristics - Passing On a Rich Natural Environment to Future Generations by Reducing Environmental Impact | Publications | JICA

Survey report we carried out

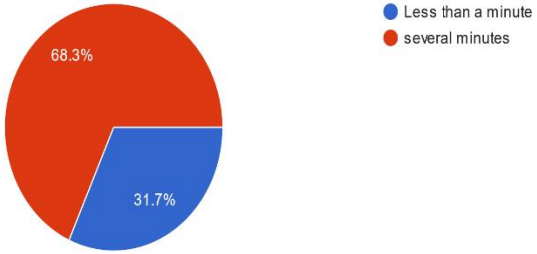
How often do you change the trash bag at you house?

41 responses



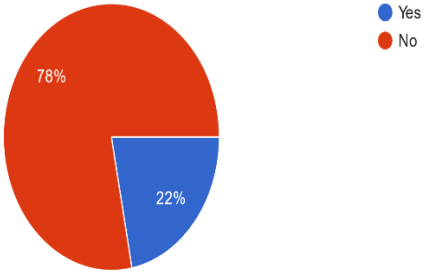
How long does it take to change trash bag?

41 responses



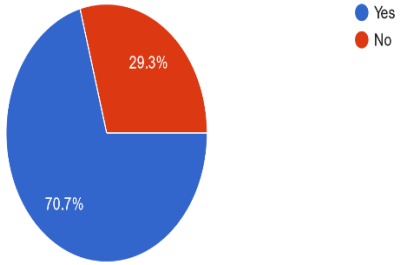
How you ever got sick after cleaning trash bag?

41 responses



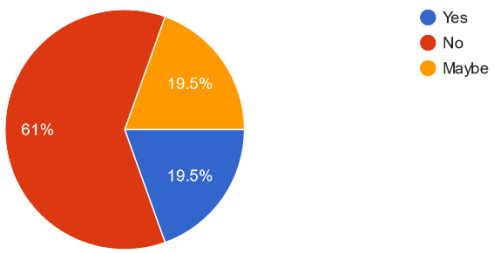
Did you ever have to deal with trash spill even though you sealed the trash bag with a knot?

41 responses



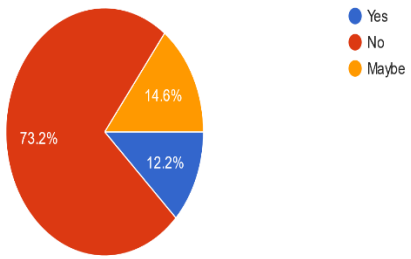
Do you prefer to knot trash bag manually using the hand?

41 responses



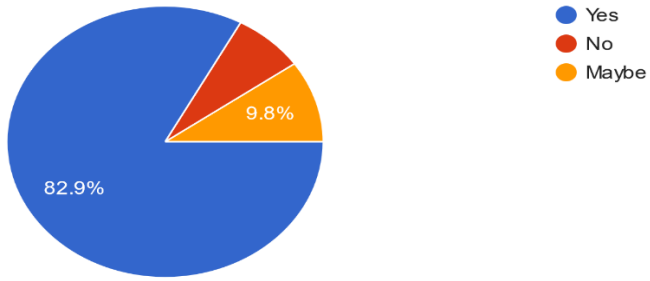
Do you think is it safe to operate dust bins manually at public places?

41 responses



Do you pefer making the trash bin automated?

41 responses



What features from the following whould you perfer?

37 responses