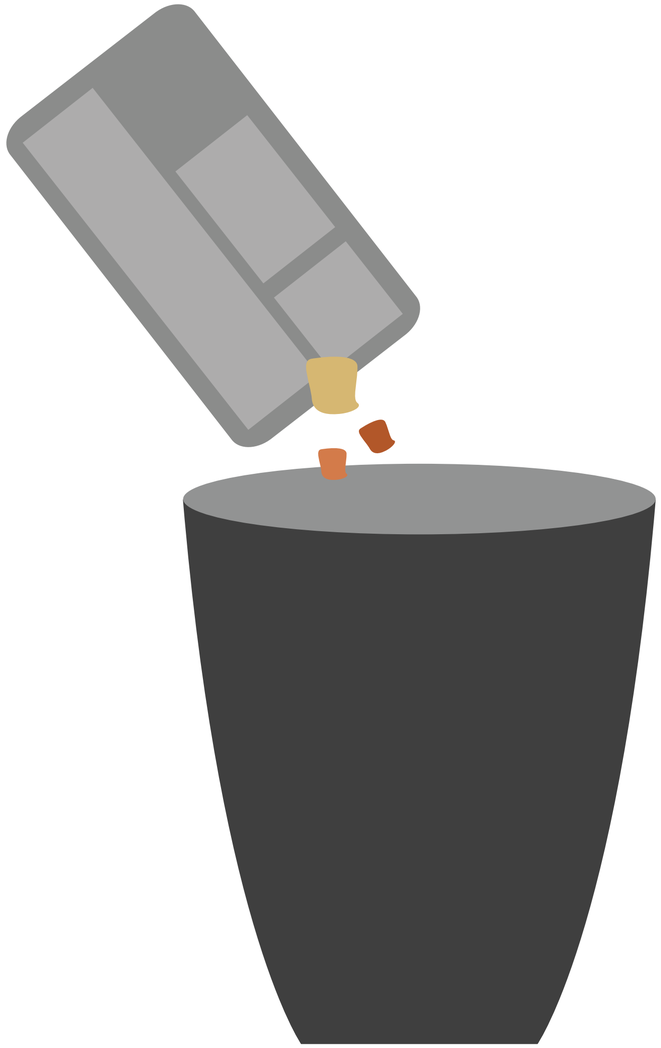
IDC I IIT Bombay



Changing Food Waste Behaviours

Studying the Effect of Interactive Installations on Behaviour Change

Guide: Prof. Girish Dalvi

Jayati Bandyopadhyay I 146330004

Statistics :

- **1/3** rd of world’s hungry live in India.
- India ranks **63** among **88** countries in global hunger index.
- India wastes as much food as the **whole** of **UK** consumes.

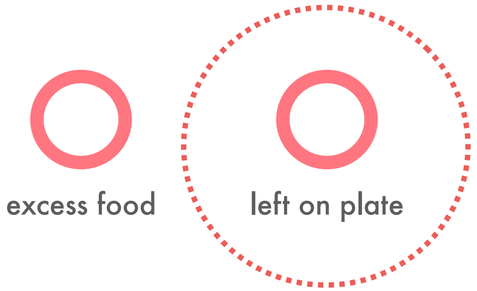



Different Phases of Food Waste :

Existing Solutions :

- **Save Food Initiative —** Food and Agriculture Organization (FAO)
- **Farm to Family** — Share Food Program (USA)
- **Love food, Hate Waste campaign** (United Kingdom)
- **Solidarity Fridge** (Spain)
- **Rubies in the Rubble** (United Kingdom)
- **Smart Fridge**
- **Tray-less cafeterias** (Canada)
- **Ugly, But Edible** (USA)

Different Phases of Food Waste :



Behaviour to Change :

Leaving food on plate.

- Food waste is a habitual behaviour problem.
- It poses severe threat to our environment.

Primary Objective

To reduce the amount of food being wasted at IITB Hostel 12, 13, 14 mess.

Secondary Objective

To investigate whether installations can bring about a behaviour change.

Why IIT Bombay Mess?

- Food waste is a severe problem in the campus.
- Indifference of maximum students towards food waste.
- Immediate context to implement and test.

Why Hostel 12, 13, 14 Mess?

- In IIT messes, a large amount of food gets wasted everyday.
- Hostel 12, 13, 14 has a common mess where almost 2000 students eat.
- Initiatives were taken to motivate students with no substantial improvement.

Why Installation?

- Can be made non intrusive.
- Can attract audience attention.
- Can be made interactive, mapping direct cause and effect.
- Can be used to give moderate aversive messages through engaging visuals and interaction.

Related Works :

BinCam :

Persuasive technology using cameras to capture and share pictures of the waste (focus on waste segregation) on an online social network.

Hostel Mess Design Experience at IIT Bombay :

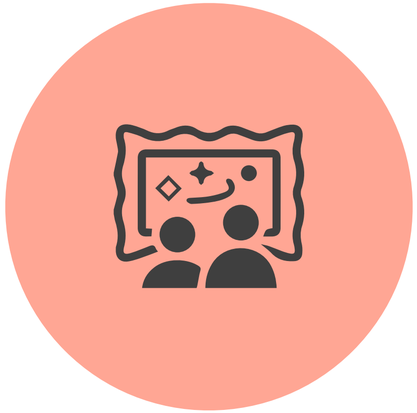
System design for complaint management and food wastage.

Secondary Research

Secondary Research :

Behaviour

Food Waste



Installations

Secondary Research : Behaviour

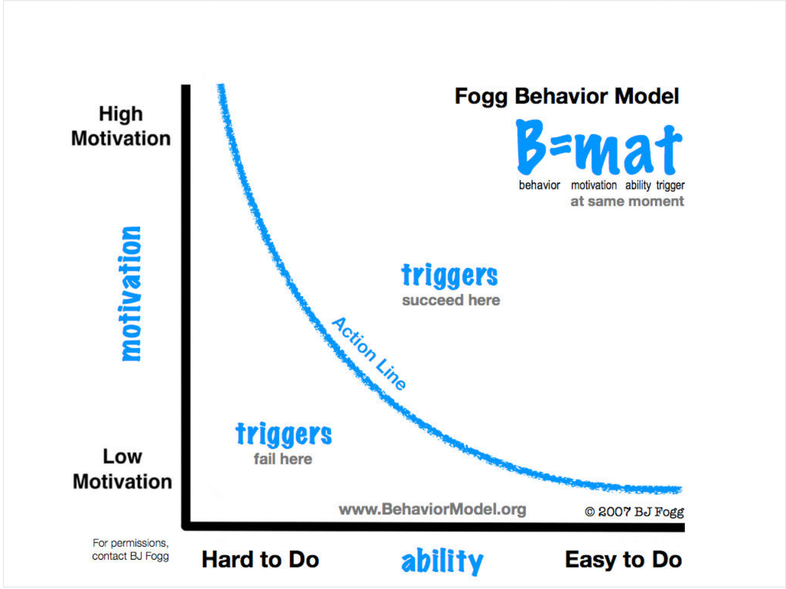
Behaviour

- Wasting is a **habitual behaviour** and occur without much thought.
- Human beings are ‘**predictably irrational**’ and hence their behaviour is also predictable.
- People who are moderately motivated, need a **trigger** to behave in the desired way.
- It is better to ‘**nudge**’ people instead of coercion (libertarian paternalism).

Secondary Research : Behaviour

Behaviour

- Desire to get socially accepted might make people behave in a certain way which is not **sustainable**.
- The users need three things to achieve a behaviour — **motivation, ability, trigger**.
- **Gamification** can induce playful triggers.
- **Social influence** can be used to cause ‘feeling of shame’ and lead to self reflection.



Fogg's Behaviour Model
Source: www.behaviormodel.org

Fig.16

Secondary Research : Food Waste

Food Waste

- Different stages of food waste.
- Existing solutions in the different stages of food waste.
- Food security and statistical data of food waste in different countries.

Secondary Research : Installations

Installations

- Physical interfaces involved in digital technologies that can **reconfigure a space**.
- The audience are referred to as ‘spect-**actors**’.
- The parameters for designing proactive contextual interventions in a public space are **location**, **prominence of spectacle**, **length of interaction** and **spatial distribution of focal points**.
- Interactive installations can be categorised as **Performative**, **Immersive** and **Ubiquitous**.
- **Social context** of a location contributes to the public nature of engagement.
- Engagement can be classified into **initial** and **ongoing** engagements.

Primary Research

Primary Research :

Stakeholders of the Mess :

Students

Mess Workers

Mess Manager

Mess Coordinator

Primary Research : Interviews

Semi structured interviews :

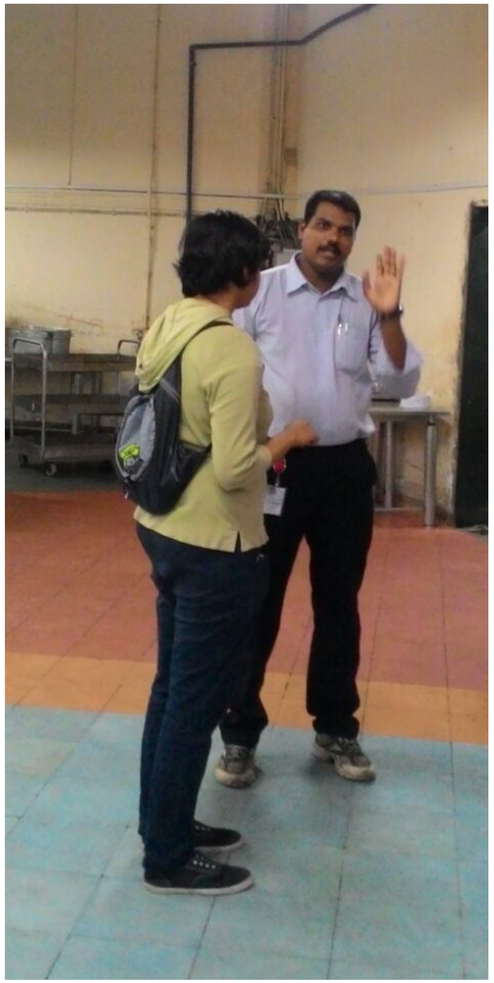
- 7 students
- 2 mess workers
- 1 mess manager
- 1 mess coordinator

“Who are you?” — student statement.

“One must be a part of the system to understand the amount of effort put in to prepare the food” — mess coordinator statement.

“Students do not respect food” — mess employee statement

“We distribute the excess food to the mess workers” — mess manager statement

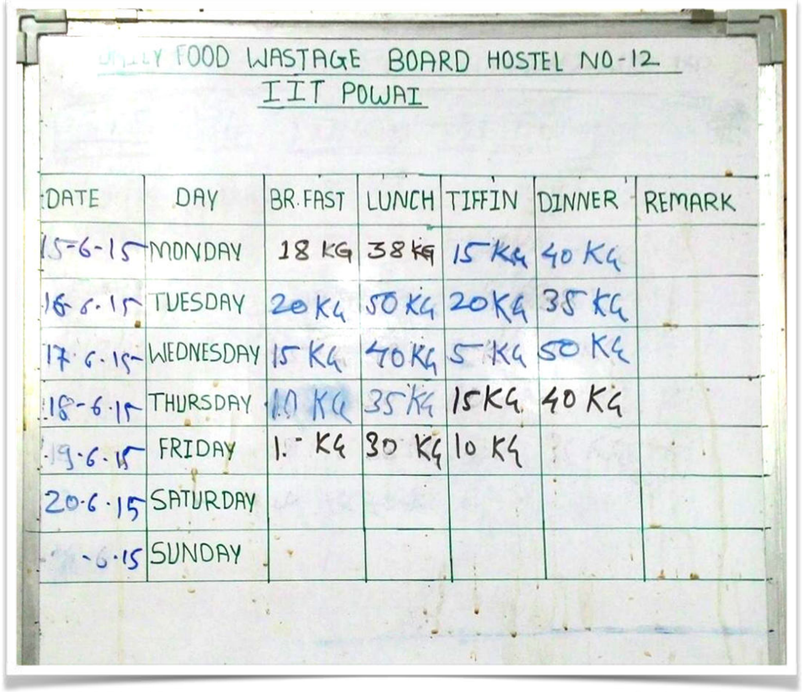


Primary Research : Observations & Insights

- The mess employees are **keen on reducing** food waste.
- **Feedbacks** written are **not** outrightly **visible**.
- The students write **positive feedback** as well.
- Comments about the **bad quality of food** on ‘Stop food waste’ posters.
- The **quantity of extra item** is almost **double** of what an average male adult can consume.
- The **counters** are placed at **extreme corners** of the mess.

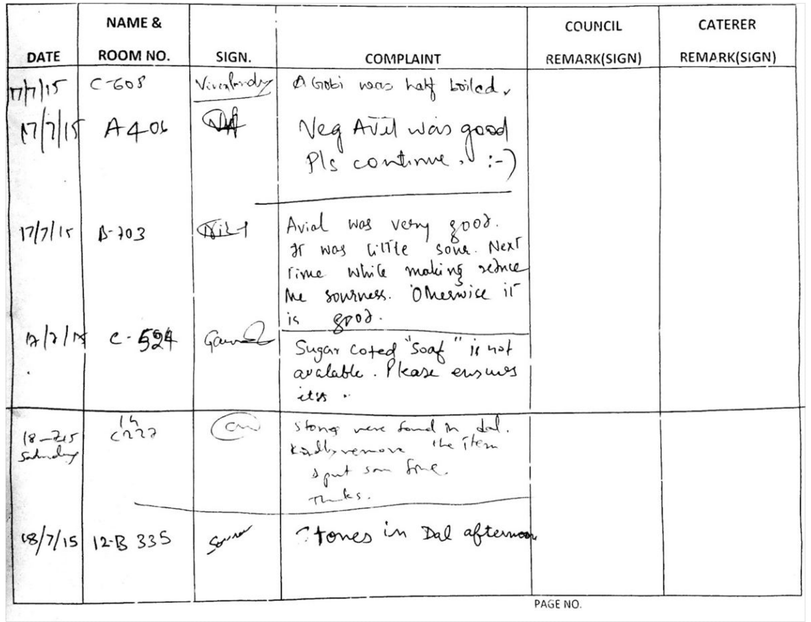
Primary Research : Observations & Insights

- The students do not consider **tasting** as an option.
- Students eating in the mess do not get **feedback about the food items**.
- The students do not have direct '**aversion to loss**'.
- They consider mess food as '**free**' food.
- A previous attempt for saving energy as **General Championship**.



DAILY FOOD WASTAGE BOARD HOSTEL NO-12
IIT POWAI

DATE	DAY	BR.FAST	LUNCH	TIFFIN	DINNER	REMARK
15-6-15	MONDAY	18 KG	38 KG	15 KG	40 KG	
16.6.15	TUESDAY	20 KG	50 KG	20 KG	35 KG	
17.6.15	WEDNESDAY	15 KG	40 KG	5 KG	50 KG	
18-6-15	THURSDAY	10 KG	35 KG	15 KG	40 KG	
19.6.15	FRIDAY	1.- KG	30 KG	10 KG		
20.6.15	SATURDAY					
-6.15	SUNDAY					



DATE	NAME & ROOM NO.	SIGN.	COMPLAINT	COUNCIL REMARK(SIGN)	CATERER REMARK(SIGN)
17/7/15	C-608	Vivekbindra	Gobi was half boiled.		
17/7/15	A-401		Veg Avial was good Pls continue :-)		
17/7/15	B-703		Avial was very good. It was little sour. Next time while making reduce the sourness. Otherwise it is good.		
17/7/15	C-524		Sugar coted "soaf" is not available. Please ensures its.		
18-7-15 Saturday	14 C-222		Stones were found in dal. Kindly remove the item spoil sm fun. Thanks.		
18/7/15	12-B 335		Stones in Dal afternoon		

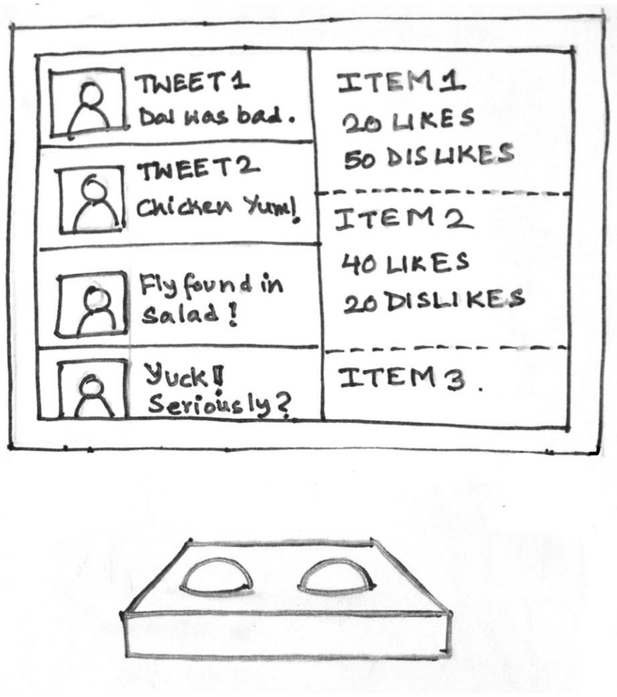
PAGE NO.

Primary Research : Process

- The excess food is **distributed** among employees at around 10:30 pm.
- The wasted food is **measured** after each meal and written on a **white board**.
- A truck collects all the wasted food and takes it to the **dump** yard.
- The waste is segregated and **composted**.

Design Ideas

Design Idea 1 :



Feedback integrated with social media displayed. Users can also give feedback by clicking on the buttons.

- Leverage the 'social influence' aspect of behaviour change.
- Individuals would have a 'feeling of guilt' in light of the presence of others.
- Taking wastage statistics for individual meals, post it on social media sites.
- Showing encouraging messages as positive motivation.
- Subtly shame and embarrass students when the amount of waste increases.

Drawback : Individual privacy would become a huge concern.

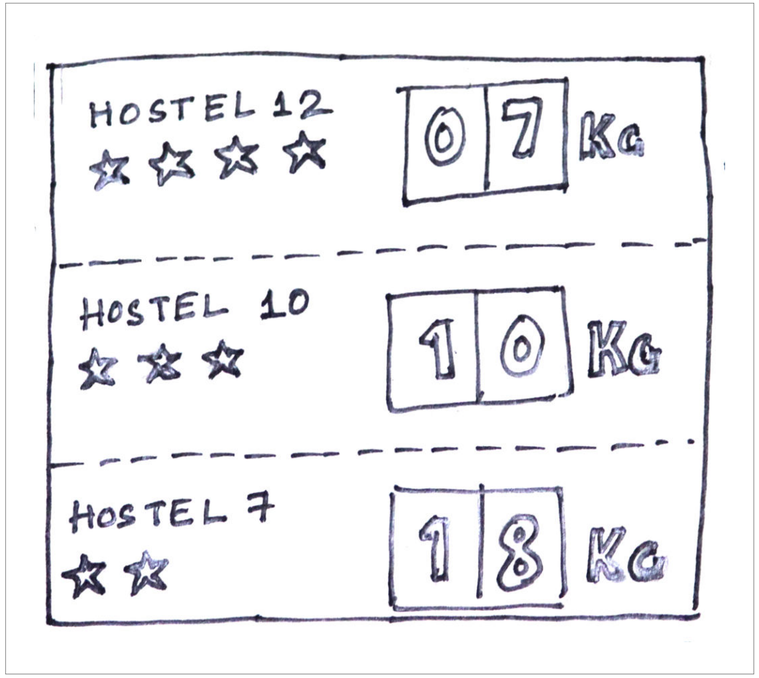
Design Idea 2 :

Aversive feedback by displaying statistical facts.

- Display in front of the dustbin showing individual and total food waste.
- Change in display each time someone drops food into the bin.
- Visuals and text depicting statistics of food waste and hunger.
- Inducing shame (pain motivation).

Drawback : Aversive feedback might trigger untoward behaviour.

Design Idea 3 :



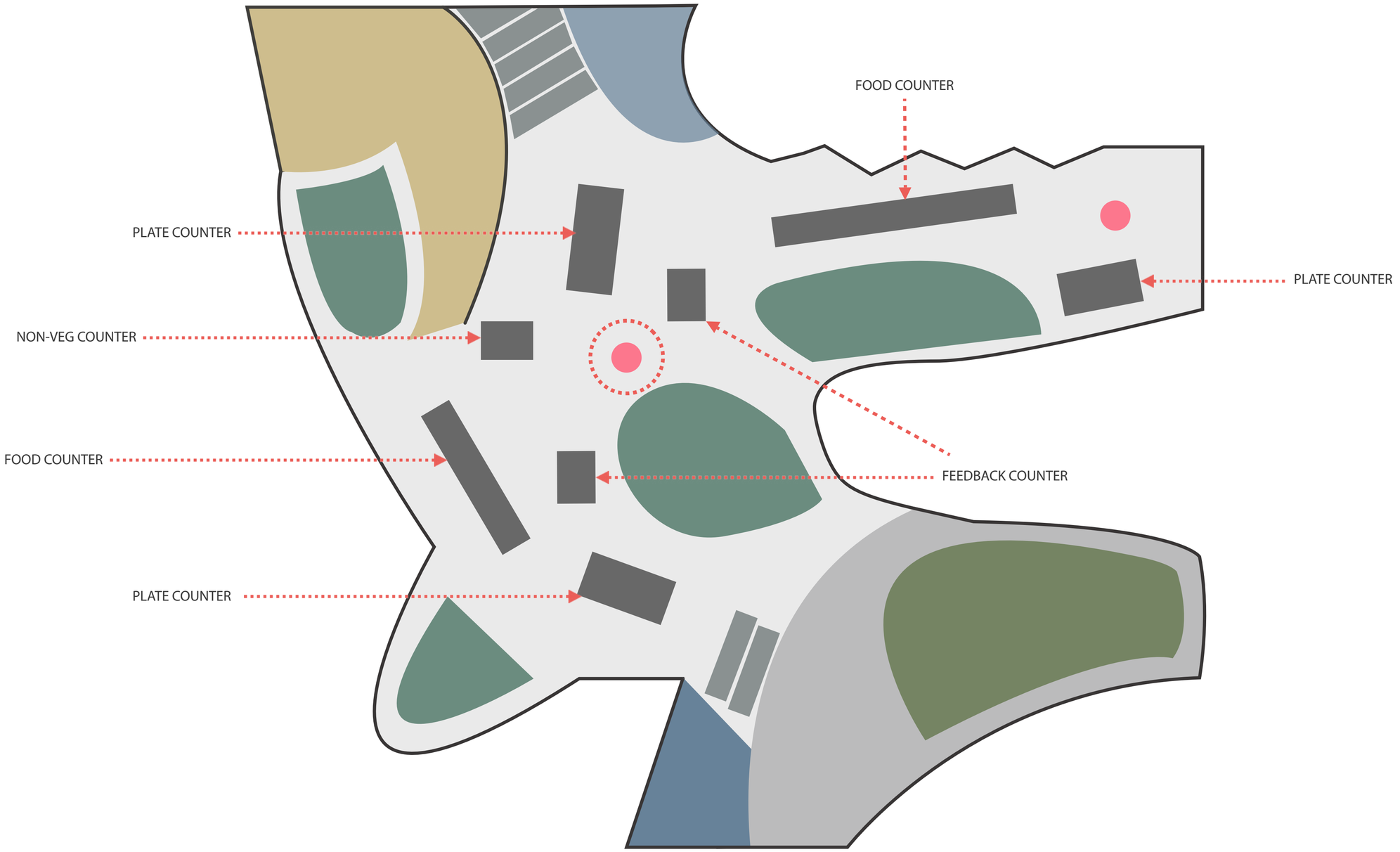
Putting up displays in public places with hierarchy and statistical data.

- Put up public displays highlighting ranks of hostels across the campus.
- Playful persuasion.
- Leveraging ‘aversion to loss’ psychology.

Drawback : Might not induce the expected amount of competitiveness.

Layout


FIRST ENTRANCE
THIRD ENTRANCE
SECOND ENTRANCE
DUSTBIN
CANTEEN
FOOD COUNTER
DUSTBIN
FOOD COUNTER
FEEDBACK COUNTER
PLATE COUNTER
PLATE COUNTER
POSITION OF INSTALLATION
PLATE COUNTER
NON-VEG COUNTER
FEEDBACK COUNTER


FOOD COUNTER
PLATE COUNTER
PLATE COUNTER
NON-VEG COUNTER
FOOD COUNTER
FEEDBACK COUNTER
PLATE COUNTER

Pilot Implementation : Goals

- To test the hardware integration.
- Getting initial feedbacks / suggestions from users.
- Acquaintance with the layout and logistics.
- Positioning of the installation.

The questions that the pilot was expected to answer were:

- Can installations be used to solve food waste problem?
- Is it creating interest among users?
- Is it acting as a trigger for already motivated users?

Pilot Implementation 1 : Design

- ‘Gaze Effect’ and ‘Panopticon’ psychological theories in visuals.
- Messages designed to evoke pain and moderate level of aversive feedback.
- Negative motivation to articulate the observed behaviour of students.
- The aversive messages appear if the waste is above a predefined threshold.

Aversive Message :

A child dies every 5 seconds as a result of hunger…

And you take more than what you can eat,

Eat till you are full…

And throw away the rest.

Pilot Implementation 1 : Insights

- Enhance interactivity by adding suitable hardware (Proximity and Camera).
- Adding sound to increase cause and effect mapping.
- Triggering the changes when there are onlookers or bystanders.
- Bigger font size for numeric data.

Insights to enhance the hardware :

- Need to include proximity sensor along with weight sensor.
- Displaying facts when people are at a certain proximity.
- Increasing the surface area of the weighing machine.
- Abstracting the hardware.

Pilot Implementation 2 : Design

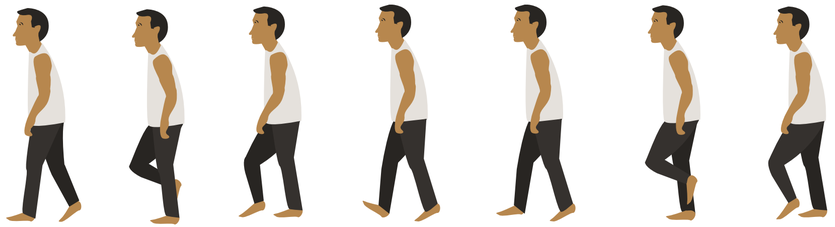
- More performative than the first pilot.
- Playful persuasion techniques applied.
- Associating rewards with winning condition for motivation.
- Aversive feedback through facial expressions and dialogues.
- Inducing social influence by spanning the game across the entire duration of meal.

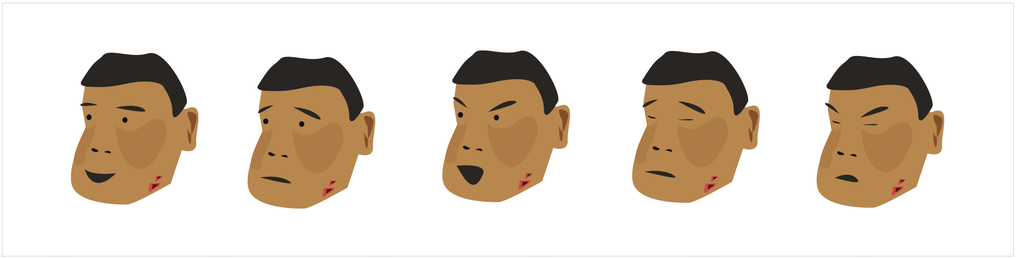
Aversive Feedbacks :

- Boulder 1 : “Stop doing that!” (Annoyed tone)
- Boulder 2 : “Are you kidding me?” (Annoyed tone)
- Boulder 3 : “Please save us!” (Prayer tone)
- Boulder 4 : “No no no…Aaaaarrrrggghhhh!” (Angry tone)

Pilot Implementation 2 : Gameplay

- Miners trapped inside a mine with between two mountains.
- Miners trying to reach the end of a tunnel in order to save themselves.
- When food gets dropped into the bin, boulders of different sizes are spawned.
- Boulders hit the miners and reduce their strength or health.
- The miners try to break these boulders to make path.
- Miners lose out on energy and dies.





Pilot Implementation 2 : Insights

- The game was not effective because of its complexity.
- Multiple factors influencing the health of the miners subdued the cause and effect.
- The time taken by the boulder to travel the tunnel broke the initial engagement and never led to a honey pot effect.
- A positive motivation or appreciation could be used but giving a feedback is a must.
- The game should be simpler with minimum active components.

Final Concept 1


The Darker Side

The Darker Side : Concept

- An incidental* interactive installation.
- Highlights the ignored and less explored facts surrounding food waste and hunger issues in India.
- Aimed at creating awareness and evoking self reflection.

The Darker Side elements :

- Awareness facts
- Contextual data
- Interactive visuals

*interaction between the installation and the audience can become active if the viewers realise that they are affecting the behaviour of the installation

The Darker Side : Design

- The messages aimed at giving aversive feedback.
- Constructed such that it highlights the target behaviour (in red).
- The contextual data projected to reinforce the need for a behaviour change.
- Facilitate self reflection through awareness facts,
- Plight of farmers and children highlighted in the content of the message.

It takes **140** days on an average to harvest any major crop...

and we do not even **think twice before throwing** it away.

310 **gms** added in the last **5** **seconds**.

Total Waste : **30.390** **kgs**

1. People tend to be more concerned about children than adults
1. Recently suicide of farmers gained a lot of attention

The Darker Side : Messages

It takes **140** days on an average to harvest any major crop...

and we do not even **think twice before throwing** it away.

100 gms of rice needs **249** litres of water for harvesting...

And we fail to **see the amount of effort** that goes into the process.

1 in **4** children are malnurished in India...

and we think, **now** that it's paid, we own the **right to waste**.

3,000 children in India die every day from poor diet related illness...

and we complain about the **taste** of **the food**.

The Darker Side : Visuals

- Images portraying the under privileged population.
- Complimented the awareness messages projected.
- The visual change based on the amount of waste thrown into the bin.
- Subjects as close up portraits of people staring at the camera.
- The facial expression of the subjects metamorphose.
- The backdrop was kept white and images converted to grayscale
- The time of the transformation was taken as 3-4 seconds.

1 in **4** children are malnurished in India...

and we think, **now** that it's paid, we own the **right to waste**.

257 **gms** added in the last **5** **seconds**.

Total Waste : **10.647** **kgs**

It takes **140** days on an average to harvest any major crop...

and we do not even **think twice before throwing** it away.

310 **gms** added in the last **5** **seconds**.

Total Waste : **30.390** **kgs**

The Darker Side : Space

- Detects proximity and faces of the audience.
- The contextual data were taken from the weighing machine and projected on a wall mount display.
- A concave arrangement for the screen aimed at creating lesser honey pot effect.

Demo

Implementation


iit bombay
20.13 kgs


3,000


STOP
don't waste it
3,000 children in India die every day from poor diet related illness...
and we complain about the taste of the food.
130 gms food wasted in the last 6 seconds


STOP
don't waste it
Total food wasted : 20.28 kgs


Food
don't waste it
FOOD WASTAGE
STOP

The Darker Side : Insights

- It grabbed a lot of attention among the audience.
- Social interaction was causing a hindrance to individual engagement.
- The weighing platform should be completely hidden from the audience.
- The cause and effect was evident and most of the users noticed the change.
- Audience are keen on reading write ups placed near the installation.
- Some questioned the authenticity of the contextual data displayed (unable to perceive the objective).
- The users directly interacted with the sensors to re explore the interactions.

Final Concept 2

THE HUNGER PIT

The Hunger Pit : Concept

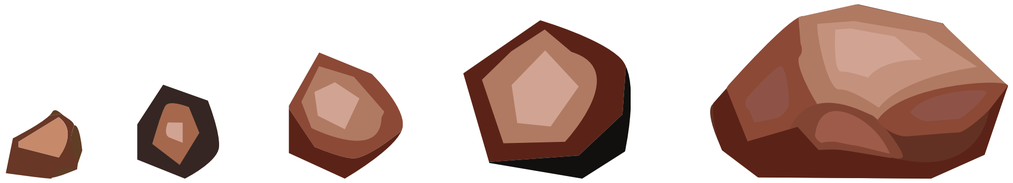
- An performative interactive installation.
- Aims to gamify the objective of reducing food waste.
- Direct mapping between cause and effect.
- Associating tangible reward if a winning condition is reached.
- Inspired from the second pilot, eliminating complex interactions.

The Hunger Pit elements :

- Five boulders mapped to amount of food wasted.
- Hungry human.
- Static backdrop.

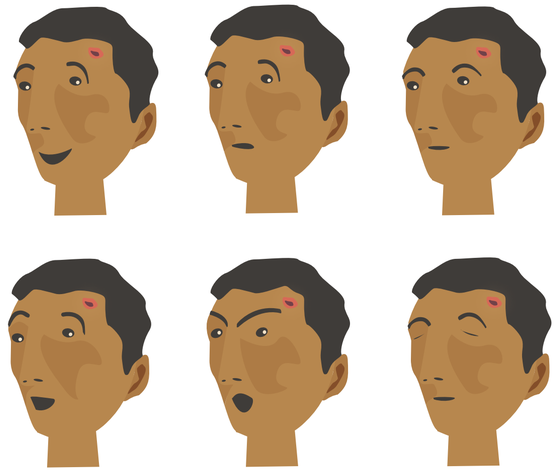
The Hunger Pit : Gameplay

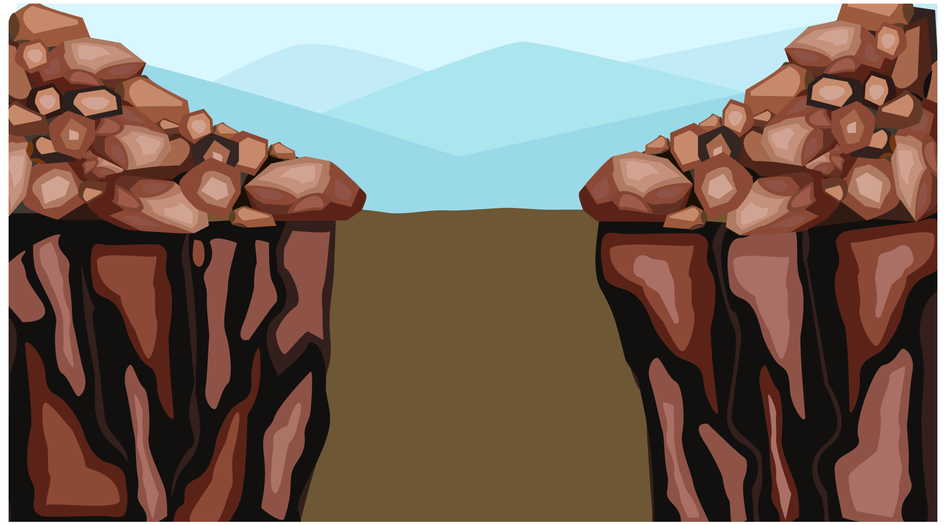
- Hungry people stuck in a hunger pit.
- Boulders of varied size roll down the pit depending on the amount of food wasted.
- Spawns a hungry person when audience is at an extremely close proximity to the weighing machine
- Kills the hungry person if food wasted is above a certain threshold.



The Hunger Pit : Design

- Minimal number of interacting elements.
- Positive feedback of the human escaping the pit.
- Initial engagement established through the visuals and sound effects.
- Expressions, emotions in facial expression and statements for aversive feedback.
- Consistent static backdrop.





The Hunger Pit : Space

- Making the audience aware of the gameplay before they reach the bin.
- Space planned to ‘prime’ the audience before arriving at the primary focal point.
- A flat arrangement to gathering spectators initiating social interactions.

Save them.
Help them get out of the hunger pit...

THE HUNGER PIT

People are stuck in this hunger pit.
The more food you drop, they suffer.

When you throw waste into the bin,
boulders roll down, hit them and block
the path of their escape.

Demo

The Hunger Pit : Insights

- The simplicity of the game created interest among the audience.
- The audience enjoyed the playfulness of the installation.
- The self reflection was subdued but the social influence became predominant.
- Audience were interested in the game play.
- The direct cause and effect of the game increased the interactivity and playfulness.

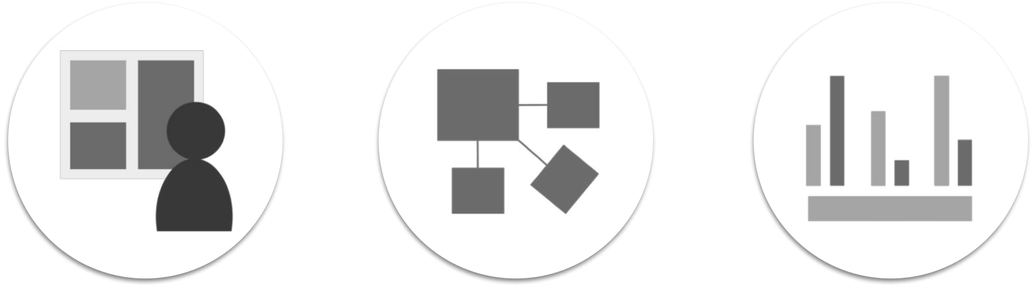
Ecosystem

Ecosystem :

- The installation aims at spreading awareness on food waste.
- Multiple intervention points can be leveraged to prevent food waste in the current context.
- A system design approach needs to be taken to address food waste in the mess.

The system has 3 components :

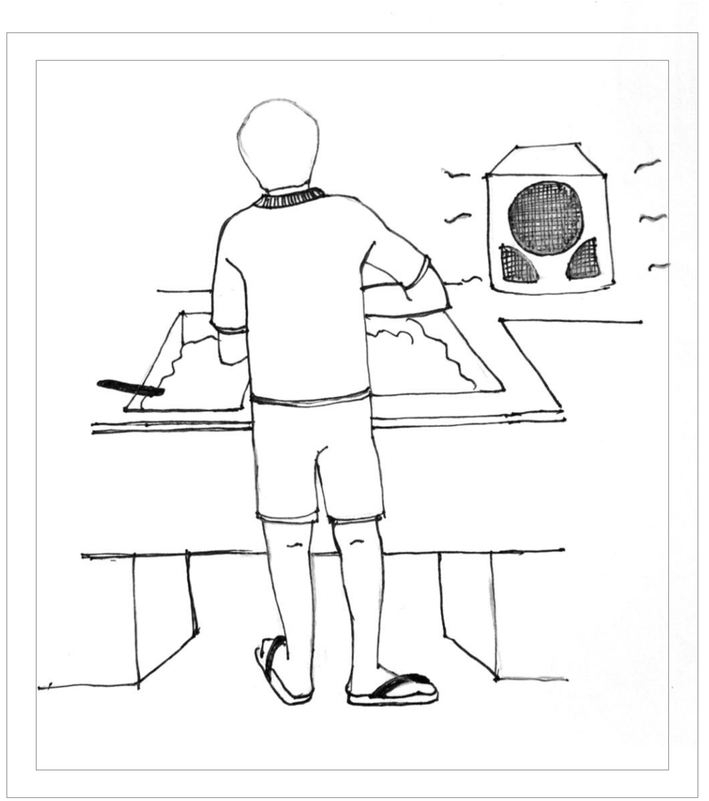
- Interactive Installation
- Feedback System
- Infrastructural Solutions



User Journey

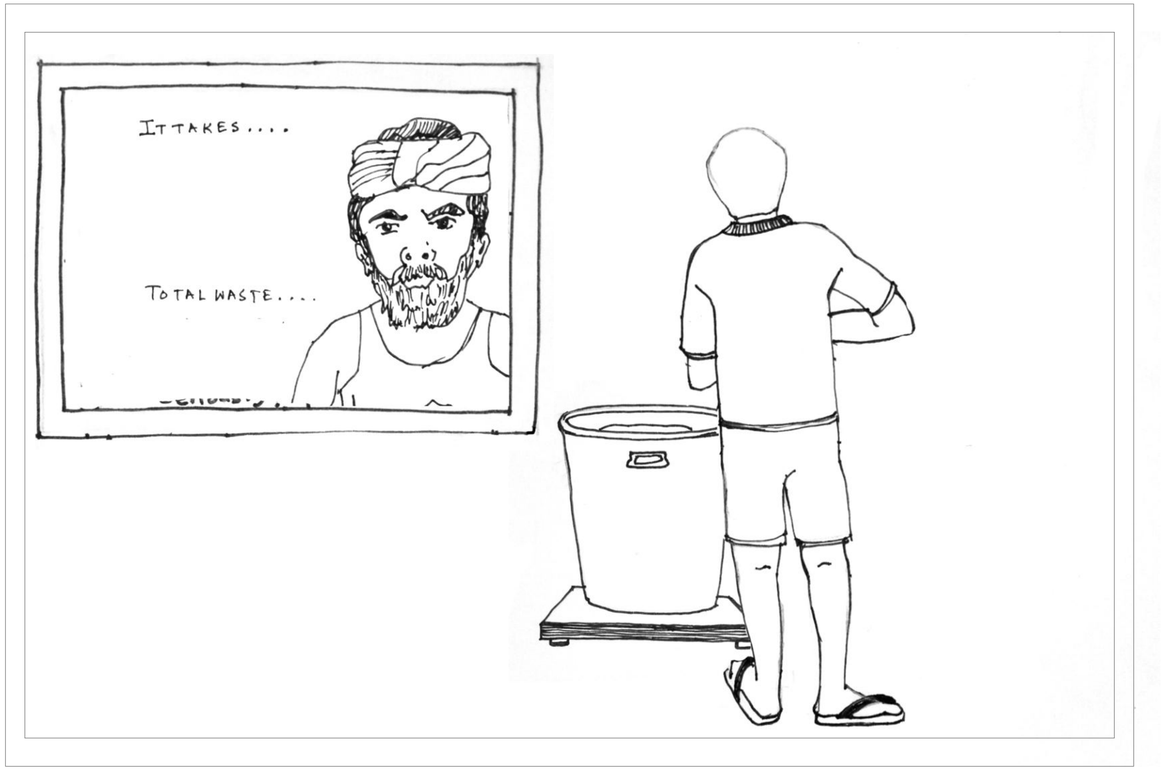
1. The student is on his way to the mess.

2. He checks the crowdsourced ratings and comments of food items from an mobile application.



3. He takes food while the audio system primes him by suggesting that he can come back later for a second helping.

Incidental Interaction

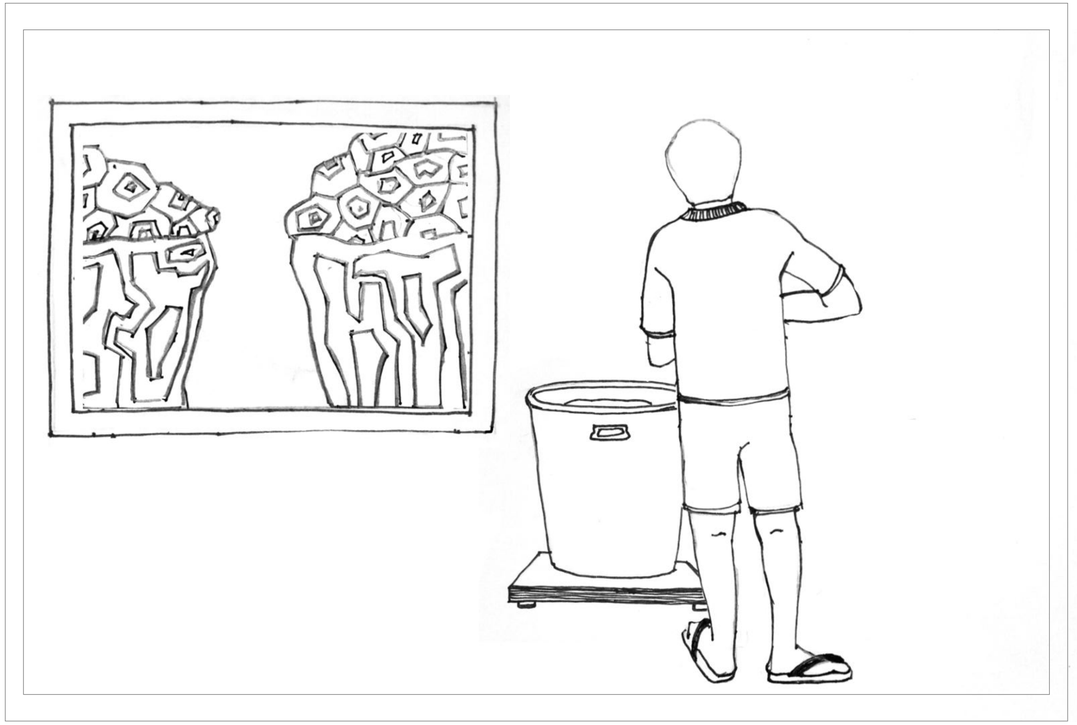


4i. He goes to the bin and the bin detects his presence. When he looks at the screen, the bin detects his face and shows him the amount of food he has wasted. He reads the message and feels bad about himself.

Performative Interaction

4p1. He eats food and learns from a poster on the table that they will get his favourite sweet item if their mess can win a game called ‘The Hunger Pit’.

He also goes through the brief game play.



4p2. He goes to the bin and helps the hungry man escape the pit. He increases the score for his mess. He requests his friends to waste less food so that they can get the special item the next day.

Evaluation

Evaluation Protocol :

- Evaluate with each installation having minimum four sets of data, one as pre and post assessment each.
- Individual and total wastes for each set should be recorded for quantitative evaluation.
- Validation of quantitative data should be done through an online survey with both open and closed questions.
- If the hardware fails, the same test needs to be repeated for that meal the very next day.
- If the parametric evaluation and the survey fails to show significance difference, the open ended questions can be analysed to conclude the results.

Evaluation Survey:

Measures	Closed Questions	Open Questions
Awareness about Food Waste (Motivation)	4,5,6,7,10,11	
Change in Behaviour	12,13,14,15	
Effectiveness of Installation as a medium	8,9,10,11,12,13,14,15	16,17
Demographics	1,2,3	

Evaluation Survey:

- Possibilities of other types of inferences -
- Change in behaviour against age.
- Change in behaviour against geographic location.
- Awareness against age.
- Awareness against geographic location.

Evaluation :

- Performed One Way ANOVA on 4 days of data (pre assessment, installation, post assessment).
- p-value not significant.
- Survey sent across the entire student group after installation.
- 80% of the audience mentioned that they get reminded of the installation when food waste is being discussed or someone wastes food.
- 60% of them felt that it was effective in spreading awareness while 80% of them thought it motivated them not to waste food.
- Motivated users were mostly taught as a child not to waste food.
- Motivated users are mostly not aware of the statistics of food waste in India.

Challenges

Challenges :

- Finding a sustainable solution to the food waste problem.
- Expansion and scaling up in different contexts.
- Attracting and retaining attention of the audience when implemented over a span of time.
- Fabricating aversive messages.

Future Scope

Future Scope :

- Implementing the feedback system to help students get prior feedback about food items.
- Hiding the focal points to prevent users from manipulating the sensors.
- Evaluating impact of performative installation.
- Evaluating the performative installation against incidental installation.

Conclusion

Conclusion :

- Interactive installations have the potential to initiate an engagement which is necessary for awareness creation.
- Carefully fabricated aversive feedback can be used as opposed by persuasive technologies for behaviour change.
- For awareness creation, social interactions should be minimised to facilitate self reflection.
- Display size is directly proportional to the level of initial and ongoing engagement.
- The installations triggered critical thinking as the audience were keen on giving feedbacks and suggestions.

Learning

Learning :

- Using interactive installations to achieve a target behaviour.
- Reconfiguring the space to increase the effectiveness of the installation.
- Changing the layout to achieve required amount of engagement by the audience.
- Extending the realm of interactive installations from ‘Pure Fun’ to ‘Target Oriented’.

Acknowledgement

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All my classmates

Mess Manager

Mess workers

Mess council members

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