KODI

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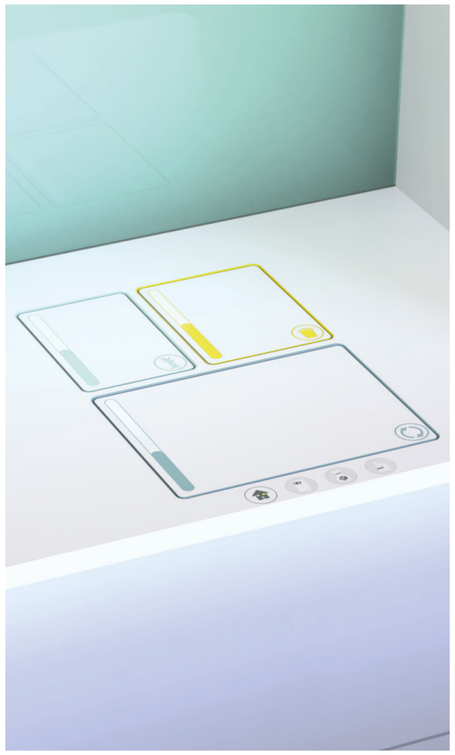


SUMMARY

This portfolio presents the concept of Kodi, a response to the selected ‘Future Homes and Energy’ genre. The future scoping design process and iterative development which has lead to this exciting proposal has been detailed.

Kodi is an intelligent home waste system that can save you the hassle of disposing of your refuse, whilst simultaneously substantially improving recycling rates. Kodi will be a feasible and a potential reality 10 years from now. Kodi is made up of 3 components to make waste disposal an effortless experience.

The Kodi Caddy sits under your counter-top and stores your waste. It’s interactive projected display provides feedback, making residents conscious of their behaviour. A robotic porter, the Kodi Concierge, collects waste from the Caddy autonomously, efficiently disposing of it into the Kodi Chute.

In 10 years’ time, rubbish trucks will be on the decline, replaced by the less polluting, cost-effect, and discrete Automated Vacuum Waste Collection System. Tunnels underground will carry waste from the Kodi Chute to a sorting plant, for waste to be systematically processed.

Kodi is the user-centred, front end of this larger, city wide system. By reducing the inconvenience of today’s waste system, Kodi will save consumer energy and improve recycling rates in future homes.

CONTENTS

meet kodi

INTRODUCTION

Identifying the design opportunities

PROBLEMS WITH TODAY'S WASTE DISPOSAL

Everyone has experienced the pain of a burst bin bag, the hassle of taking the bins out and the unpleasant job of cleaning up afterwards. All of these problems and more were potential opportunities for Kodi to improve on.

SCALE OF THE PROBLEM

In 2016, the UK produced 27 million tonnes of waste[1]

The recycling rate for household waste was just 45%[1]

7.7 million tonnes of biodegradable waste was sent to landfill, making no improvement on 2015.[1]

ASSUMPTIONS

We are designing for:

1 The world in 10 years time

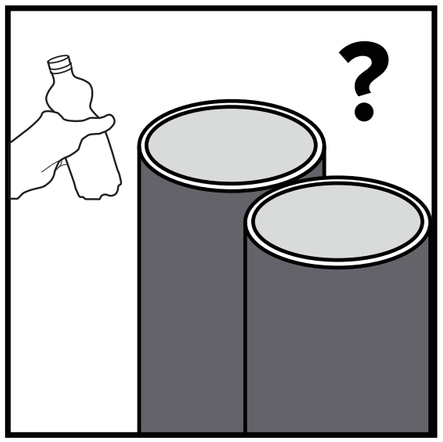
2 New cities

3 New build apartment blocks

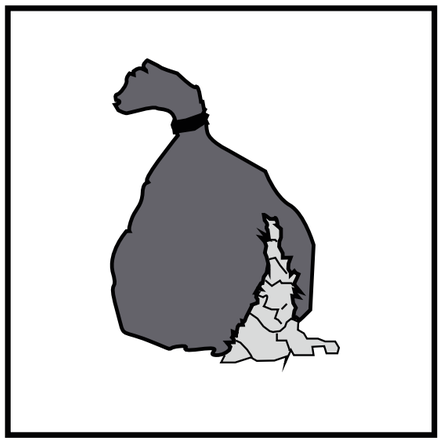
PROBLEMS TO TACKLE

Selecting the main issues with the current waste system to be resolved

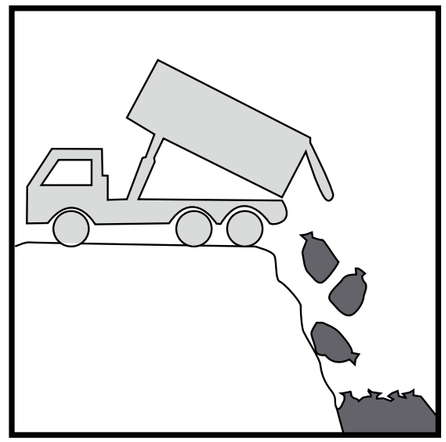
Lack of information



Hassle

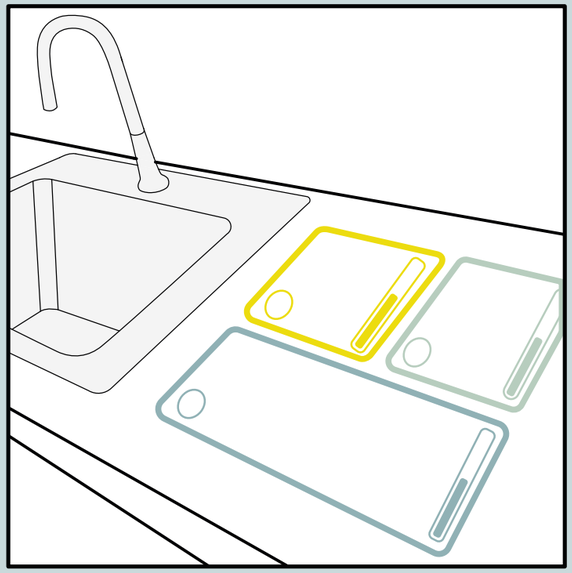


Sustainability



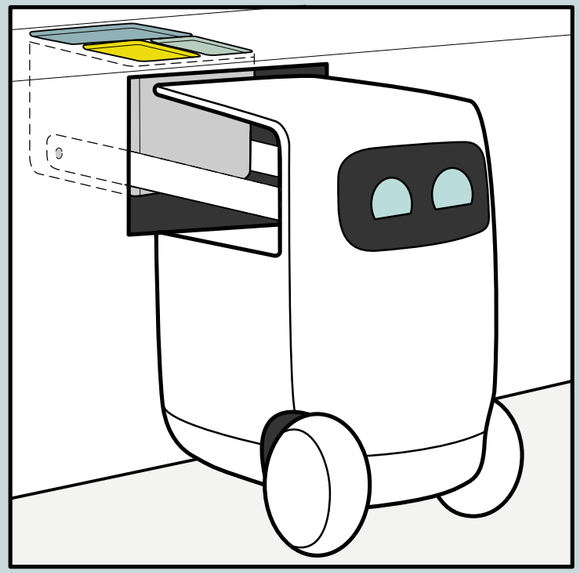
VALUE PROPOSITION

Choosing which pain points to target



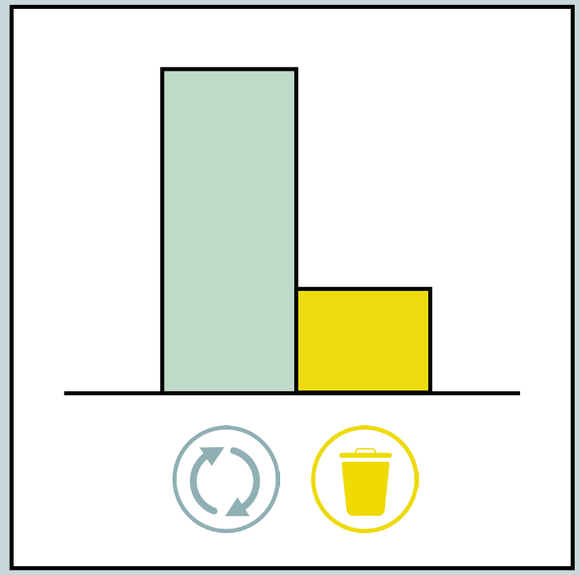
INTELLIGENT

Learns and adapts to your waste habits



EFFORTLESS

Never take out your waste again



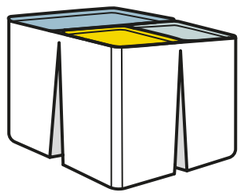
SUSTAINABLE

Gamification and feedback reduce waste

KODI COMPONENTS

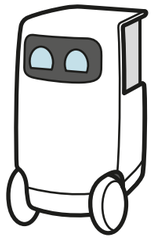
1 THE KODI CADDY

The Caddy is a refuse receptacle that sits within the kitchen.



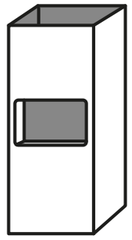
2 THE KODI CONCIERGE

The Concierge is an autonomous robotic waste collector.



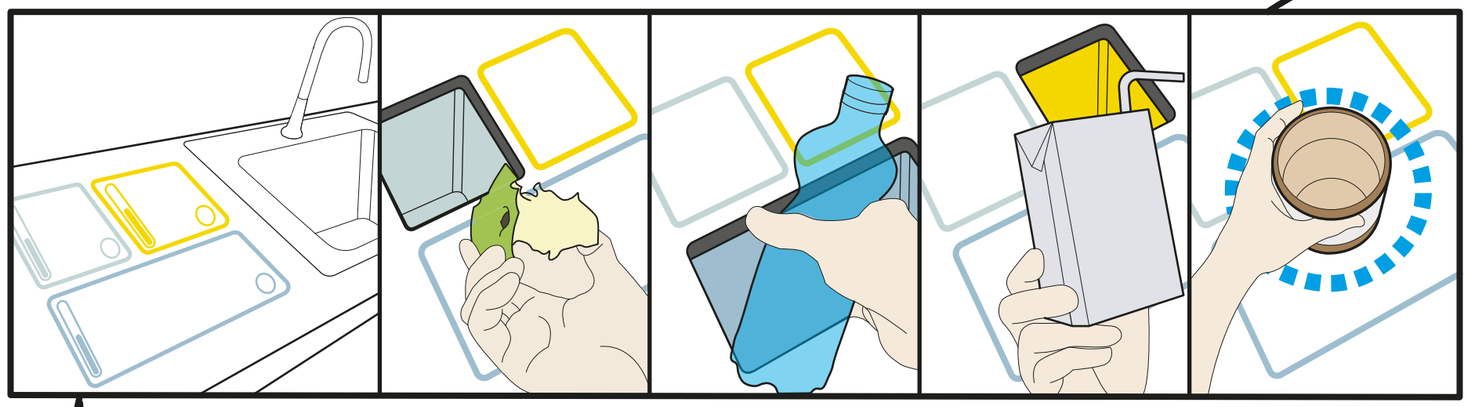
3 THE KODI CHUTE

The waste is dropped off into the Kodi Chute.

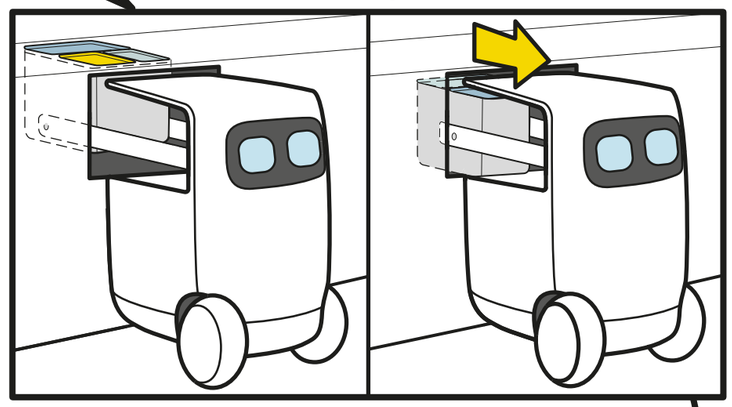


STORYBOARD

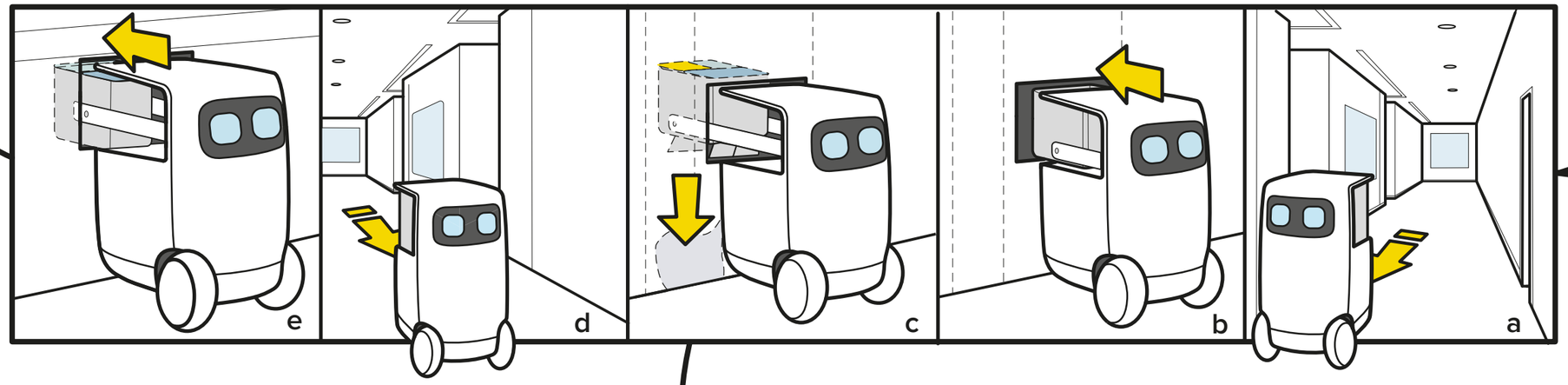
1. User puts waste into the caddy



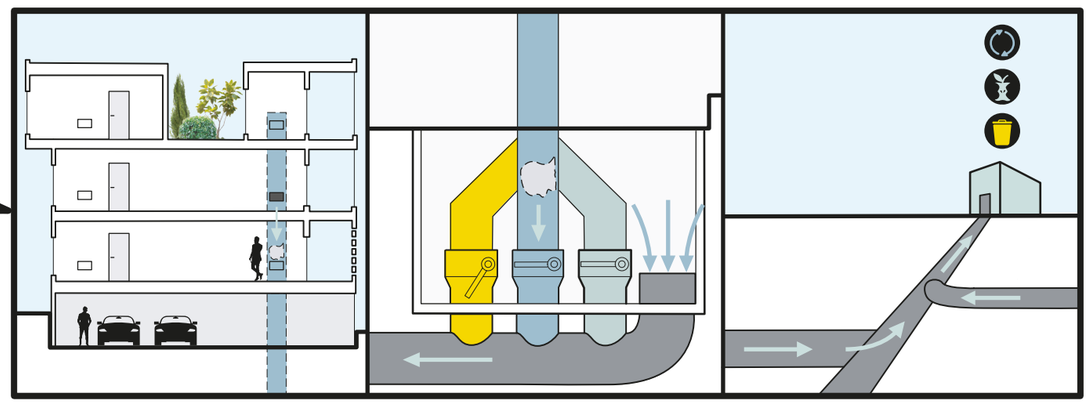
2. Concierge collects the caddy



3. Concierge empties rubbish into the chute and returns the empty caddy to user



4. Rubbish travels through the AVWC system

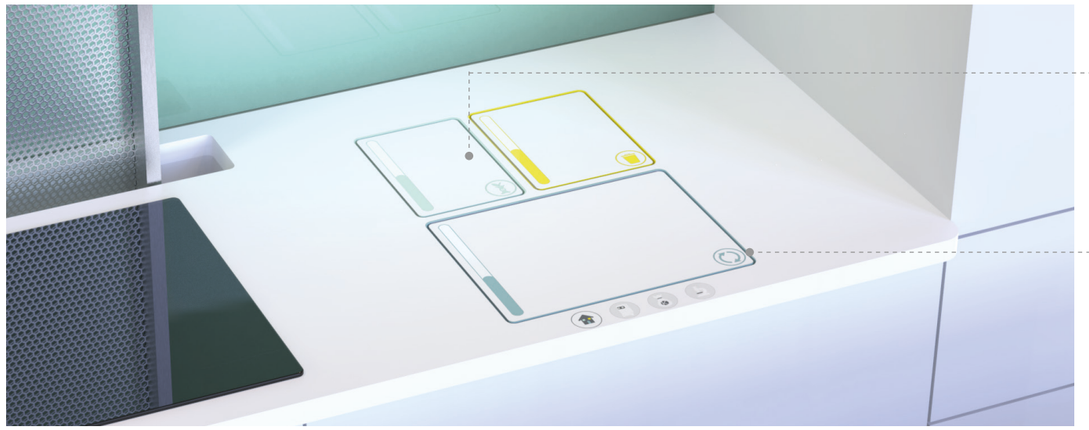


How do you use Kodi?

This is the sequence of actions undertaken by Kodi to dispose of your waste.

KODI CADDY

The Kodi Caddy is the refuse receptacle that sits within the kitchen. It is the main touch-point for the user to interact with, providing feedback on their waste.

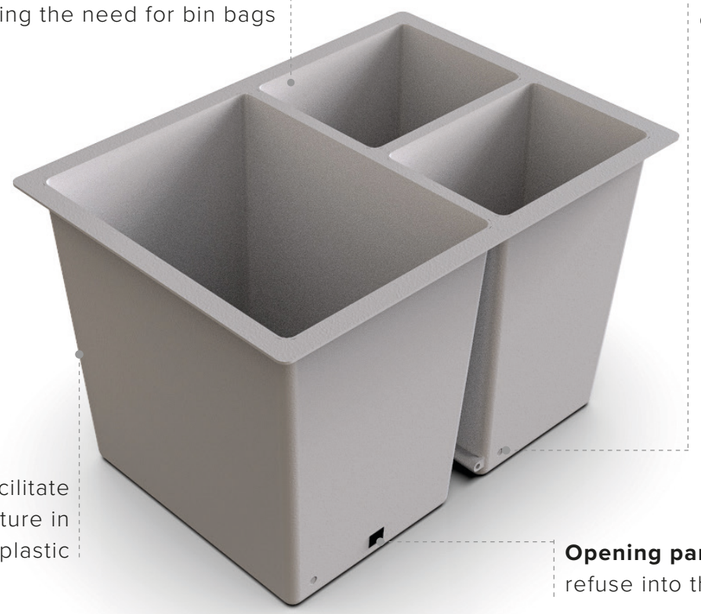


Projected interface on the counter-top.

Lids flush with the counter-top contain odours and hide waste

3 Sections: waste, recycling and biodegradable material

Hydrophobic surfaces repel all moisture and dirt, providing a strong, self healing coating[2], eliminating the need for bin bags



Pin holes allow the Concierge to grab onto the Caddy

3° draft angles facilitate mass manufacture in ABS plastic

Opening panels release the refuse into the Chute

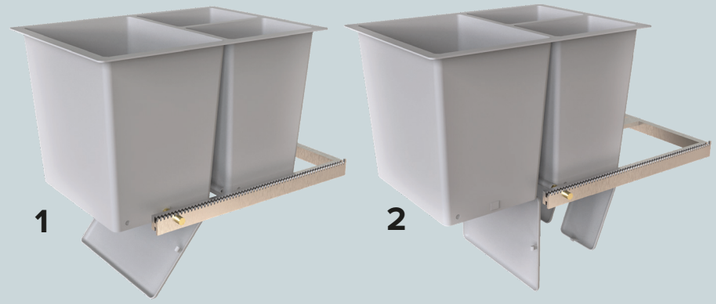
20% ORGANIC 12L

25% WASTE 15L

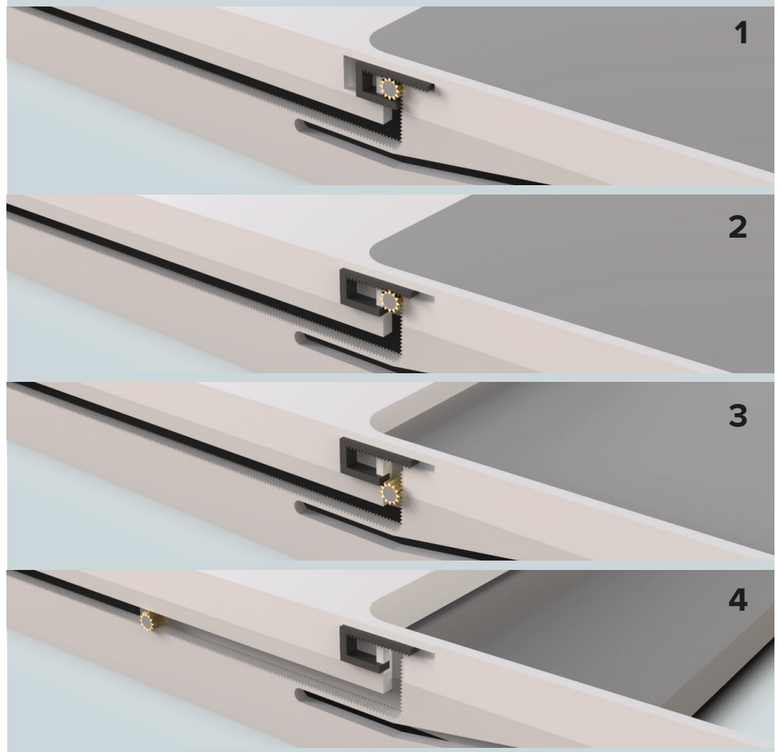
55% RECYCLING 34L

MECHANISMS

EMPTYING
Actuators in the Concierge arms depress clips, releasing rubbish into the Kodi Chute. Rubber seals are fitted to prevent leakages.



LID
A pinion mounted within the lid rotates and drags the lid through a slot. Clockwise rotation closes the lid, while anticlockwise rotation opens it.



CADDY INTERFACE

The interfaces are projected onto the counter-top, allowing the user to directly interact with Kodi. Kodi Koins are earned through a gamified system, and can be spent at sustainable partner organisations.

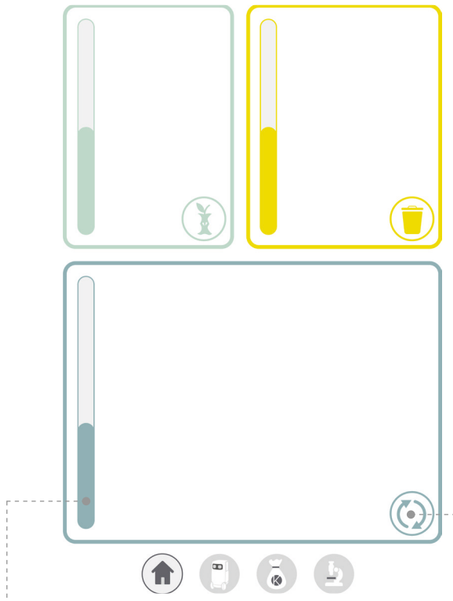
EARNING KOINS

Factors affecting how many Koins a user can earn include:

- Volume of Landfill
- Volume of Recycling
- Quality of Recycling

HOME

A hand gesture above or a touch of one of the compartment lids opens the Caddy. While the lid is open, computer vision tracks the inserted waste.

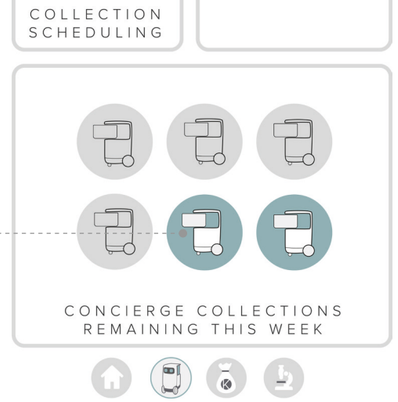


Logos indicating each type of refuse

Fullness of each compartment

CONCIERGE

Scheduling a convenient pick up time

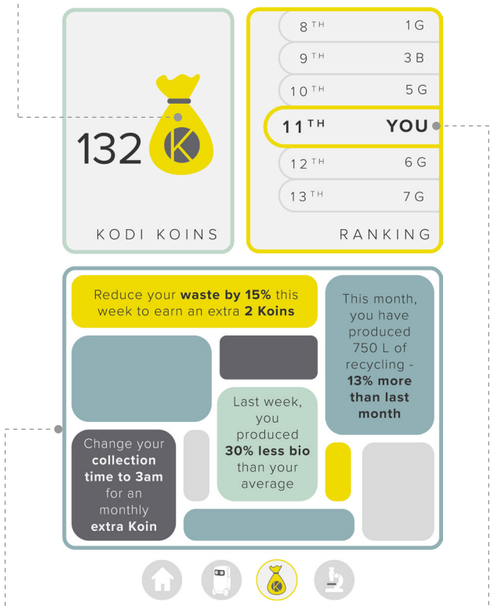


Immediate emergency collection

Number of remaining collections. Additional collections can be purchased.

DATA

Earned Kodi Koins

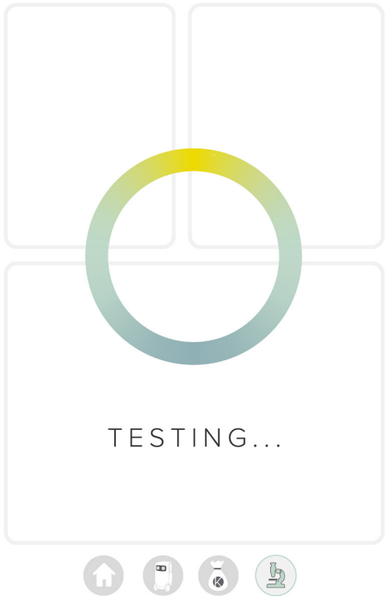


Apartment rankings stimulate competition between residents

Data Trends show key insights, more information is displayed when touched.

TEST

Users can place items in the ring and computer vision will identify the object, opening the necessary bin.



This large display would use infrared sensors to detect when and where the surface is touched. This principle has already been tried and tested by Sony's Xperia Touch[3].

KODI CONCIERGE

The Kodi Concierge is an autonomous robot that takes out rubbish. It carries the Caddy from the kitchen to the Chute. It travels between floors using the lift.

Facial expressions allow the Kodi Concierge to communicate with residents

Two large wheels and a smaller one allow traversal of carpet and hard flooring whilst facilitating a tight turning circle

Rubberised base protects the Kodi Concierge from any knocks and scratches

Illuminated wheel arches make Kodi visible from a distance

Sliding front panel covers the Caddy to lock it in, containing odours

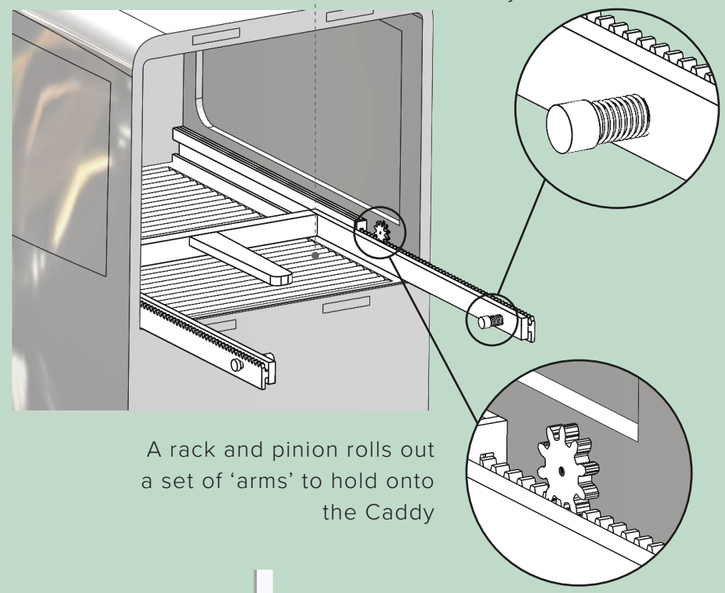
Frosted polycarbonate panels create a more spacious feel and show if a Caddy is inside

Locks allow the Concierge to latch onto the wall when collecting and disposing of waste, reducing the risk of unwanted access

GRABBING MECHANISM

Rollers allow the Caddy to slide in and out smoothly

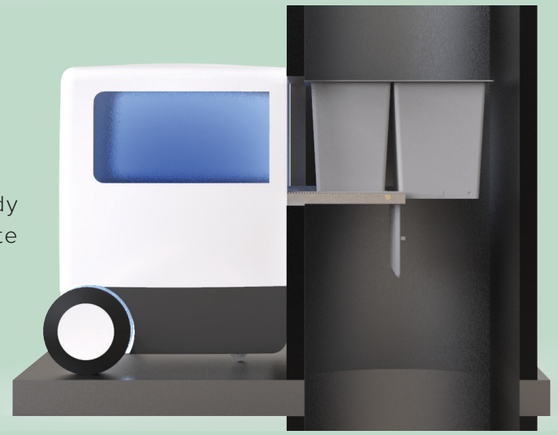
Pins on the end of the arms can extend and retract to grab the Caddy



A rack and pinion rolls out a set of ‘arms’ to hold onto the Caddy

Removing the Caddy from the kitchen

Emptying the Caddy into the Chute



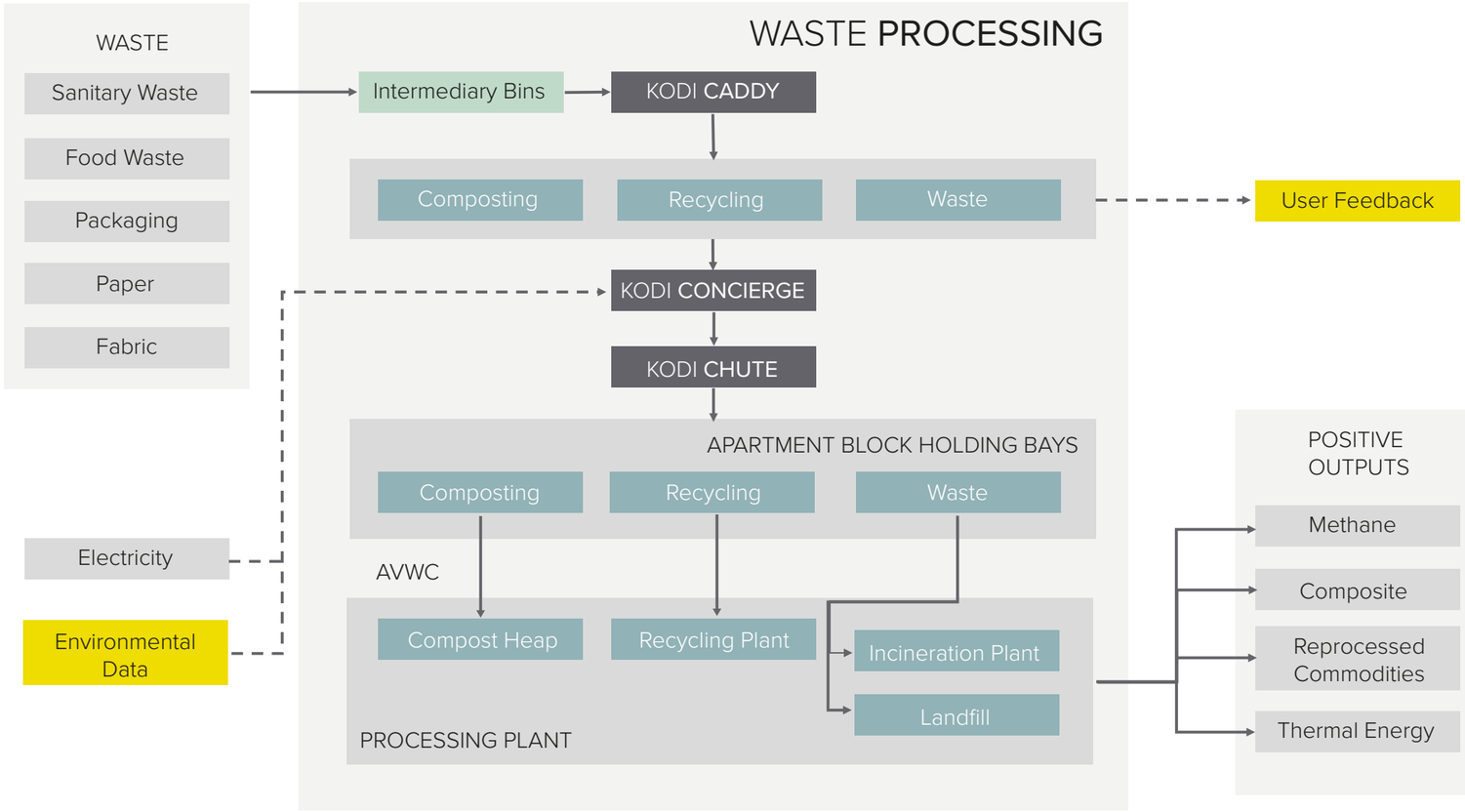
future

context

THE BIGGER PICTURE

How will Kodi fit into the world in 10 years time?

Kodi is the user centred, front end of a much larger waste system. It allows the residents to efficiently dispose of their rubbish into a city-wide waste collection structure. These two systems efficiently work in unison.



COMPARISON

AVWC	Less Congestion	Minimal noise, aesthetic pollution and odour	No urban air pollution	40 % lower operational costs[4]
TRUCKS	Clog up roads	Noisy, strong odour, eyesores	Exhaust fumes	Cost effective only in the short term

AUTOMATED VACUUM WASTE COLLECTION

AVWC is an efficient alternative to traditional rubbish truck collection in urban areas.

A tree shaped network of underground tunnels channels refuse to a sorting plant. Large turbines suck air through the tunnels, drawing the waste with it. Valves allow one branch to be isolated, reducing the volume of air that experiences suction.

Air inlets along the length of each branch let air into the system. An algorithm is used to optimise the suction sequence, minimising energy losses[6]. Once the waste reaches the sorting plant, it can be taken to the relevant processing plants for any further treatment, including recycling and incineration.

WEMBLEY CASE STUDY

The AVWC system has saved over 400 tonnes of CO_2, reduced waste collection movements by 75% and doubled recycling rates[5].

Just one of more than 1000 locations in which AVWC has already been implemented[4].

STAKEHOLDER MAPPING

Who is Kodi designed for?

The initial target market for Kodi will be young professionals or 'Yuppies'. This demographic are quick to try new products due to a disposable income and willingness to adopt new technologies. However, over time it is expected that Kodi could be used by almost anyone.

PRIMARY STAKEHOLDERS

Residents

Maintenance team

Building managers

SECONDARY STAKEHOLDERS

Sorting plant

City planners

The recycling plant

Construction teams

Designers and engineers

Employees at each stage

TERTIARY STAKEHOLDERS

Governing body

City cleaners

Law enforcement

TARGET MARKET

YUPPIES

BENEFITS FOR USER
Make lives more efficient
Relieves busy schedule
More leisure time

OPPORTUNITIES
Good at adopting new technologies
Disposable income

BARRIERS
Is it likely that an entire tower block would be full of Yuppies?

AGING POPULATION

BENEFITS FOR USER
Less reliance on carers
Increased independance
Extend time living at home

OPPORTUNITIES
The aging population is growing exponentially

BARRIERS
Less likely to adopt to new technologies

FAMILIES

BENEFITS FOR USER
Alleviate time stress
Keep the kitchen tidy
Improve hygiene

OPPORTUNITIES
With more people in the house, small chores like this seem less of a burden

BARRIERS
Not seen as a necessity

STUDENTS

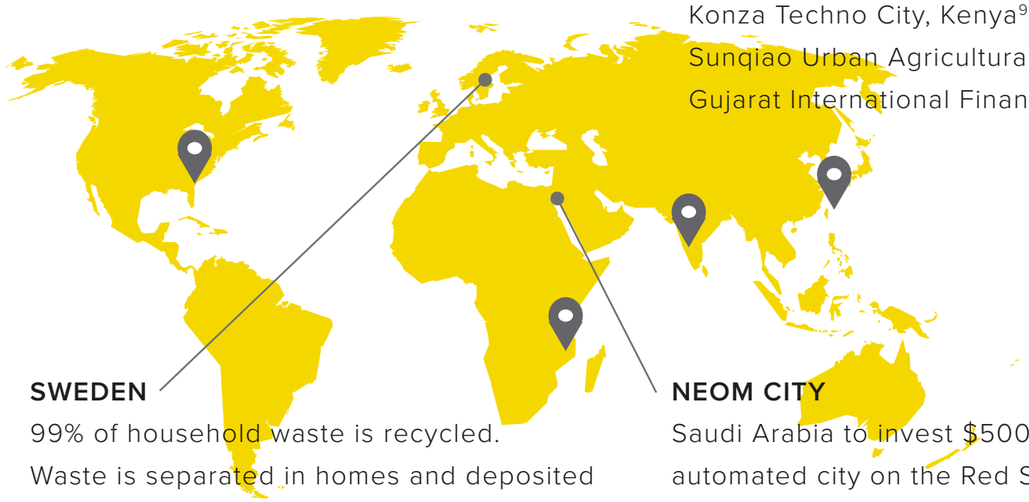
BENEFITS FOR USER
Improve hygiene
Ease the transition from home to living independently

OPPORTUNITIES
Applicable to student halls where people live in a similar setting

BARRIERS
Tight budget

FUTURE VALIDATION

NEW CITY OPPORTUNITIES



PROPOSED NEW CITIES

Destiny, Florida, USA[8]

Konza Techno City, Kenya[9]

Sunqiao Urban Agricultural District, China[10]

Gujarat International Finance Tec-City, India[11]

SWEDEN

99% of household waste is recycled.
Waste is separated in homes and deposited at recycling stations that are no more than 300 metres from residential areas[7].

NEOM CITY

Saudi Arabia to invest $500 billion in fully automated city on the Red Sea coast.
It will be an independent zone, with its own regulations and social norms[12].

BENCHMARKING

TITAN TRASH COMPACTOR

Compacts the rubbish using a system that ensures only the bin bag touches the rubbish[13].

DUSTCART

Urban robot developed to collect refuse and perform deliveries[14].

SAM

Robot concierge changing the way residents interact within their senior living community, providing check-ins and non-medical care[15].

GITA

Robot porter that follows people to give a helping hand. A hatch on top gives access to a compartment, which can carry 18 kg[16].

ROADMAP

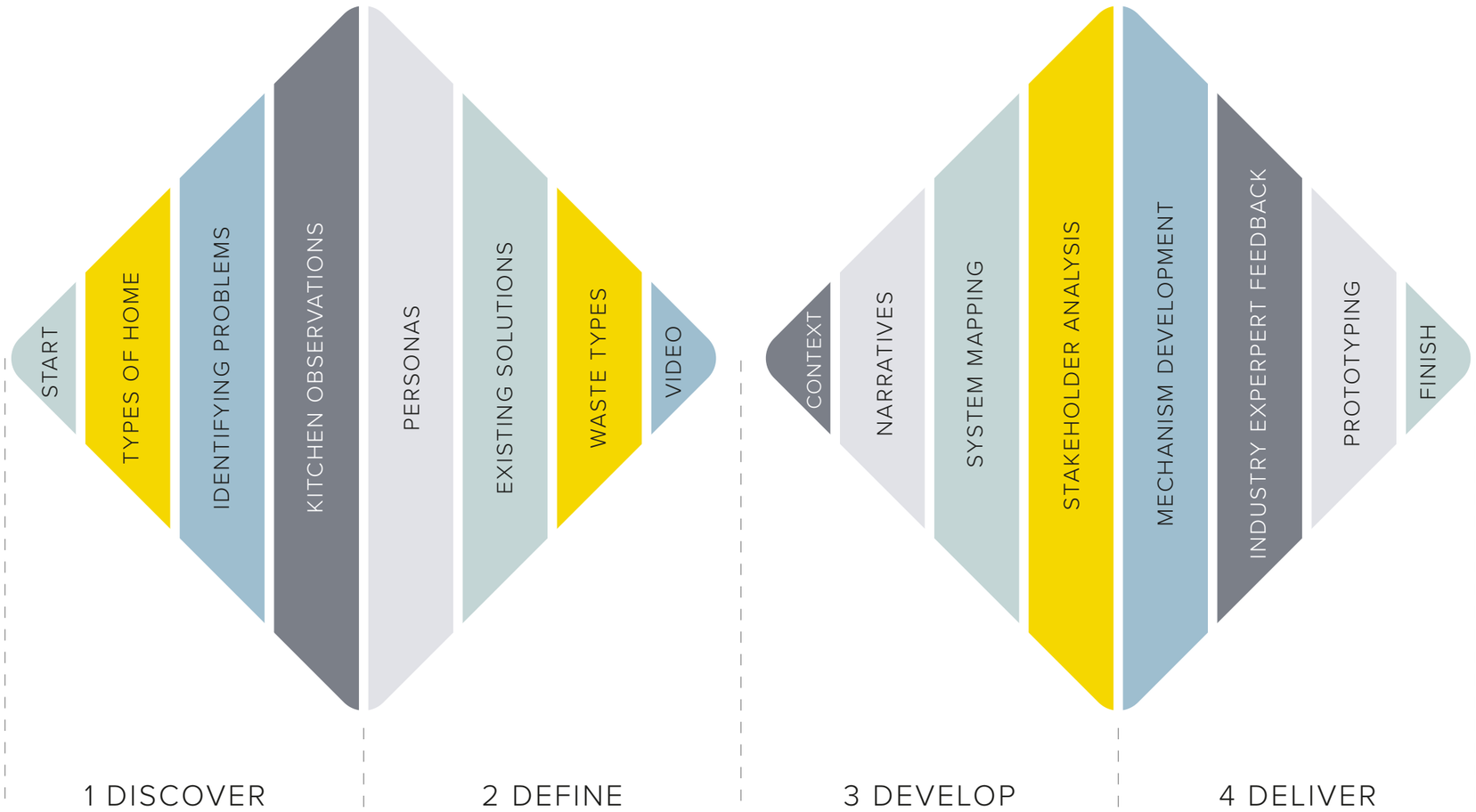
	NOW	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
WASTE	UK recycling rate was 44.3 % in 2015, commingled waste system[1]	Increase in compost-able packaging[17].	Most packaging is mono-material and recyclable, soft plastics can be recycled.	Legislation ensures sustainable packaging and products.	Reductions in crude oil based products and landfill use.	Fully sustainable packaging, landfill eliminated waste seen as a valuable commodity.
CITIES[18]	Existing cities experience overloaded infrastructure and housing shortages.	New urban areas are being planned, focusing on the residents' well-being.	Focus shifts to environmentally friendly infrastructure as climate change becomes more evident. Almost 66% of people will live in urban areas.	Residents of the new locations enjoy a healthier environment.	The second generation of 'new cities' is planned, improving on existing ones.	Cities are designed with sustainability as the priority.
ROBOTIC PORTERS	Inelegant first attempts have been made such as Gita[19] and SAM[15].	Robots like Gita will start entering markets where they are most necessary such as medical care.	Robots are in development for use as apartment block porters.	The new robots begin to penetrate the market, starting with the luxury and care markets.	A fully functioning robotic porter is in popular use in some apartment blocks.	Many jobs are replaced by robots.

design process

OPPORTUNITY EXPLORATION

Narrowing down from ‘Future Homes and Energy’ to Kodi

TOPICS EXPLORED



MACRO CONTEXTUAL ANALYSIS
Scenarios
SWOT
PESTLE Analysis
Six Ws and an H

SPECIFICATION
Design Brief
Stakeholder mapping

PLANNING
Gantt Chart

CREATIVITY
Mindmapping
6 Thinking Hats
Morphological Analysis
Agile Sprints

EVALUATION AND REVIEW
Industry expert feedback
Critical review evening

1 Today’s problems in different types of homes were identified. These were narrowed down to urban residential homes. The kitchen environment was then explored and the elements within it critiqued in order to find opportunities for improvement.

2 Waste disposal was found to be an area that a lot of people found bothersome.

3 A future scenario was built and validated and around this new, more efficient waste disposal system being designed.

4 Finally, the team focused on communicating the validated scenario surrounding Kodi to third-party audiences.

TOOLS AND METHODS

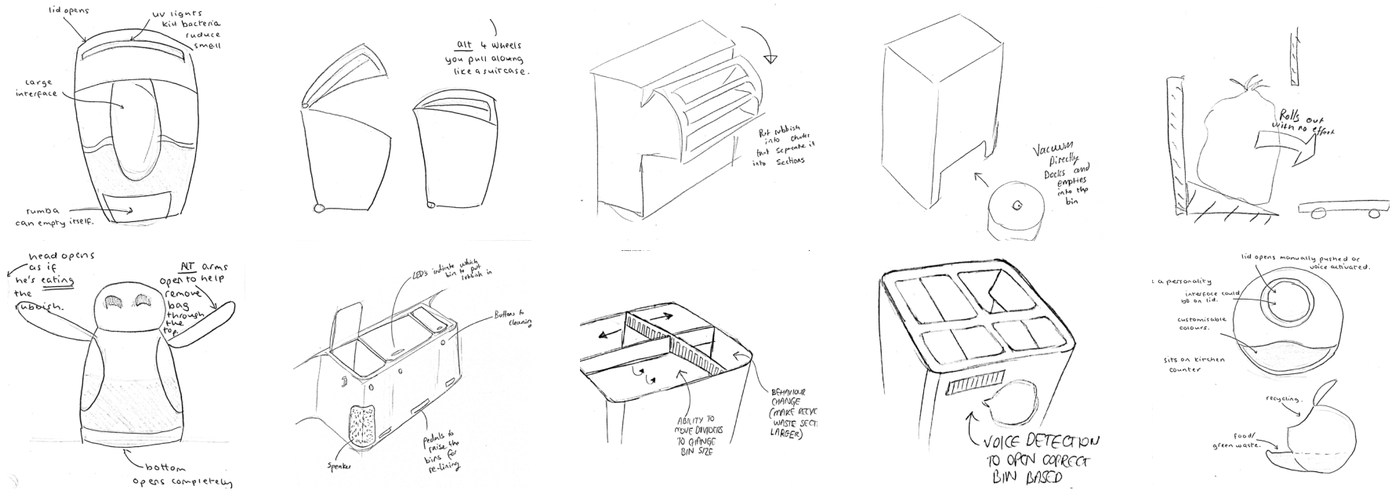
In order to narrow down such a broad spectrum of ideas, we used a variety of tools. These included design reviews, ideation workshops, user feedback, industry expert advice and macro contextual analysis.

COMPONENT DEVELOPMENT

How did the development of Kodi lead to the 3 components?

After the decision was taken to tackle waste within the home, a wide range of ideas was narrowed down into a cohesive product. Iterative sketching and discussion lead to the final form of Kodi.

IDEATION



SPECIFICATIONS

KODI CADDY

1. Facilitates separation and collection of waste into 3 categories: biodegradable, recycling and waste.

2. Provides the user with feedback and data on their waste.

3. Allows the Concierge access, without it entering the home.

KODI CONCIERGE

1. Collects waste from an external port to someone's home

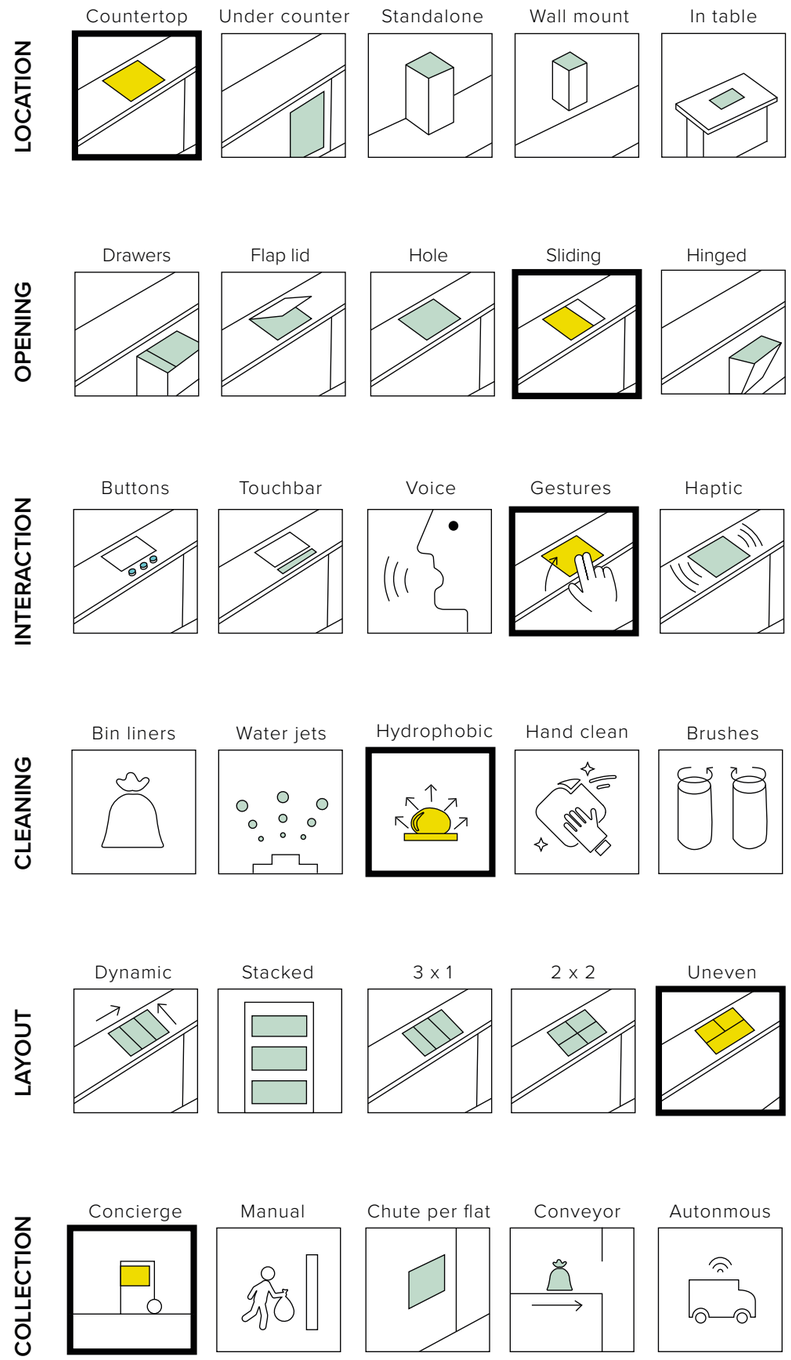
2. Drops off the waste into the Chute, ensuring each category is kept separate.

KODI CHUTE

1. Allows the Concierge to drop off waste into the holding bays below.

2. Only allows access to the Concierge, no one else.

MORPHOLOGICAL ANALYSIS



INTERFACE DEVELOPMENT

How to change people's attitudes to waste?

A gamified system was developed as part of the interface, encouraging users to recycle and compost more, while sending less waste to landfill.

GAMIFIED SYSTEM DESIGN

*'People will change their behaviour if they see the new behaviour as **easy, rewarding** and **normal**' [20]*

- Katzenbach, Steffen and Kronley

In order for behavioural changes to happen, people need to:

Feel incentivised[21]

Feel part of a community[21]

See change happening[22]

Receive penalties[23]

Commit to change[24]

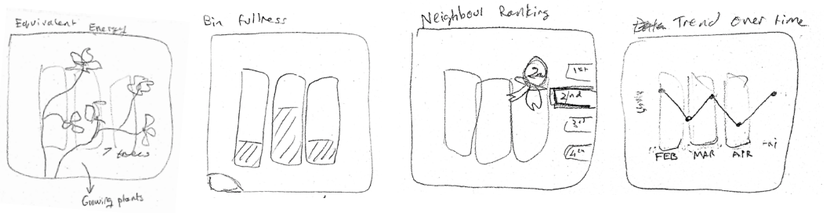
Pre-commit to targets[25]

A universal, gamified points system was designed to incentivise people to change. It heavily penalises poor quality recycling while rewarding outperforming expected quantities. Points are distributed based on 5 factors:

- Volume of recycling (V_R)
- Volume of landfill (V_L)
- Quality of recycling (Q)
- Expected landfill average (L)
- Expected recycling average (R)

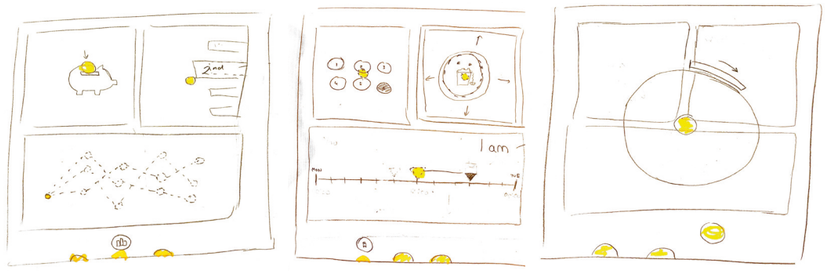
$$Koins\ gained = \frac{RL \times Q^2}{\left(\frac{R}{V_R} + \frac{L}{V_L}\right)}$$

INITIAL WIRE-FRAMES



FINAL WIRE-FRAMES

Splitting the interface into 3 defined screens



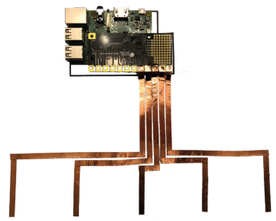
Exploring intuitive logo graphics to reduce text

Using the opening lids as interface boundaries

Touch points (in yellow) for the demonstration interface

DEMONSTRATION INTERFACE

A large, projected interface was made using a bare conductive PiCap to create capacitive touch sensors. The electrodes were placed to imitate the real interface. Wires were connected using ring terminals. These were cold soldered with conductive ink to small circles of indium tin oxide (ITO) coated PET. This is a sheet of clear PET that has been treated to make it conductive.



Early stage testing

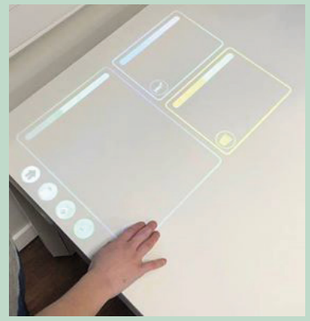
MadMapper is a projection mapping software that helped us align our projections with the counter-top holes.

Serial

OSC signals

Change in capacitive field of electrodes → Raspberry Pi Python script → Processing script → MadMapper → Projector onto counter-top

USER TESTING



"What is the tree showing?" - Student, 21
A money bag graphic was used instead to make it intuitive

"How do I earn Koins. It sounds very complex?" - Gareth McNeil, Joseph Joseph
Koin collection system was simplified using fewer variables

"The data trends graph does not initiate engagement" - Stephen Green
User insight facts are now used with more information if the user touches the display

"Icons are unclear, what is the blue one?" - Student, 21
Recycling was made more familiar to existing designs to conform with cognitive stereotypes

CADDY DEVELOPMENT

REFUSE CATEGORIES

The Caddy has 3 sections, recycling, biodegradable and waste, decided upon after an interview with Verity Parker, a recycling officer. Higher quality recycling is produced when it is separated into more than one category beforehand. However, less will be collected, as people care less for such a complex system. In contrast, co-mingled (mixed) recycling produces higher rates, but of a lower quality.[26]

The conclusions drawn were that co-mingled would be best for Kodi, as the intelligent feedback system will improve the quality of co-mingled recycling, retain the higher rates, and adhere to the effortless quality of Kodi.

REFUSE QUANTITIES

The proportional sizes of each Caddy section were based on today's data that was extrapolated for 10 years time.

UK DAILY: 1.4 kg refuse[27]

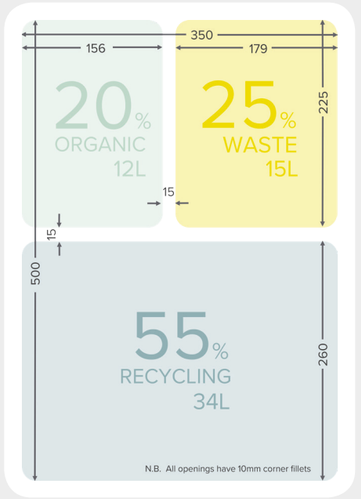
8 litres recycling[28,29]

8 litres waste[28,29]

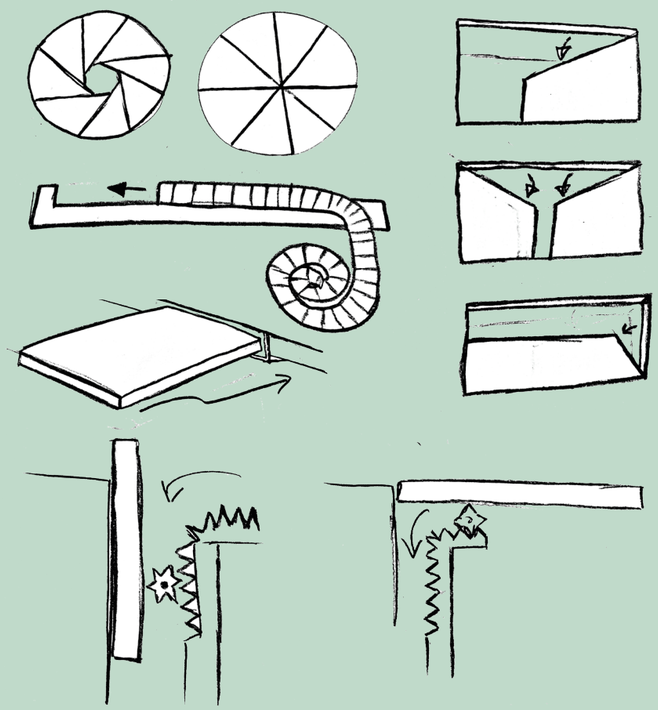
3 litres biodegradable[28,29]

FUTURE

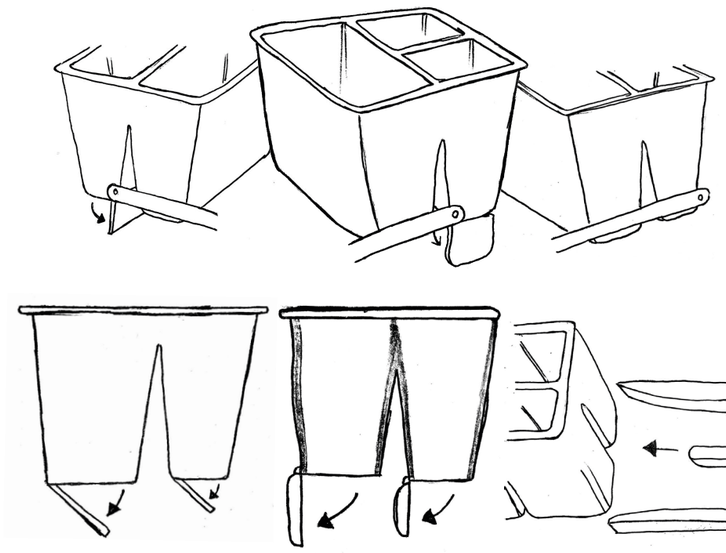
The predictions based on extensive research made in the futures roadmap (Page 10) lead to the final caddy proportions. These are based on the daily collection schedule of the Kodi Concierge.



COUNTER TOP OPENING IDEATION

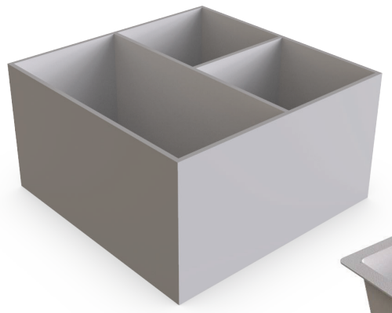


CHUTE MECHANISM IDEATION



Various opening flaps were designed and tested. The same orientation was chosen for the opening of all the compartments to reduce the number of actuators required.

Lower flaps were adjusted to reduce the complexity for manufacture with sealing parts.



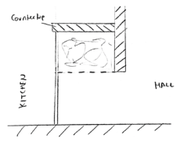
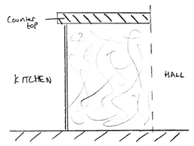
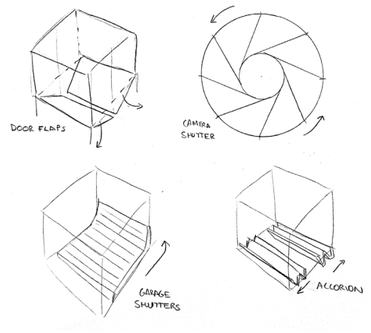
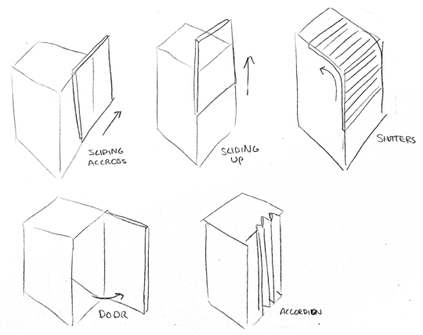
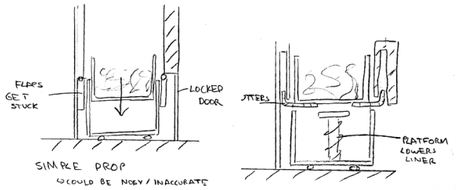
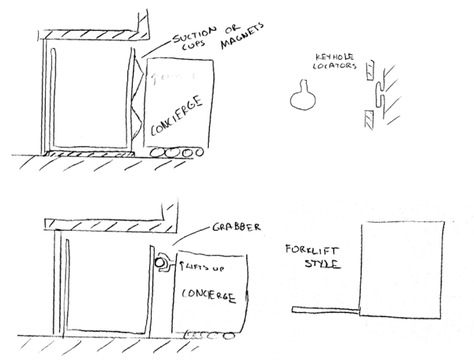
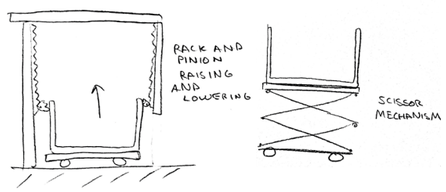
Initial CAD

Final CAD

Cardboard Prototype

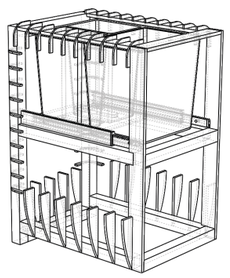
CONCIERGE DEVELOPMENT

FUNCTION

CONCIERGE COLLECTS FROM BELOW		CONCIERGE COLLECTS FROM THE SIDE
		
	OPENING MECHANISMS	
	COLLECTION MECHANISMS	
		

PROTOTYPING

The mechanism was prototyped using laser cut acrylic, whilst a sketch model of the form was created by making cardboard compound curves around a wooden frame.



How was the Concierge developed?

The Concierge design was based around the ‘form follows function’ ideology. The mechanisms required to remove the Caddy from the kitchen and empty it’s contents into the Chute were developed first, followed by aesthetics and form iteration.

FORM

1 BLOCK MODEL

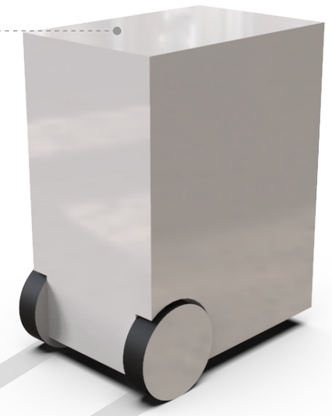
This model provided an initial understanding of the dimensions required, and how each component would fit together.

2 FIRST DESIGN

In this model, the block model was advanced to give a much better impression of the Concierge. A ‘ribbon’ that wrapped the insides was used and several different styles of eye were trialled.

3 FINAL DESIGN

The boxy, intermediate version was been matured to create a friendly, more organic shape. The oversized wheels and face make it feel more approachable and available for interaction. By adding translucent windows, the whole design is more airy and less substantial.



FUTURE DEVELOPMENTS

What would be changed about Kodi in the future?

In the short time that Kodi has been developed, there are many more things that could be added and aspects to be improved.

FUTURE TECHNOLOGIES

As time goes on, new technologies will be developed which could replace those that we have selected for Kodi. The current method to make the interface is through the use of motion tracking, although this could be displaced by something more advanced.

EXPANSION

Currently, Kodi is designed specifically for apartment blocks. In a future version of Kodi, it needs to be compatible with a much wider variety of housing types, including houses and care homes.

TESTING

Most importantly, Kodi needs to be tested in a real life setting with a wide variety of users. The invaluable data and feedback collected from these studies would likely cause significant changes to the design and functions provided by Kodi.

SIMPLIFICATION OF MECHANISMS

Through further testing, iteration and physical prototyping, the current mechanisms could be designed to be more robust. In doing so, they could be simplified for much easier manufacture and assembly.

APPLICATION

A mobile app would also be designed to go with the 3 Kodi components. This could allow the user to access their data at anytime, anywhere. Furthermore, it could connect with a public waste disposal system.

ADAPTIVE PERSONALITY

Machine learning should be implemented for Kodi to learn and adapt to each individual's habits. This would stretch from the macro scale to the micro scale, from cultural differences to the personalities of each inhabitant.

FINAL REMARKS

CONCLUSION

Kodi was designed in response to a variety of common problems with today's waste system. The 3 components of Kodi worked together to create an effortless, intelligent and sustainable solution. A future scenario was built up around Kodi, creating a clear picture of what the total future waste system will be like in 10 years time. Overall, Kodi is a potential future reality, solving a range of issues associated with waste in the home.

CONTRIBUTIONS

Anna Bernbaum

- Project management
- Concierge and Caddy ideation, final CAD
- Contextual research (Benchmarking, roadmap, AVWC)
- Concierge mechanical design
- Interface prototyping and wire-frames
- Planning and execution of Concierge manufacture

Felix Crowther

- Behavioural research and points system
- Contextual research (case studies, current waste system)
- Counter-top opening panels design
- Caddy and Concierge mechanical design
- Building the sketch models
- Rendering

Lidia Dynes Martinez

- Storyboard
- Graphics editing (info-graphics, portfolio)
- Interface wire-frames
- Contextual research (stakeholder analysis)
- Graphics package
- Presentation leaflet

Sanish Mistry

- Interface graphic design
- Concierge and Caddy ideation
- Concierge and Caddy mechanical design
- Concierge and Caddy CAD
- Kitchen demo model CAD and manufacture
- Contextual Research (AVWC, Waste Management, New Cities)

Sylvia Zhang

- Contextual research (new cities, stakeholders)
- Caddy manufacture
- System diagram graphics
- Opportunity exploration
- Concierge collection flowchart
- Concierge and Caddy ideation

DESIGN TOOLS

The following programs were utilised during the project. Solidworks and Keyshot were used together in order to model and render the three Kodi components.

The Adobe Suite was used to produce this portfolio and the interface animations for the Caddy. Finally, the team used a shared OneNote to compile research and produce targets that were completed weekly to stay on time according to the Gantt chart.

ACKNOWLEDGEMENTS

EXTERNAL EXPERTS

Verity Parker, Recycling Officer at Surrey Heath Borough Council
Verity gave us invaluable inside knowledge on how today's waste system operates and what the current problems are. Her expertise helped us to select use of a co-mingled refuse system.

Gareth McNeil, Senior Design Manager at Joseph Joseph Ltd
Our heavy focus on the front end of the waste system and final embodiment of Kodi was strongly influenced by Gareth's crucial viewpoint as a designer of similar product ranges.

Norah Lewis, Technical Specialist - Circular Economy Strategy at WRAP
Norah helped us to ensure that every decision we made was fully validated and all options thoroughly considered. Her essential advice helped to shape the design process.

OUR TUTORS

Stephen Green, Senior Teaching Fellow at Imperial College London
Stephen's advice significantly shaped the path that the project took as well as the final embodiment. His broad range of expert knowledge helped us to draw a wide spectrum of topics together to form a coherent and innovative project.

Sam Cooper, Lecturer at Imperial College London
The innovative and out-of-the-box ideas that Sam presented to us influenced the decision to make Kodi as a 3 part system. His knowledge on different technologies aided us in our mechanical design.

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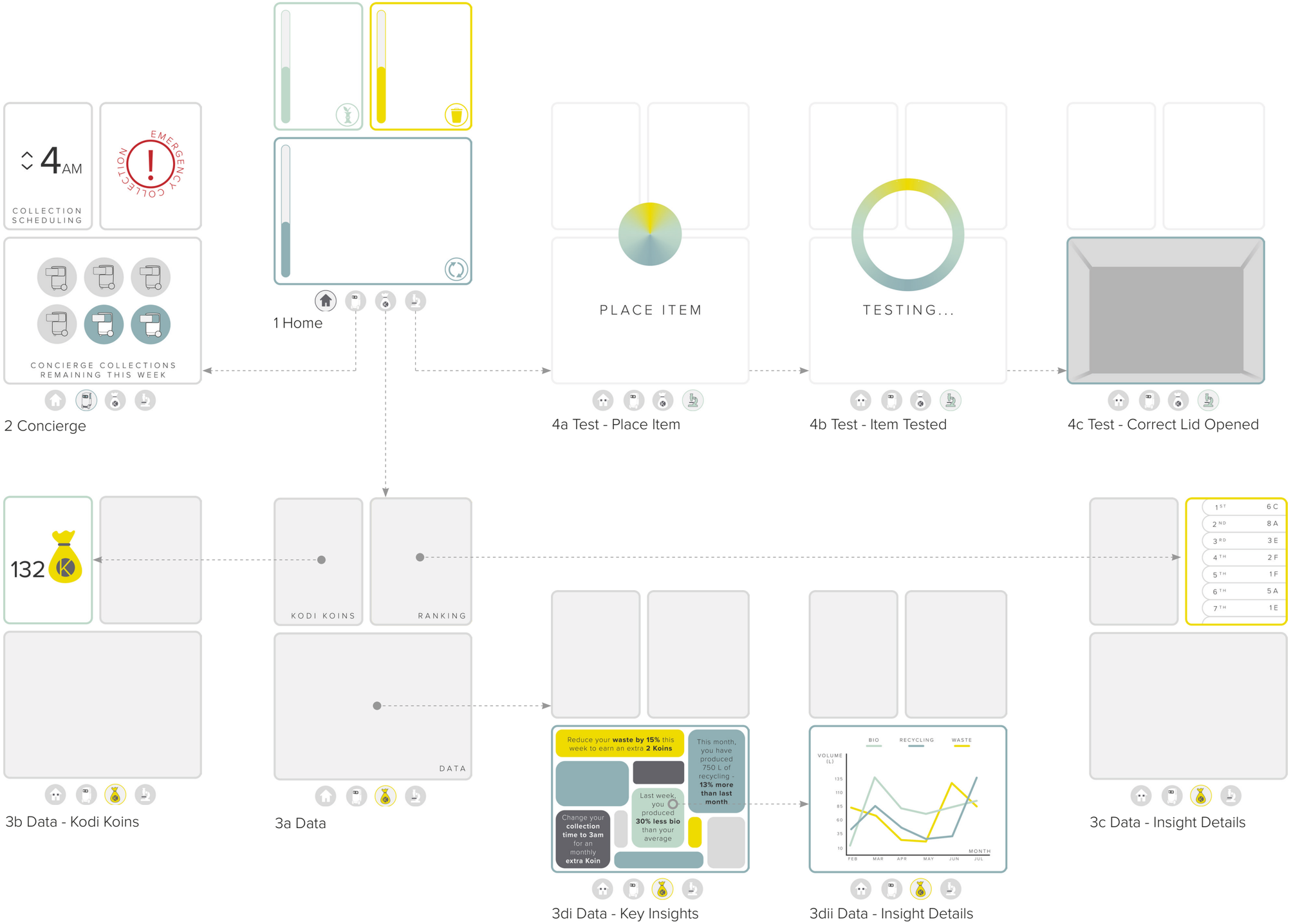
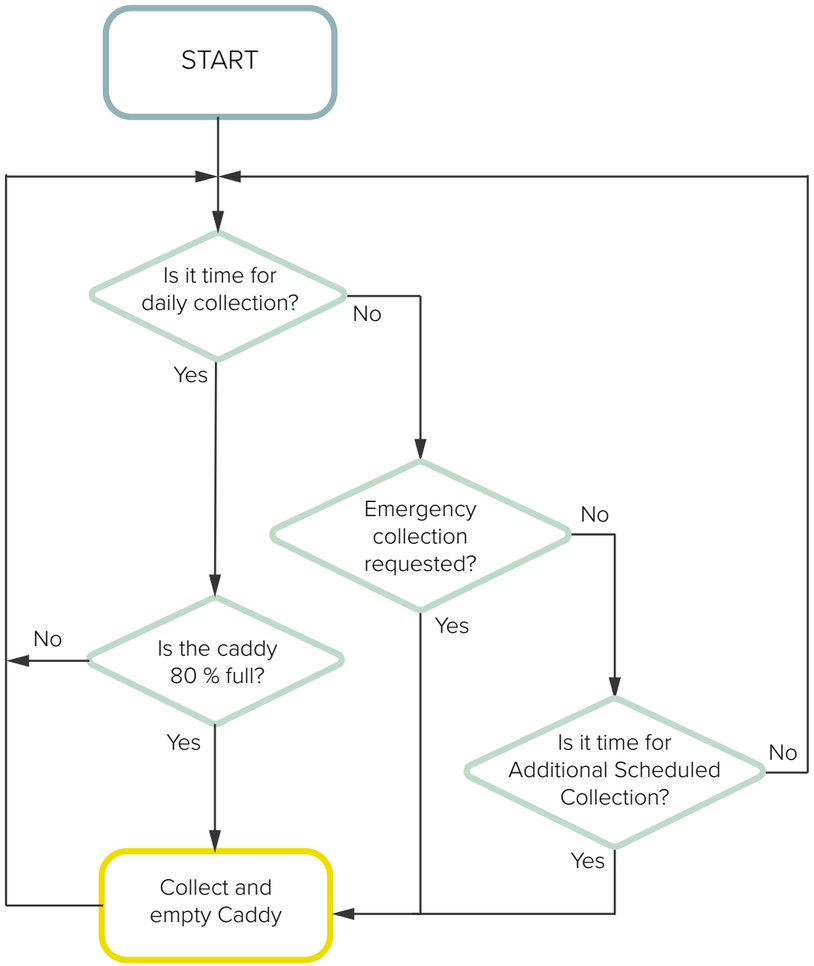
APPENDIX A: INTERFACE FLOWCHART



APPENDIX B: COLLECTION SCHEDULE

The default time for daily collections is 4 am every day, to minimise Kodi interfering with the user's day to day lives. Furthermore, by charging Kodi overnight, it takes advantage of the comparatively inexpensive electricity rates.



APPENDIX C: AREAS EXPLORED

CADDY	CONCIERGE	CHUTE
DEVELOPED		
Aesthetics Size Form Interaction Ergonomics Opening mechanism Feedback Interface Behavioural aspects	Caddy collection mechanism Aesthetics Size	Caddy empyting mechanism
CONSIDERED		
Smell Manufacture Sensors and motors Security Hatch mechanism Architectural integration Interface manufacture	Aesthetics Smell Logistics Cleaning Route planning	Location within building Concierge attachment
AWARE		
Power cuts Hatch aesthetics, noise and manufacture Wider kitchen use of projected interface	Noise Electricity costs Maintenance Manufacture Recharging Manoevring Additional uses	Installation Manual override

APPENDIX D: GANTT CHART

Deliverables	Person Responsible	Tasks	Week No.	1	2	3	4	5	6	7	8	9	10	11	Easter Break
			Week Beginning	08/01/2018	15/01/2018	22/01/2018	29/01/2018	05/02/2018	12/02/2018	19/02/2018	26/02/2018	05/03/2018	12/03/2018	19/03/2018	26/03/2018
Portfolio	Lidia	Selecting contents													
		Layout													
		Inserting content													
		Re-drafting and finalising													
		Printing and binding													
Interim Poster	Anna	Selecting contents													
		Layout													
		Inserting content													
		Re-drafting and finalising													
		Printing													
		Displaying													
Final posters	Sylvia	Selecting contents													
		Layout													
		Inserting content													
		Re-drafting and finalising													
		Printing													
		Displaying													
Storyboard	Lidia	Familiarise self with Adobe Illustrator													
		Storyboard each scene													
		Sketch each scene													
		Produce scenes in illustrator													
CAD lookalike	Felix	Concept sketches													
		Iterate chosen design													
		Final Design													
		Final CAD													
		CAD Renders													
Interactive Surface	Anna	Select Modelling Method													
		Set up RPi													
		Test conductive ink													
		Design conductive ink layout													
		Graphics													
		Model and build projector mounting onto the cabinet													
		Connect ink and graphics													
CAD Workalike	Sanish	Mechanism research bin opening													
		Mechanism research concierge interaction													
		Functionality research waste identification													
		Design detailed mechanisms													
		Final renders & animations of functionality													
Physical Mechanical Models	Felix	Brainstorm and sketches													
		Cardboard model													
		CAD													
		Manufacture													
		Installation into the cabinet													
		Amendments													
		Perform Task													
		Deadline													