Citizen Centred Services:

New forms in public space recycling

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CITIZEN CENTERED SERVICES:
NEW FORMS IN PUBLIC SPACE RECYCLING

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Abstract

When designing for citizens, municipalities often focus on the back end infrastructure of services while ignoring the user experience.

This can lead to a lack of engagement by citizens and improperly used services. Contemporary issues facing cities today such as waste reduction, and other challenges associated with living in a dense urban core, reinforce the need for a drastic change in the way that people live, work and co-organize as supported by their local government.

A two year design research partnership with a local governing body explored the role of participatory design in the creation of a service touch-point aimed at decreasing contamination in the streams of waste that are recycled in public city spaces. It considers how principles of behavior change can be utilized in this inquiry for designing services that are used by the general public in an urban context.

During the course of the project, participatory methodologies are used to facilitate conversations between municipal waste coordinators and designers. Through user observations, ethnographic research, co-creation and user testing this thesis argues for the need for participatory design to create effective services for cities.

Through explorations of form, iconography, and systems this inquiry has culminated in the design of a street-scape recycling station and a human centered framework for municipalities called ‘citizen centered services’.

> “I am enthusiastic over humanity’s extraordinary and sometimes very timely ingenuity. If you are in a shipwreck and all the boats are gone, a piano top buoyant enough to keep you afloat that comes along makes a fortuitous life preserver. But this is not to say that the best way to design a life preserver is in the form of a piano top. I think that we are clinging to a great many piano tops in accepting yesterday’s fortuitous contrivings as constituting the only means for solving a given problem.”
>
> -Buckminster Fuller

Thanks!

Thank you to all the people that have made this project happen. Most notably I would like to acknowledge my partner in crime Maia Rowan for the motivation and companionship along the way.

To my classmates Caylee Raber, Bree Galbraith, Michael Peterson and Christina White for the input on my work and providing the confidence to move forward.

The instructors at Emily Carr have provided guidance, leadership and insight into how design, research and theory intersect at the centre of this work: Deborah Shackleton, Hélène Day Fraser, Bonne Zabolotney, Jonathan Aitken, Christopher Hethrington, Craig Badke, and Peter Cocking. A special thank you to Louise St. Pierre for getting this project rolling, and providing me with the opportunity to take it on.

I would like to extend my gratitude to the partners in this project that allow me to have a tangible impact with the design work that I am doing. The context and support for this research from Peter Cech and Metro Vancouver has been amazing. Insights into people’s cognition are from Alex Digiacomo and her team at the Brain and Attention Research Lab at the University of British Columbia. The manufacturing expertise from Gord Breakwell at Brenco Industries has facilitated bringing this work to life.

I would like to thank the all of the citizens that have unknowingly interacted with my prototypes over the past two years and the participants in my design workshops and co-creation sessions. Their input and time are what drive my insights moving forward.

Keywords

CASE STUDY

A research project in partnership with a local governing body that sees the design of a recycling station for public spaces. This project makes up a majority of my thesis work and is examined for its use of human centered design methodologies

RESEARCH PARTNER

Metro Vancouver is a local governmental organization in British Columbia. Their goal is to create a livable sustainable region. They have partnered in this research project by providing a problem space and access to resources and stakeholders in local municipalities.

METRO VANCOUVER

Metro Vancouver is an organization but also represents the region surrounding the city of Vancouver in southwestern British Columbia.

MUNICIPALITY

This term is used to represent a city and its employees that create and implement services for citizens.

CITY SERVICE

Cities provide a multitude of services for its citizens. Cities do things that, as a population, we do better and more efficiently together. This includes things as simple as roads, to public transit, and garbage collection.

PERSONA

A method that design uses to describe and understand the type of users they are designing for.

PARTICIPATORY DESIGN

The process of involving the end users of a product or service into the design process as a means of ensuring that their needs are met.

STAKEHOLDER

A stakeholder is a person that is involved in the use and creation of a service. This can be the municipal engineers in charge of the design, as well as the end users.

SERVICE WORKER

This is the person that works on the back end of a service for a municipality. They are often in a maintenance or citizen facing position.

CITIZEN FACING

The parts of a service that a citizen directly engages with. This comes in many different forms from a website to municipal employees.

CITIZEN

Citizens are the main stakeholders and focus of this thesis. They are the people that use city services everyday and are increasingly being asked to change their behavior by the cities they live in.

BINS & RECYCLING STATIONS

The physical object that I have designed for the case study. A recycling station is a receptacle where citizens deposit and are asked to sort their waste into different recycling streams.

RECYCLING STREAM

Recycling waste is the process of separating out certain materials that are being disposed of and grouping them together so that they can be turned into new materials. Each material is represented by a stream, most commonly: garbage, paper, containers and organics.

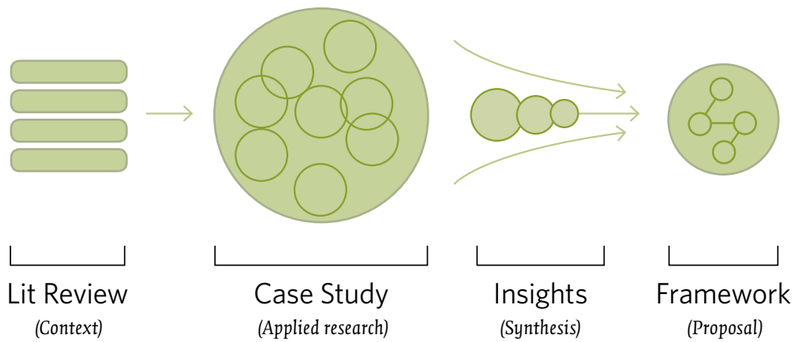
1.0 Introduction

Municipal services are designed without adequate consideration of the citizen experience. Through a case study of the design of recycling services, I show how the integration of participatory design principles leads to innovative solutions that effectively engage citizens.

A two year research project on the design of recycling services is the focus of inquiry into how to enhance sustainable behaviors in urban environments. This project is undertaken in partnership with Metro Vancouver, a local governing body that oversees twenty-two local municipalities. It looks at how to help citizens sort their waste properly in a public context. During the course of the project, I use participatory design methods to engage with and design for people involved in the recycling service. This study informs a set of recommendations for the inclusion of participatory design methodologies in the development of citizen-centered services.

Creating city services that are more effective at helping citizens is increasingly important in contemporary urban settings. Cities are situated in a global context that is attempting to tackle large scale challenges with climate change. It is through revising peoples patterns of everyday behavior (such as energy usage, waste disposal and material consumption) that shifts of a city's impact on the environment can occur. These changes in behavior are a direct result of the designed objects and services that citizens interact with as part of their daily routines.

Thesis document structure



The design profession is also venturing out into new contexts beyond its traditional market driven existence. Service design has emerged as a common language to explain how the design process helps to innovate in new contexts like government organizations.

Systemic sustainable issues facing cities and design in new contexts are precursors to the applied research completed in the case study. A framework for 'Citizen centered services' uses insights drawn from the case study to outline how to incorporate principles of human centered design into the creation and implementation of city services.

1.1 Problem statement

Municipal governments struggle to implement services that support ecologically sustainable behavior patterns.

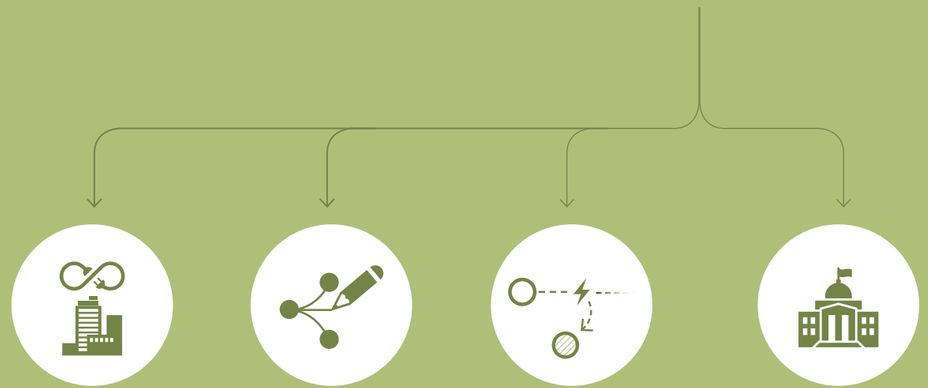
1.2 Thesis statement

How might participatory design methods be utilized to increase the success of government services designed to support sustainable behaviors?

1.3 Design objectives

Through a case study that designs a touch-point for public space recycling, I aim to show how human centered design can be used to encourage behavior change.

2.0 Literature review



Sustainable infrastructure

Service design

Behavior change

Design for government

2.1 Contemporary issues facing cities

Large populations living in dense urban cores pose logistical challenges for local governments that strive to decrease ecological impact. Participatory design methods offer insights for solving these complex problems.

Everyday Metro Vancouver sends approximately 40 semi-trucks full of the region's garbage to a landfill in Cache Creek British Columbia, 340 km away ("Cache Creek hopes", 2012). Each of the 600,000 tonnes of trash created annually is shipped by truck (see fig. 2.2). In urban cores, growth and development pose a challenge to the people in charge of managing waste in cities. The larger the population the more garbage we create. Issues of limited space in combination with a growing population density leads municipal waste managers to resort to solutions of long distance removal. Transportation that is entailed in this type of strategy compound the problem adding to the already significant ecological impact of the garbage.

For the first time in history, more than half of the world's population live in cities (United Nations, 2014). This increase has both positive and negative implications for the city's in which we dwell. The benefits of living in an urban core include the ability to reduce our ecological footprint (World Changing, 2011). This is accomplished By having more people live on less land we assure that a significant quantity of land is maintained for farming and biodiversity needs.

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Figure 2.2 has been removed due to copyright restrictions. The information removed is a photo from the website: http://www.straight.com/files/olddays/popup/public/20130722_192621.jpg

Fig. 2.1: Truck dumping garbage at Cache Creek landfill.

Fig. 2.2: Vancouver garbage can

At the same time, a dense urban population poses challenges in terms of shared space, material waste, and consumption behaviour. Urban living gives people increased access to material goods and encourages opportunities for consumption. As noted above, one current pressing problem facing municipalities is the material waste that civic governments are responsible for dealing with. In 2013 Canada created the National Zero Waste Council (NZWC) with a mission "to act collaboratively with business, government and the community, at the national and international level, as an agent of change for waste prevention and reduction in the design, production and use of goods" (National Zero Waste Council, 2013). The creation of this council shows the strategies that municipalities are using to combat a local issue like waste accumulation.

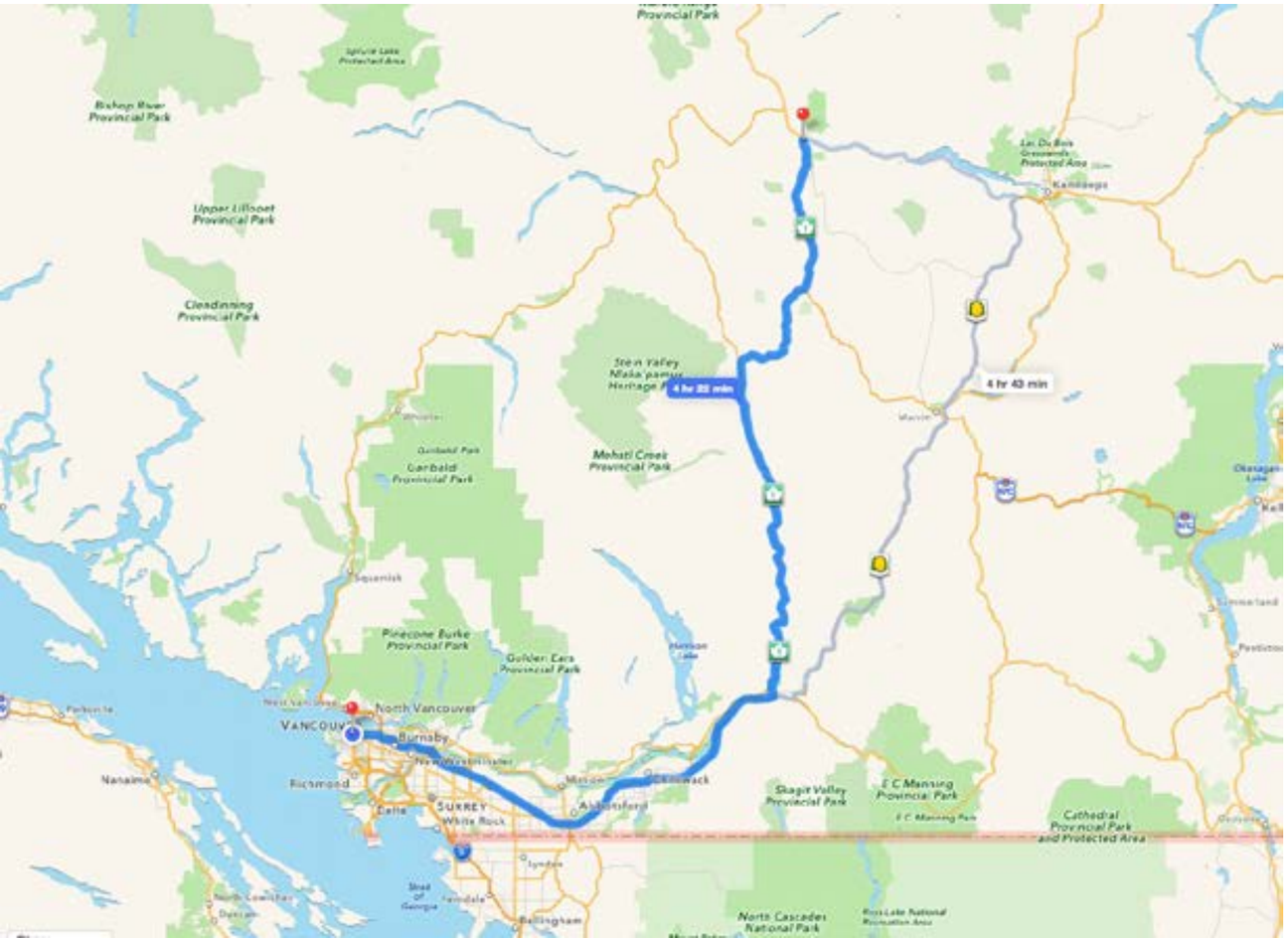

Fig. 2.3: Map showing the distance from the city of Vancouver to the Landfill where all of its garbage is shipped to (344 km).

Through creating a waste prevention and reduction framework for Canada the NZWC displays the role of government in tackling complex issues like the creation of waste in our cities. One of the many methods in tackling waste and its prevention has to do with human behavior and ways of influencing or changing it for the benefit of the planet. Attempting to solve a complex problem like waste reduction requires new ways of thinking and approaching the problem. The "ingenuity requirement goes up as environmental problems worsen, because societies need more sophisticated technologies and institutions to reduce pollution and to conserve, replace, and share scarce natural resources" (Homer-Dixon, 2002, p. 23). This need for ingenuity can be framed from the perspective of a city's municipal government. City engineers and managers are facing multi-layered challenges as cities become larger and more dense. Traditional approaches, like top-down decision making, to solving problems at a city wide level are becoming less effective.

Thomas Homer-Dixon articulates that design needs to, and can, be placed in new operative contexts. This thesis examines the role that design methodologies can play within government. One of my motivations for this examination is to see how new contexts bring new challenges for design as a profession and its ontology. Mads Nygaard Folkmann is aa researcher in the field of design. He describes design's role in beginning to tackle large more complex problems, like the ones that cities and governments are facing by stating that "wicked problems, which, unlike simple or 'tame' problems, are structurally non-definable and in principle unsolvable but can lead to innovation in a process of reframing the wicked problem" (Folkmann, 2013, p. 101). With increasingly complex problems, comes the need and opportunity for more creative and unexpected solutions. As Tony Fry explains,

> "unquestionably, there are many problems that require fundamental transformations of our mode of being-in-the-world as a species, such as: how we treat our immediate environment; where we live; how we live and travel; what we eat; what we buy; what waste we generate and how we deal with it" (Fry, 2010, p. 45).

As part of my thesis research I participate in a two year research project in partnership with Metro-Vancouver looking at increasing recycling accuracy in its citizens. I use this project as an opportunity to demonstrate design methodologies and the design process as effective means for tackling a complex problem like recycling behavior compliance. The bulk of this thesis comprises of this research project where it documents and reflects on the process of designing for a government service in case study format. It then proposes a framework for integrating design into cities problem solving processes.

2.2 Service design:

A human centered approach to municipal problems

"Service Design helps to innovate (create new) or improve (existing) services to make them more useful, usable, desirable, for clients and efficient as well as effective for organizations. It is a new holistic, multi-disciplinary, integrative field" (Moritz, 2005, p. 31)

The 20th century saw industrial designers attempt to humanize technology through material form. At the beginning of the twenty-first century we are now "saturated with material wealth, and our consumption of products is threatening our very existence rather than being a resource for good living" (Polaine, Lovlie, and Reason, 2013, p. 18). We need to transition from consuming objects, to having access to the things that we need and use in our daily lives. Service design represents the approach that many designers are now taking in order to create effective solutions that go beyond physical products.

The seminal book, 'This is Service Design Thinking' released in 2010 attempts to create a unified language and terminology for designers working in the realm of product/service systems. Some of the terms I utilize in this thesis include the concept of the 'front-end' and 'back-end' of a service. The front end describes the users experience when interacting with a system. The back end refers to the infrastructure that makes up a service and all the people involved in the service delivery. The book also outlines methodologies and techniques for researching and designing services. I outline some of these techniques in the following sections.

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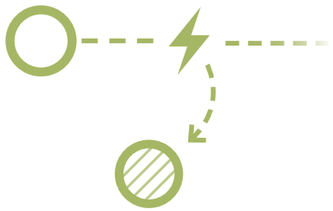
One of the main interfaces between citizens and their government is their experience of, and exposure to, the services that the government provides. These services include water, garbage, streets, schools, police, fire departments, and transportation. They are all integral to the functioning of the city and its citizens.

Municipal services, however, do not always function according to initial plans and intentions. Confusing, unclear and unintuitive experiences with services lead to friction points for citizens. This, in turn, results in mistrust and negative attitudes towards essential services and their government. The first step in designing for citizen is understanding the user experience. Human centered design is "an approach to bring the people we serve through design directly into the design process in order to ensure that we can meet their need" (Sanders & Stappers, 2012, p. 14). The framework that service design provides has allowed me to use the design process and methodologies when approaching the problem space of recycling services in my case study. Recycling is a service provided by the city to help citizens dispose of waste in a way that does less harm to the environment. It engages citizens by asking them to sort and organize their waste and therefore changing their behavior.

Fig. 2.4: Household garbage and recycling collection in Burnaby BC as one example of services provided by the local municipal government.



2.3 Behaviour change and services

Designing for citizens that represent different backgrounds and abilities requires a deep understanding of behavior in order to create effective solutions.

For municipalities that want to change their citizens behavior for the better, human behavior and motivations are important in citizen centered research. Many theories exist on behavior and behavior change. I have chosen theses models to examine in this section of my thesis because of how they can support designing for city services. Models like BJ Fogg's 'Motivation Ability Trigger' are highlighted here, which is complimented by other similar models such as Ölander and Thøgersen's 'Motivation-Ability-Opportunity' as described in their paper 'Understanding of consumer behavior as a prerequisite for environmental protection'.

Throughout all of these theories it is important to recognize where these ideas support a rational behavior mindset. This idea is highlighted by Tim Jackson's report on 'Motivating Sustainable Consumption' for The Sustainable Development Research Network in the UK. Rational behavior is where "we weigh up the expected benefits and costs of the different actions, and choose the one that offers the highest expected net benefit or lowest expected net cost to us"(Jackson, 2005, p.29.). I start this section by looking at Daniel Kahneman's '*Thinking fast and slow*' because of how his theory of 'thinking fast' talks about the irrational quick decisions that we make while in that thinking mode. Projecting forward to the case study where I am designing for public space recycling, this helps me to understand that people won't always be able to make a rational well thought out decision when asked to perform a task

Quick decisions are made without any deep thought, while on the go

Mode of deep thinking with full concentration on the task at hand

THINKING FAST AND SLOW

A prominent contemporary theory of behavior is Daniel Kahneman's '*Thinking Fast and Slow*'. In it he describes two main systems of thinking that people use, depending on the activity or context (see fig. 2.5). System one thinking is fast, instinctive and emotional and occurs when we make a quick decision and don't have very much time to think. System two thinking is slower, more deliberate and logical and occurs when people are deeply engaged in an activity or thought (Kahneman, 2011).

These two systems of thinking can be applied when designing for municipal services. Both systems need to be considered in the design. Thinking fast applies to the interaction that a citizen has with a service while they are using it. Thinking slow utilizes when citizens are learning about how to use a new service or why a new behavior is needed.

Fig. 2.5: Diagram showing Daniel Kahnemans two main modes of thinking, fast and slow.

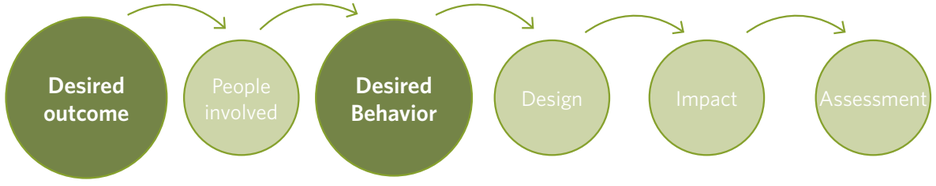


Fig. 2.6: Diagram showing the different goals and participants in designing for behavior change.

DESIGNING FOR BEHAVIOR CHANGE

Stephen Wendel's book ' Designing for Behavior Change' creates a framework for designing for behavior change by showing all the parts, actions and people that are involved in the process (Wendel, 2013). The Diagram (see fig. 2.6) highlights the different components of designing for behavior change. Visually diagramming out all the stakeholders and touch-points creates a visual tool in helping solve complex problems related to behavior change. The most interesting component to note from this framework is the distinction between the desired outcome and the desired behavior. Having the desired behavior as the focus can be misleading if you lose track of the desired outcome which can come from different approaches and actions.

MOTIVATION-ABILITY-TRIGGER

BJ Fogg's paper 'A Behavior Model for Persuasive Design' outlines his framework for understanding human behavior and how to design for behavior change. In Fogg's Behavior Model (Fogg, 2009), he describes three main criteria for understanding behavior: Motivation, ability and a trigger (see fig. 2.7).

Motivation | Municipalities have an imperative to encourage certain behavior that they think is going to benefit its citizens or the environment. The first step towards getting citizens moving in that direction is to consider their motivation. Does the citizen know why the behavior is good for them, or others? How can the city create awareness for its citizens and therefore influence their motivation?

Digging deeper into ones motivation, the Theory of Reasoned Action states that "if a person believes that mostly favorable outcomes will result from a behavior, then the person is said to have a favorable attitude toward the behavior. If anticipated outcomes are believed to be negative, the person will have a negative attitude toward the behavior." (Ajzen, 1991) What this implies is that when people know that the city's intentions are for the greater good of the people, that they are more likely to participate and help towards that goal, through doing a particular behavior.

Ability | For a proposed new behavior, does the citizen have the skill set and knowledge required to complete the task? Even if a citizen is motivated to do a certain task, it can't be guaranteed that they have the ability to do it depending on the complexity and knowledge required for the task. This begs the question; How can municipalities teach citizens about new and better services they are offering? What if that service requires a new skill set, or an adjustment to an old one?

Trigger | The trigger is often the object or interface that a citizen interacts with. This can range from a city website, to the roads we drive, bike or walk on everyday. The design of the trigger can dramatically influence the effectiveness of the service as well as the desired behavior. If a trigger is not clear in it purpose or instruction, a friction point is created for the user in its purpose. The design and creation of many city services are often the triggers in Fogg's behavior model.

This framework is useful when troubleshooting or designing for a specific behavior. If there is a problem with a service, either being used improperly, or not used at all, which of the three sections are missing, or need more to be improved?

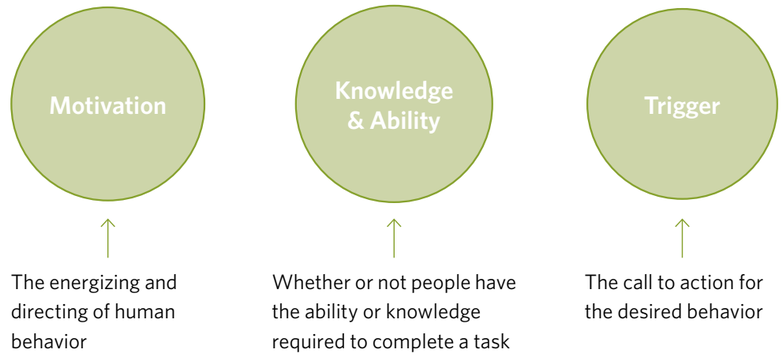


Fig 2.7: The three main sections of BJ Fogg's behavior change theory.

INSIGHTS

These theories on behavior change begin to set the foundation for the case study, as well as my framework for citizen centered services moving forward. Through reflection of the outcomes of the case study, I will integrate different aspects of these theories into my proposed framework.

2.4 Design for government

Conventional planning processes make it difficult to create and implement new and innovative ideas for government services.

This thesis describes the opportunity for design research to be applied to a relatively new context. Various methods of traditional design work have occurred for governments such as the branding and marketing involved in the design of logo's and websites (see fig. 2.8). I aim to utilize emerging user centered, ethnographic research to drive the design of city services moving forward.

Designers have traditionally worked for businesses to create consumer products and services. However, "designers are being increasingly called upon to join, and sometimes to lead, teams that are tasked with very large challenges" (Sanders & Stappers, 2012, p. 22). This research places design and design methodologies in a new context to explore how they can improve citizen's experiences in services provided by municipalities.

Charles Owen explores current decision-making processes within governments and organizations. He makes the observation that governments currently use a science based approach to problem solving. Statistical data is analyzed in order to find patterns that inform decisions about policy. This is in contrast to the design process where "makers are driven to synthesize what they know in new constructions, arrangements, patterns, compositions and concepts that bring tangible, fresh expressions of what can be." (Owen, 2009, p. 17). By following the design process governmental organizations will be able to better develop services based on qualitative insights and experiences. This section examines precedent projects to understand various approaches to effective services that relate to public engagement.

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Fig. 2.8: Images highlighting the current scope of design work being done for municipal governments: Branding and website design

Precedents

CIVIC SERVICE | PARSONS DESIS LAB

Civic service is a project from the Parson's DESIS Lab in New York City. Their goal is to help civil servants improve the services that they provide for citizens. They host workshops with civic employees and designers to teach them service design techniques (see fig. 2.9). Their approach to designing for government is to integrate design methods into the ways that civic employees problem solve and create solutions. They are doing this by hosting workshops that teach design skills and methods to civic employees. Through this process they are building a network and creating a forum for conversation around this subject area.

I see this model as a strong precedent for the research I am conducting. Through my case study I aim to showcase design methods in action and how empathy and observations of users is turned into insights for design.

Fig. 2.9: Diagram showing how civic service teaches design methodologies to civic employees.

Their approach to designing for government is to integrate design methods into the ways that civic employees create and problem solve.

Teaching design
methods to civil servants

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MY POLICE

In the United Kingdom the government found that there was distrust between the police and the general public (Stickdorn, M., & Schneider, 2010, p. 234). There was distrust despite the fact that the crime rate had been on a steady decrease in the years prior. The design consultancy Snook conducted user centered research to find out why people didn't trust the police. Their research process consisted of mapping out the landscape of the public and police, developing service blueprints, interviews, and the making of persona's. Through this process they were able to show that the general public in the UK did not feel listened to by the police.

Based on this, the Snook team designed a concept called 'my police'. The concept acted as a platform for the general public to get information about the police, and most importantly a place for the public to give feedback and input into the service that police are given. This project highlights the distrust that citizens can have towards services that are provided by municipalities.

This precedent and the system of engagement used by Snook acts as a good precedent to look at when thinking about means of allowing people to participate in the design of public services. How might we create a place for people to get information about how services work, as well as the opportunity for people to give feedback about their experiences?

Fig. 2.10: Image from the Civic Service website showcasing their process.

3.0 Case study

Decreasing recycling contamination in public spaces through the design of receptacles

Metro Vancouver is a political body and corporate entity that serves 24 cities in the regional district and provides various services such as water, solid waste management and housing. The organization approached the design department at Emily Carr University with a specific problem they are facing. Public space recycling in the region is often contaminated and is inconsistent throughout the region. Their request for the university is to research and design a public space recycling station that alleviates contamination issues. As a designer, this means that the problem space, as well as the solution, is predefined by the research partner. This scenario has advantages and disadvantages. Having a specific problem space predefined at the outset of a project means that exploration into other possible problem spaces becomes limited. The advantages of this approach mean that I can take a deep dive into the problem space with a real world partner organization like Metro Vancouver. This means my research can have an application and impact in my community beyond the walls of the University.

The focus of this case study is on the design of recycling receptacles for public spaces that decrease contamination in recycling streams and facilitate ease of maintenance for waste collectors. A research project between Metro Vancouver and Emily Carr University has the goal of unifying the public space recycling experience for citizens across the region. During the course of the project, representatives, including waste coordinators, service workers and citizens, from several municipalities became active participants in the participatory design research.

Municipalities often only focus on the creation of the backstage of a design. They do not yet know how to effectively engage with user for feedback when developing services for the public. This case study includes the processes, research methodology and insights involved in engaging with the citizens. I divide the research investigation into two sections: The backstage and the frontstage. ‘The backstage’, or the behind the scenes perspective involves the municipalities criteria for a functional recycling station. This includes design workshops, and ethnographic research with waste collectors and coordinators in the region. ‘The Front stage’, includes everything that is outward facing to the public. I examine the citizen’s experience and investigate why recycling streams are consistently contaminated. This is done through user observations, co-creation, and prototype testing in multiple municipalities in the region.

3.0.1 Research project with Metro-Vancouver

The working research question for this case study asks: How might we establish better recycling habits in citizens?

CONTAMINATED RECYCLING STREAMS

Recycling is an activity that most cities in industrialized countries request that their citizens engage in. The task of recycling becomes complex for the citizenry as it requires sorting, organizing, and knowing what to do with items and when. There are many variables in product packaging that impact their recyclability. Product packaging changes in material and design, depending on the product and the brand. The consumer is tasked with figuring out how to recycle these items on a daily basis, often not thinking deeply about the task they are engaging with.

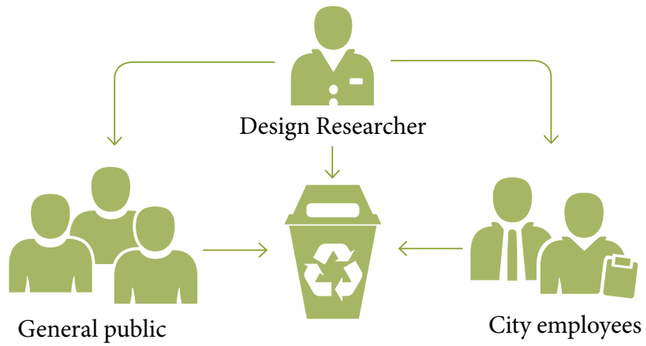
In order for different material streams such as paper, plastic and food scraps to be processed into new materials, the recovery industry that processes the different streams requires that they be uncontaminated. Recycling streams become contaminated through user error, or someone putting an object in the wrong stream.

Two main contexts exist for citizens engaging in recycling. The private household has become the main location for recycling of peoples products and packaging. Household recycling is an established practice in many cities around the world. This is where a majority of people's products and packaging is stored and disposed of. This context isn't the only place where people are required to dispose of garbage. Public spaces such as sidewalks, parks and plazas all require places for people to dispose of and sort products and packaging for recycling. Recycling in public spaces is relatively uncommon and there have been no established practices in dealing with it effectively.

Each municipality in the region of Metro-Vancouver has their own approach to recycling, which creates confusion when people travel from one municipality to another. This is particularly relevant when dealing with public space recycling touch-points.

STAKEHOLDERS

When designing for a service like citywide recycling, it becomes challenging to narrow down who you want to design for. Recycling is intended to be done by all citizens of a city, so isolating one or two specific types of people proves to be difficult. When looking at recycling through the lens of service design, two main categories of stakeholders become apparent.



THE FRONT STAGE

The first stakeholder category consists of the general public, who are engaging with recycling stations in public spaces. Instead of making a group of persona's that try to cover each and every different kind of citizen in the city. I am approaching the persona by looking at what frame of mind the user is in when they are recycling. This way persona's can be broken down by space and place. For example; what is a user's frame of mind when recycling at home, compared to when they are recycling on a busy streetscape? These two different touch-points in the service are unique and will require different design solutions. One of the goals of my primary research is to find out what the user's frame of mind is in these different scenarios. This is achieved through ethnographic research as described in the methodologies section.

THE BACKSTAGE

The second stakeholder group is municipal employees and service workers. They are the people that are part of the supporting infrastructure for the city's recycling services. They drive the recycling trucks and empty the bins. Understanding their needs is equally important when designing a service. The service worker is a distinct stakeholder that is specific to the backstage operations of city services. If their needs are not met, then the service will become unbalanced.

Public space recycling streams are contaminated and end up in the landfill

Metro Vancouver's problem

Inconsistent approaches and confusing recycling touchpoints make sorting difficult for users

Discover the users problem

How might we reduce recycling contamination in public spaces?

Case study research question

3.1 Research methodology

I approach my primary research by dividing my methodologies into two sections, the frontstage and the backstage.

The Frontstage looks at the different ways that I engage with citizens through observations, surveys and a co-creation session. The Backstage examines the primary research that I conduct with the service workers and waste coordinators in the participating municipalities through workshops and an ethnographic ride along. These methods give direct insight into the needs and wants of the stakeholders involved. The insights I gather from my research inform not only the design, but the design process moving forward.

Through a reflective process that involves a real world project, I examine how various human centered methodologies work in a municipal government context. The analysis of the effectiveness of these methods are used to create a framework for approaching human centered design problems facing city governments.

FRONTSTAGE

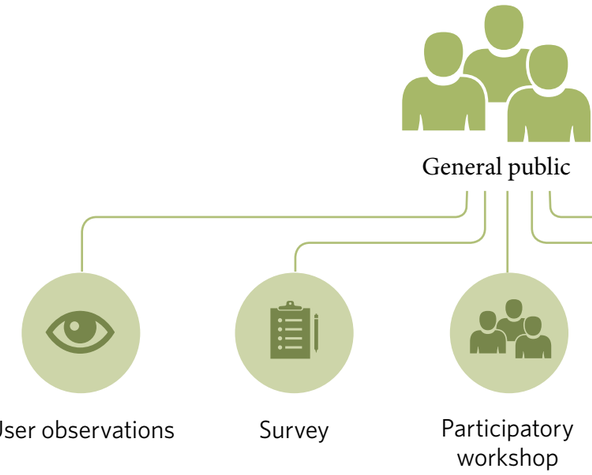
General public

BACKSTAGE

City employees

3.1.1 Frontstage: The public

Research methods overview



User observations

THE FUZZY FRONT END

The exploration into the citizens experience begs by getting out into the field and doing observations of people recycling in public spaces. An undergraduate class of third year industrial design students worked on this project for one semester. The undergraduate students contibution to this thesis is limited to this user observation research as well as the design workshop in the next section. As a Teaching Assistant for the class I designed research instruments for the students to use in their observations in the field (see fig. 3.1.1). The students and I conducted behavior and place - centered mapping by observing people in various streetscape locations. The research instrument encourages students to draw, sketch and visualize what is happening instead of taking regular notes. Students sketched out the approximate layout of the streetscape that they were observing, and mapped the movements through the space.

One of the key take aways form this process is that different contexts have different needs. Depending on the location of recycling receptacles, (a skytrain station or a public park), the recycling needs would change. A skytrain station for example only needs streams related to newspaper, where as a public park would need a stream for dog waste.

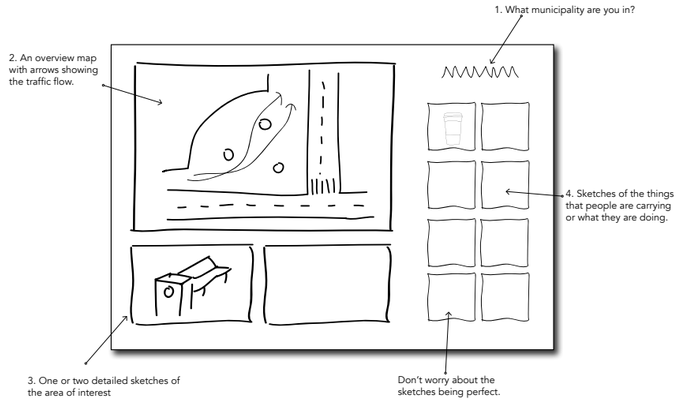


Fig. 3.1.1: Research instrument designed for undergraduate industrial design students.

Together with the undergraduate design class we took all of the observations from the field and found three main insights:

DESIGN FOR CONTEXT

Streetscape recycling comes in many forms and locations. These are distilled down to the following categories: busy intersections, transit hubs, parkscapes and public events. How should receptacles be placed in one context or another? Instead of just designing a recycling station, what would installation guidelines look like to accompany them?

BUSY INTERSECTIONS

TRANSIT HUBS

PARKSCAPE

PUBLIC EVENTS

DESIGN FOR USERS STATE OF MIND

What does it look like to design for a transitional moment in public space? The form of the recycling station needs to be appropriate signaling for a moment of transition. Depending on the user's state of mind, how can the design address the head space that people are in while in public spaces (See fig. 3.1.2)?

Fig. 3.1.2: Image highlighting a specific state of mind.

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Figure 3.1.3 has been removed due to copyright restrictions. The information removed is an image from the website: http://claan.com/uploads/image/image/3/uptecsinaleticaci05_works_1800_1114.jpg

DESIGN FOR PRIMING

This criteria asks the question, how will recycling stations compete with the visual overload that exists in public spaces? How can we reduce the cognitive load on users as they approach a recycling station? The goal of design for priming is to the get the user engaged with recycling before they are placing a material in a bin (See fig. 3.1.3).

Fig. 3.1.3: An example of a visual primer.

Survey

In order to find out what people's baseline understanding of recycling is I conducted a survey of 25 people. "Surveys are a method of collecting self-reported information from people about their characteristics, thoughts, feelings, perceptions, behaviors or attitudes" (Martin & Hanington, 2012, p. 172). I want to know what people's motivations for recycling are, and more importantly to what extent they participate in this activity. Do they do it at all?. The Survey consists of 5 questions and was done in person during a co-creation session. The questions are designed to be straight forward in scope, with an open ended answer format. This way participants that have more to say on the subject are given the space to do so. Participants that don't have a strong opinion can answer with short responses.

Fig. 3.1.4: Questions from the survey conducted by participants

1. When you recycle, what is your motivation for recycling?
2. Why do cities recycle?
3. Do you know what happens to recycling?
4. Do you trust that recycling gets dealt with properly?
5. What is your recycling knowledge/ability from 1-10? Why?

SELECT QUOTES

On their recycling ability:

"Mid range - Because I feel like so much of the recycling information is not accessible. How does my action ripple?"

On their motivation for recycling:

"Social reasons - I don't want to be the person who doesn't recycle, especially in public"

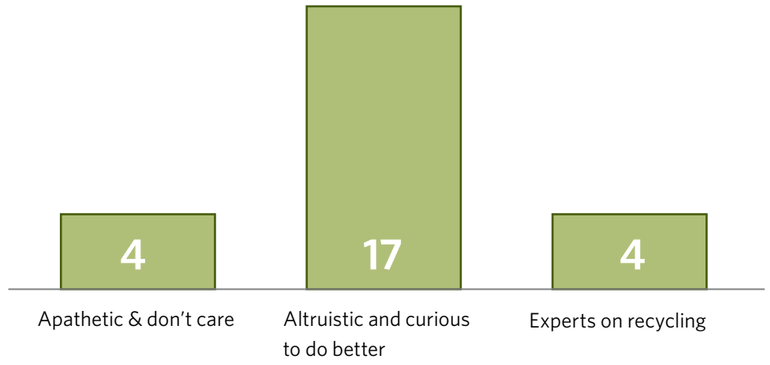
On whether they trust that recycling gets dealt with properly:

"Not always, especially when I see garbage trucks dump everything together"

INSIGHTS

My process for synthesizing the survey results involves sorting the answers and looking for trends. The selected quotes highlight some emerging themes that are important to take notice of. People's desire for easier access to information about recycling is significant. The most prominent theme to emerge from the answers is the person's attitude and ability towards recycling. One end of the spectrum consists of the people that are apathetic and don't care at all. On the other end of the spectrum is the recycling experts that know everything there is to know about the process. In the middle of the spectrum is the majority of the respondents, people that know recycling is the right thing to do, and are eager to learn more. These insights help to inform the persona's for this case study.

Fig.3.1.5: Diagram showing participants levels of recycling ability.



Participatory workshop:
5 whys exercise

At this phase in my research I am looking to gain insights into the citizen's experience in recycling though different research methods. The five whys exercise is a tool for digging deep into the root cause of a problem through a simple written tool. "It is useful for quickly gaining an understanding of complex issues, and in provoking those being questioned to go deeper when trying to explain common problems" (Stickdorn & Schneider, 2010, p. 166). The exercise works by asking an initial question starting with the word 'why' in relation to the problem you are working on. This technique is repeated 5 times, turning each answer into a subsequent question by adding the word why to it.

During a co-creation session I had the opportunity to do the 5 whys exercise with groups of 4-5 participants at a time, with a total of 25 (see fig. 3.1.6). In order to formulate the question, I want to base it off the participant's current problems with recycling. Directly before the 5 whys exercise I conducted a brief brainstorming session in order to get descriptive words of what it is currently like for participants to attempt to recycle objects in public spaces. Based on the brainstorm exercise, we used the words generated to fill in the blank on the following sentence:

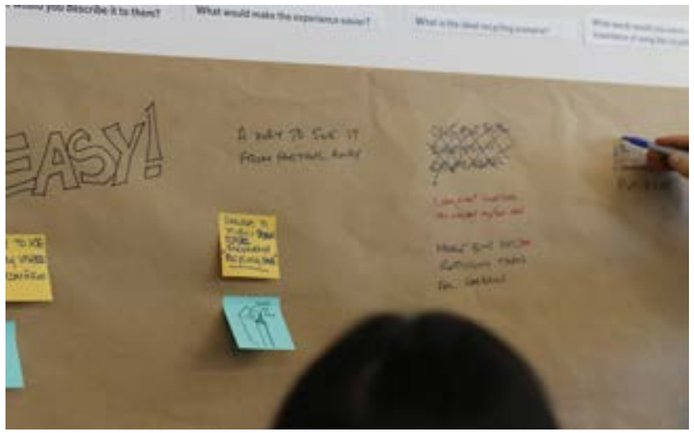


Fig. 3.1.6: Participant working through the 5 why's exercise.

Why is recycling in public spaces frustrating ?

"Because it's not clear"

Why is it not clear?

"Because there is not enough information"

Why is there not enough information?

"Because there are too many possibilities"

Why are there too many possibilities?

"Because you can't put all the information on the bin"

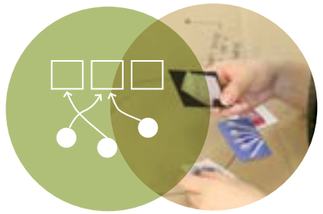
Why can't you put all the information on the bin?

"Because we need access to information about recycling so we can learn what goes where, before we try to recycle"

INSIGHTS

This exercise brings to light an obvious piece of information that hasn't been discovered yet. Many of the key words that were generated in the brainstorm beforehand had to do with frustration, hesitation and uncertainty. When we start digging deeper with the five whys exercise a couple of observations become apparent. Participants feel like they are always lacking information when attempting to recycle. They want more instructions and explanation about what to do in the situation. When myself and the participants followed up on that point we came to the same conclusion; that there is only so much information that you can fit onto a recycling bin, and that if there was too much information all at once it would become overwhelming.

This exercise highlights the idea that citizens are lacking a basic background knowledge on recycling, that would help them make decisions when attempting to recycle. This type of learning shouldn't occur at the recycling station. Rather it should be available as a resource somewhere else to engage in deeper learning.



Participatory workshop:
Card sorting

Sorting is at the center of the recycling experience. Citizens are expected to actively organize objects from a plethora of different sources with many inconsistencies. When thinking about the design of icons for this project, a card sorting exercise is helpful in determining the most effective ways in which people sort. “The card sorting method can also be used when you want to generate options for structuring your information, as it can identify different schemas for organizing your navigation, menus and taxonomies” (Martin & Hanington, 2012, p. 26). The exercise is broken into two parts. Part one asks the participant to sort images of garbage into categories that are icons only (see fig. 3.1.7-8). Part two has the participant sort icons that represent items of garbage into categories that are word only. My goal with the design of the exercise is to explore how different modes of communication (words, icons, and images) helped or impede sorting properly.

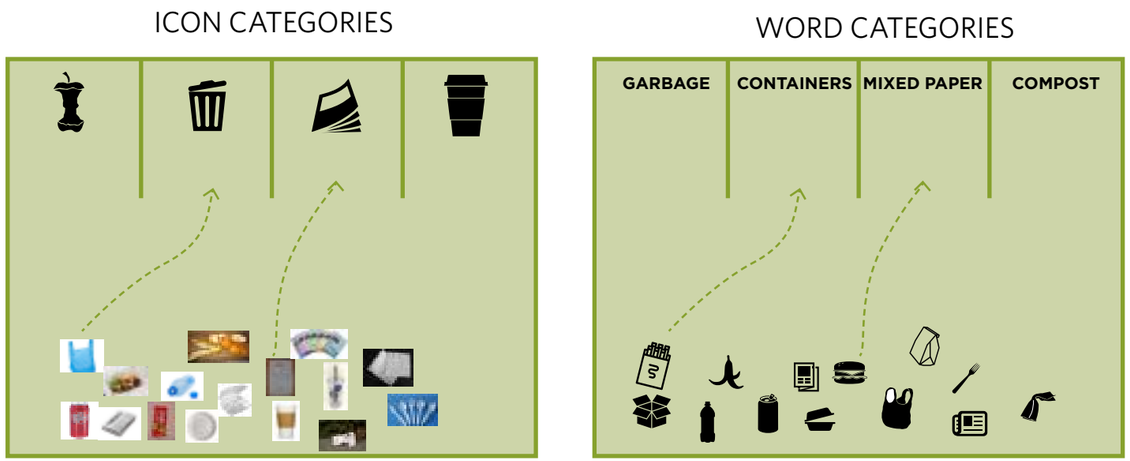


Fig. 3.1.7-8: Diagram showing how the sorting exercise worked. Sort images to icons, and icons to words.

HIGHLIGHTS

When participants matched an object to an icon, it became limited to the category . This is because the icon represents one object from a whole range and it is easier for the user to think it is limited to just what the icon represents. An example of this is the container stream, which is represented by a coffee cup icon. Users placed items similar to cups, but didn’t add other items like a plastic fork.

With the word category, the word represents a wide range of objects within that category and people are able to identify objects that fit in that category better. An example of this is the ‘mixed paper’ category that as an icon was shown as a magazine, which to the participants is limiting. When written out as ‘mixed paper’ they know they could put a lot more items in that match the written description.

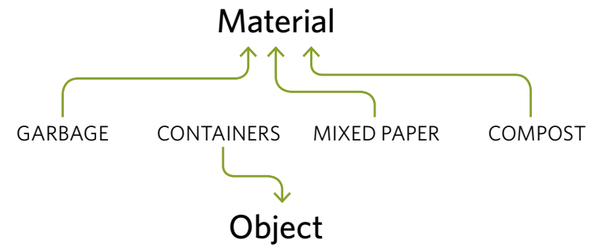


Fig. 3.1.9: Diagram showing participants understood the labeling of recycling streams.

INSIGHTS

This exercise digs deep into the way that participants understand and sort objects that varied in size and materiality. Icons are faster to engage with, but not as accurate as words. Both are necessary for helping citizens sort, and now I know what each mode is most helpful for.

The last insight has to do with the type of categories of the streams. Garbage, mixed paper and compost all represent a type of material. (see fig. 3.1.9) Containers represents a type of object. This becomes confusing to participants because they end up having a plastic object that isn’t a container. ‘Plastic’ as a word can’t be chosen for the stream, because that stream also takes aluminum as well as glass items. The word ‘Container’ is chosen because that object represents the items that are made out of those three materials.

Stakeholder mapping

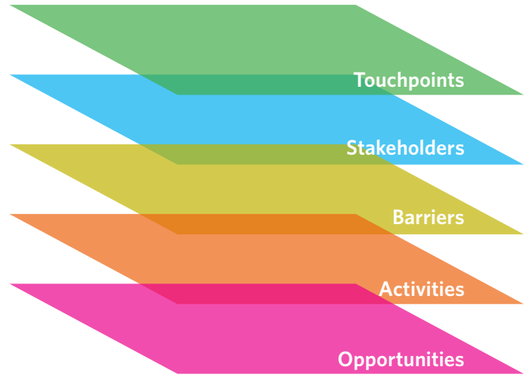
At this point in my research I am looking for a new mode in which to explore the people involved in the problem space. Part of the design process is to develop new methods in which to see a problem from different perspectives. The existing process for problem solving that cities engage in are in need of creative ways to find out who the people using the services are. Stakeholder maps are an excellent tool for visualizing the key people, places and things within a service system. In order to push this methodology further, I am investigating a method to map out the recycling service system in a new way. Stepping away from the two-dimensional sphere, I want to see what it would be like to map out this problem space in a three-dimensional space. I built a mini-scale version of a few city blocks in the city of Vancouver out of cardboard and other recycled materials (see fig. 3.1.10). The model takes up two large tabletops and consists of all the typical buildings and amenities you would find in a city. Within two city blocks there is an apartment building, single family dwellings, a community center, a store font as well as the sidewalks, alleyways and recycling stations throughout.

Fig. 3.1.10: Small scale model of 4 city blocks. Post-it notes highlight existing and potential touch-points.

Fig. 3.1.11: Close up showing color coded post-its as opportunities in the system.

CATEGORIZING

After building the model of the city, I created five categories of the different stakeholders and touch-points. They are: Touch-points, Stakeholders, Barriers, Activities and Opportunities. I then proceeded to use color coded post-its throughout the space to identify and map the opportunities. This was an emergent process, that relied on the three dimensional space to inform where a stakeholder is, as well as to identify new stakeholders or touch-points that were not apparent before the exercise began.



INSIGHT

The objective of this exercise is to map out and find various stakeholder and activities within the recycling system. I use this information to help determine what new scenarios within the recycling experience can be explored. A significant realization that comes out of this exercise is identifying local community centres as a possible touch-point for recycling learning and sharing.

Recycling persona's

A service-like recycling is used by almost every citizen in a city which means I can't section off a specific user group. Very specific persona's are normally created for regular market based products and services. "Crafted from information collected from real users through sound field research, persona's provide an ideal solution by capturing common behaviors in meaningful and repeatable profiles" (Martin & Hanington, 2012, p. 132). My approach to creating persona's for this project is different than the traditional approach.

Emerging out of my surveys and stakeholder mapps, I can piece together another way to create persona's for my problem space. No matter what the background of the people involved in recycling is, they all have different abilities, or knowledge levels of recycling. I use these varying knowledge levels to create persona's for my research. There are three main categories; the apathetic beginner, the eager novice and the recycling expert (see fig. 3.1.12). This exercise shows me that the focus of my energy needs to be on the stakeholder that represented a majority of the users involved, the eager novice. How can I support the fact that they want to recycle, but feel they are missing the information to do so?

Fig. 3.1.12: The three recycling persona's.

Figure 3.1.12 has been removed due to copyright restrictions. The information removed is an image from the website: http://cobaltpm.com/wp-content/uploads/2013/02/smiling-positive-personality-young-male-project-manager-happy-e1361235940788.jpg

THE APATHETIC BEGINNER

On the far end of the spectrum is a small percentage of the average citizen (10%). The apathetic novice doesn't know much about recycling, and doesn't plan on learning about it anytime soon. They aren't against recycling, which means if it is designed to be as easy as possible, they will comply.

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THE EAGER NOVICE

Taking up the majority of the middle of the spectrum (75%) the eager novice knows the basics of recycling, and is keen to learn more. They are often frustrated with recycling experiences because they want to do it correctly, but are lacking the proper information to do so.

Figure 3.1.12 has been removed due to copyright restrictions. The information removed is an image from the website: http://buzzer.translink.ca/wp-content/uploads/2011/01/Accessible-Biking-2.jpg

THE RECYCLING EXPERT

On the other end of the recycling spectrum is the recycling expert (15%). They know all there is to know about how, where and why to recycle. Sometimes a cynic, they are a wealth of information. They generally live a more sustainable lifestyle than most, choosing to walk, bike or take transit over driving and develop a habit of bringing their reusable bag with them everywhere they go.

3.1.2 Backstage: The worker

The backstage of a service considers all the behind the scenes functions that allow a service to take place. Municipalities provide recycling as a service to its citizens in their households as well as public spaces. In order for that service to function, the city creates recycling touch points in peoples' homes and on the streets that are maintained by servicemen employed by the city. The material streams are collected from all over the city, and brought to different facilities to be processed or shipped offshore for processing into new materials.

Research methods overview

Design workshop

A challenge when working on large research projects is finding ways to engage the stakeholders to build trust and get creative input. A lot of the design research process is not standardized or understood outside of the design industry. In order to effectively engage the waste coordinators and servicemen from various municipalities in Metro-Vancouver myself along with undergraduate design students hosted a design workshop at Metro-Vancouver headquarters in Burnaby B.C. Canada.

Over the course of one afternoon they participated in three activities that are designed to enhance conversations about recycling issues as well as explore possible solutions. The activities consist of an icebreaker, a brainstorm, and visioning exercise (see fig. 3.1.13).

The design students helped to creatively engage with the participants to extract knowledge and understanding of the problem space from their perspective. Civic employees from various municipalities began talking to each other about problems that they all had been trying to solve individually. Stakeholders got a chance to have their concerns and desires listened to, talked about and brainstormed. This workshop sets the groundwork for the criteria of the back-end of the service.

Fig. 3.1.13: Activities conducted in the workshop.

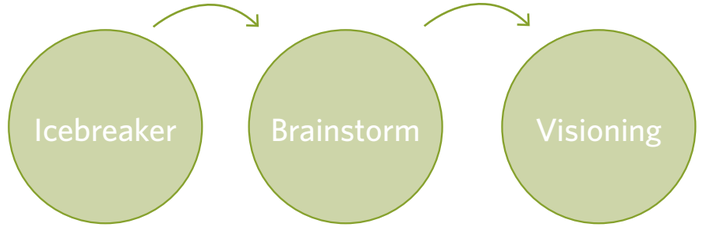


Fig. 3.1.14: Consolidating insights and finding themes on the wall during the workshop.

INSIGHTS

The main themes that emerge from the workshop are consistency for recycling across the region, contamination within recycling streams and visual communication strategies for recycling. More specific criteria considers issues around refundable bottle collectors accessing the recycling bins and keeping rain out of the containers to keep weight down and paper dry.

Ethnographic ride along

I had the opportunity to work closely with employees of several municipalities in the region through my research partnership with Metro Vancouver. I decided to participate in a ride along with the recycling waste haulers in the city of Richmond, British Columbia in order to gain deep insights into their routine. My methodology can be described as design ethnography which is an immersive method for designers to observe and understand a stakeholder's experience. It is "the study of people in their natural settings; a descriptive account of social life and culture in a defined social system, based on qualitative methods (e.g., detailed observations, unstructured interviews, analysis of documents)"(Bowling, 2014).

I observed two of the sanitation workers routes in two different neighborhoods in Richmond. One route was in what is considered the downtown part of the city, and the other was a along a mass transit route. Their job includes driving to each public space recycling and garbage receptacle in the city to empty and maintain them. My research process included photo documentation of their different tasks acting as a 'fly on the wall'. When there was down time while driving in-between pick-ups I could ask questions about their routine. This process was iterative, the more observations I made, the more questions I could ask. As soon as we started talking, the workers were eager to tell me all the problems and inefficiencies they have in their routine. This provided great insight for my research as their year of experience were translated into precise friction points. Lastly, I took notes throughout my ride-along of things that I couldn't take a photograph of, and that didn't come from talking to the workers. This included contradictions in what the workers said, and what they actually did.

The research from the ride along shows three main observations that I am showcasing in this section. They include the visibility of the garbage levels, the durability of the physical form and how much waste each station can hold.

VISIBILITY

While driving towards the next pick-up location, the sanitation worker was quick to point out set of bins pictured below (see fig. 3.1.15) The wall of the bins are made from an expanded mesh steel. This is particularly advantageous because they allow the worker to see from a distance how full each bin is and whether or not it needs to be emptied. This saves the worker time from not having to park, get out of the truck and check the bin levels only to find out that it doesn't need servicing. This is most relevant to locations with less pedestrian traffic as well as the 'off season' when traffic is much lower in public spaces, and bins don't need to be emptied as often. The station that the worker is referring to is not a normal set of bins and seems to be custom made in only a couple of locations. Small insights like this can have a huge impact system wide, when all the time and fuel saved is added up simply by being able to see the level of the bins from a distance.

Fig. 3.1.15: Bins that you can see how full they are from a distance.

Fig. 3.1.16: Worker handling a bin liner.

DURABILITY

One of my observations that didn't come from interviewing or photographs was how the workers physically treated the equipment they are using. I observed that the workers are in a hurry to make sure they get their route covered in time. This means they are working very quickly in all of their movements. The speed in which they opened a station, took out the full bag, and put in a new bag liner was impressive to watch. Because of this, the way in which they handle the bag and equipment is very rough. This observation has strong implications for influencing the physical form of designing a new recycling station that meets the needs of its users.

CAPACITY

As my observations continued a recurring complaint came from the sanitation workers was that the capacity of current recycling stations is too small. They noted that they would be overflowing during the peak season (summer) and had to be changed often which caused complications in their route operation. I kept this point in mind for the rest of my ride along, because it was mentioned so many times.

In contrast to this point, once we went to empty the largest capacity container, a 55 gallon steel drum (see fig. 3.1.17), the worker said that it is 'the back-breaker' because it is so heavy to lift when full. The distinction between what the worker said and what they did became apparent. This observation shows me that there are obvious ergonomic limitations to the capacity of recycling stations, in contrast to what the workers say. The station can only hold as much as the worker can lift safely.

Fig. 3.1.17: Worker emptying a 45 gallon drum, calling it 'the back breaker'.

Summary of Barriers to Recycling

The primary and secondary research conducted up to this point explores what the barriers are to recycling properly in public spaces.

These barriers need to be addressed in the design of the recycling station. They act as criteria for going into the design phase. Acting as a synthesis of the research up to this point, a summary list of barriers clearly highlights the key findings. They include:

1. Thinking fast in public spaces

People are in 'thinking-fast' frame of mind when interacting with people or objects in public spaces. This mode of thinking means that decisions are based on emotion and gut reaction, not considered thought. This limits the amount of time that a recycling station has to engage with the user.

2. Accessible information

The graphic communications that are used on current recycling stations is not easy to see, and their layouts are not conducive to quick digestion of information.

3. Sorting and organizing multiple items is complex

Asking citizens to sort objects in public spaces a complex task. Multiple materials going into different containers has a learning curve that needs to be addressed at the early stage of learning.

4. A Deeper knowledge of recycling

Peoples understanding of recycling is often a very common sense approach. Their decision about what stream to place a container is based off of their understanding of what will happen to it. This knowledge isn;t always correct, and teaching is required about 'what happens next' to recycling in the system.

2 LAYERS OF CHANGING BEHAVIOR

Services within government are often looking to alter or guide its citizens' behaviors' towards a greater good, whether it be environmental or an economic efficiency. Through research of different theories on behavior change, I can see a common theme in how they relate to the design of services. The diagram below integrates BJ Fogg's behavior change theory and Daniel Kahneman's 'Thinking fast and slow' (see p. 11) to show the common phases for behavior in services. This is a useful tool for municipalities when approaching a human centered problem space. The design of a touch-point is important, but it is equally important to distinguish the design of the information and learning required for use of the service or new behavior. The recycling station case study focuses on the second part of the diagram (see fig. 4.1), the physical touch-point. Future directions for the case study can explore the other half of the equation for behaviour change which looks at the knowledge and ability required to complete a specific task or desired behaviour.

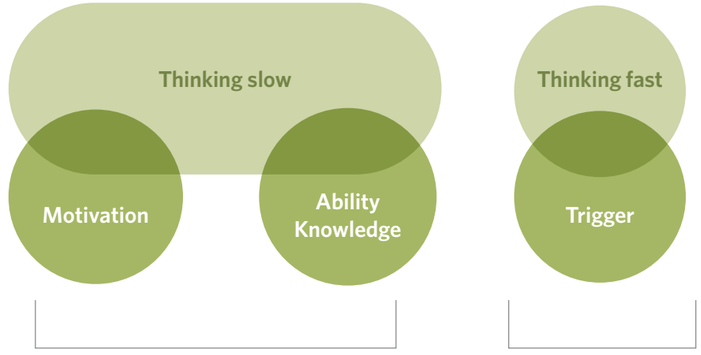


Fig. 3.1.18: Overlapping different theories of behaviour change.

This is where you can deeply engage with citizens learning about new services and how to do them. Interesting, in depth and formatted for teaching.

The touch-point, physical thing or action as part of a service. Designed to be clear and simple for intuitive use.

3.2 Design process

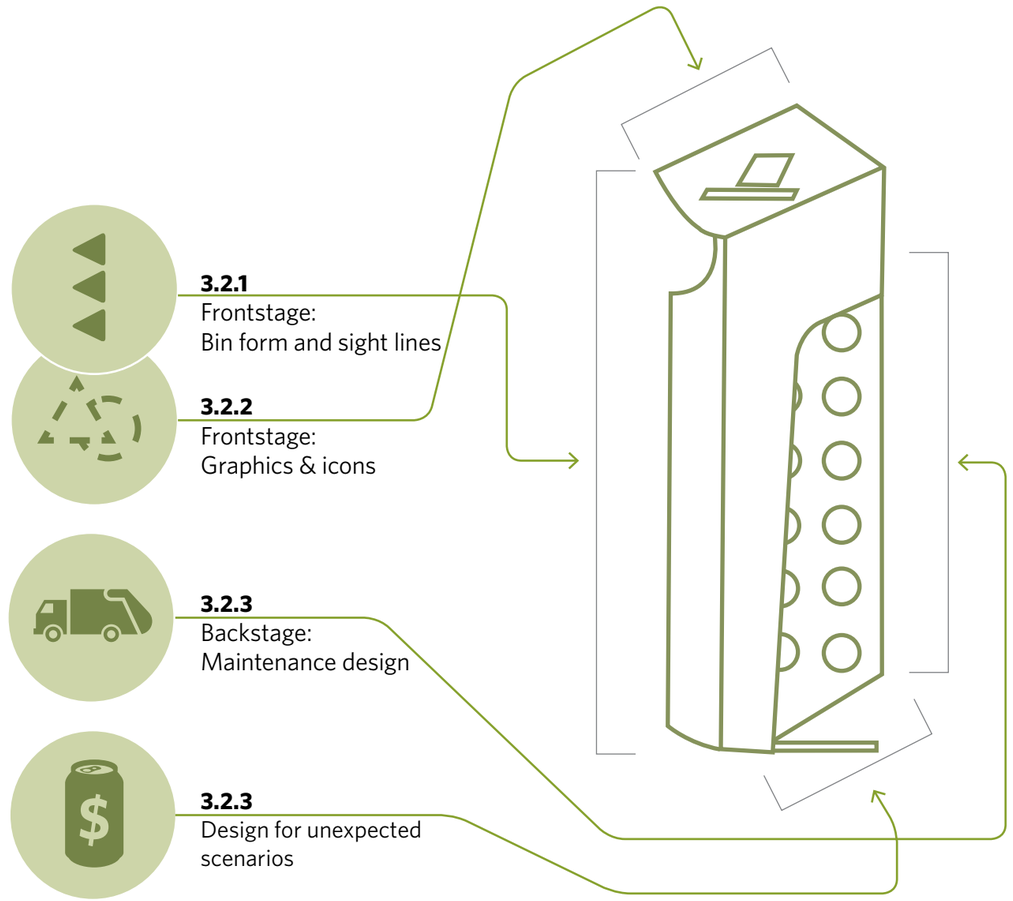
For the design of this project I have multiple municipalities as an engaged audience willing to participate in the process.

This means that as I conceive concepts, I can quickly prototype and test them on location in cities, even as an early iteration. As part of their process, municipal governments often need hard data to inform their decisions. Data is important, but it is often hard to quantify the human experience in design research. I approach this challenge by testing prototypes as often as I can, not only to validate the concept, but to create efficiency data to satisfy the municipal stakeholder. This speaks to the process of research through design in contrast to research for design. Each design that I make and test act as another layer of research through practice, informing the final outcome.

In partnership with Metro-Vancouver I am reaching out to external partners as a means to bring expert perspectives to the iterative testing phase. The department of behavioral psychology at the University of British Columbia participates in the research by helping to test one of the early prototypes on their university campus.

The design phase is broken down into the front stage and the back stage following a similar structure to the research section. The recycling station represents two different user groups coming together at one touch-point in a service. This means that each of the stakeholers needs are to be met in one physical form. This posed interesting design criteria by having two different user groups share one object which is realized in the form. Ergonomics and user empathy are the drivers of the design, looking at how perspectives, angles and sight lines can create an easy to see, easy to understand and safe to use recycling station.

Design process overview



3.2.1 Bin form and sight lines

Design for citizens

DEVELOPING SIGHT LINES

After looking at multiple examples of public space recycling stations I began to think about one of the most basic principles of human centered design; empathy. As described in 'The Design Journal "[By] employing empathic research strategies, designers will gain insight and shared understanding with users that enable them to create more intuitive, sustainable and successful product outcomes" (McDonagh and Thomas, 2011). As an empathy exercise I put myself in the user's shoes and go through the citizens experience of attempting to recycle in public. Approaching a station is rarely done head on when in a public space (see fig. 3.2.1). This is because we are often on the move when we seek out sites for recycling. After looking at multiple precedents of bin designs it becomes clear that they almost all have their graphics and visual communications on completely vertical or horizontal planes. They are parallel to the user's sight-line, not perpendicular which would be the ideal situation for seeing something clearly and easily. I began drawing out diagrams to try and visualize my ideas. This helps me to further understand my ideas as they are forming.

PERSPECTIVE SHIFT

A basic paradigm shift emerges out of the behavioral observations in my research. People in public spaces are on the go and in motion. The recycling station should reflect that mindset and spacial relationship. What would it look like to make the graphics visually available to the user as they are approaching, and not stopped and facing the station head on? This diagram illustrates the beginning the idea (see fig. 3.2.2).

Fig. 3.2.1: Image of a current recycling stations with graphics not oriented to the user as they approach.

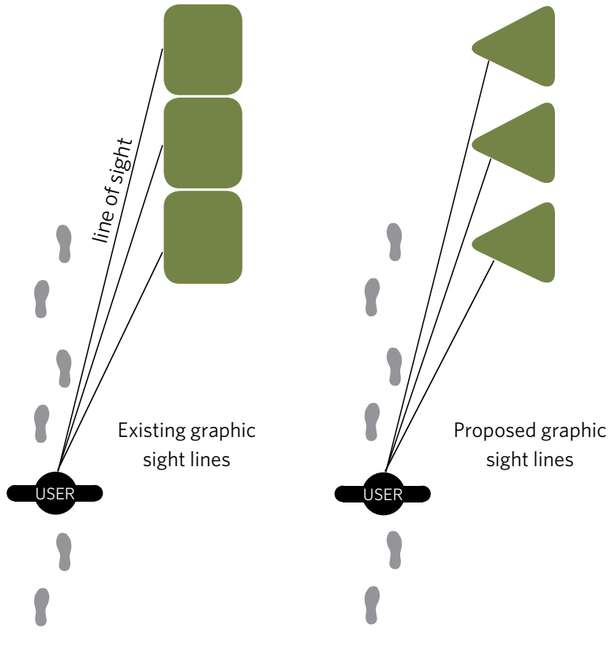


Fig. 3.2.2: Top profile view of a recycling station, transitioning from flat sight-lines perpendicular to the user, to angled sight-lines facing the user.

FORM EXPLORATION

At first I am stuck with the idea that a recycling bin needs to be based on a rectangular prism. I switch my lens from looking at a box to looking at a plane that the citizens are interacting with (see fig. 3.2.3). I aim to focus on the most effective placement of the communication for the recycling interaction. What orientation can be seen from multiple perspectives at street level? The prototype shown here (see fig. 3.2.5) has the icons placed on both sides of the bin in a more ergonomic orientation to the user as they are walking down the street. I am experimenting with ways that I can bend a vertical plane so that it is visible from both directions of pedestrian traffic. Finding the simplest way to show both perspectives makes manufacturing easier, while providing a simpler form for the user to comprehend.

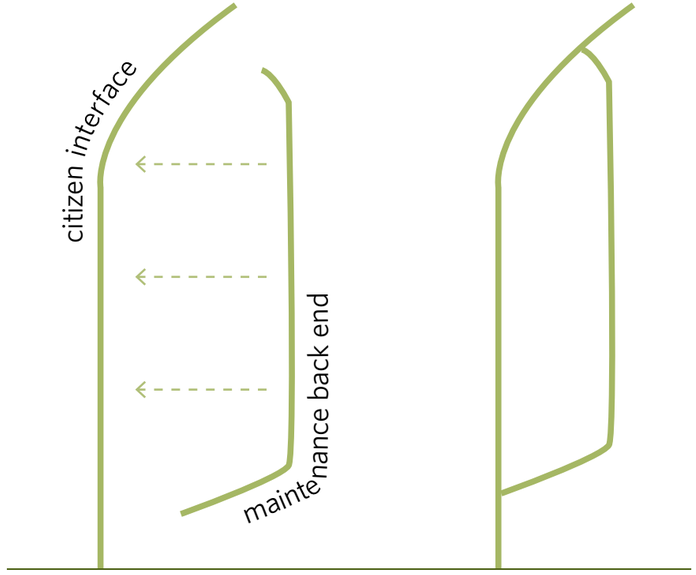


Fig. 3.2.3: Diagram illustrating braking the mold of a bin as rectangle.

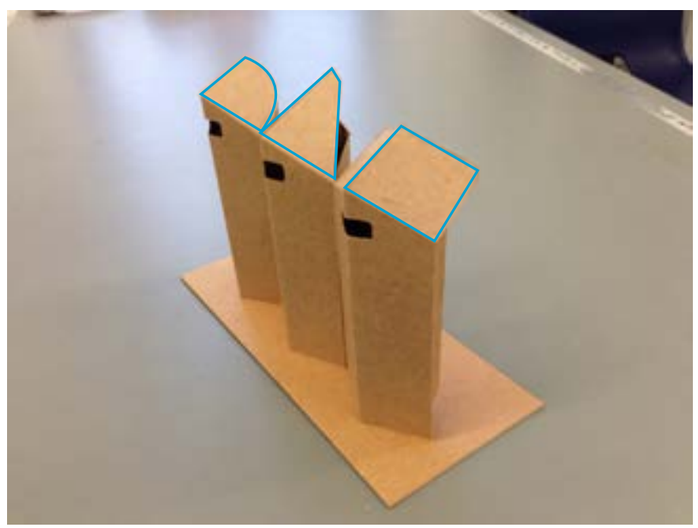


Fig. 3.2.4: Early cardboard prototype looking at sight lines in the form.

Fig. 3.2.5: First full scale cardboard mock up.

FIRST PROTOYPE

The prototype featured in Fig. 3.2.6 is a full scale mock up of a the recycling station with a plywood core and foam-core outer shell. This shows the overall proportions as well as how the line of sight works in relation to the user perspective. It also shows a very good view of the cantilever design. The cantilever serves as both an aesthetic feature that creates a pleasing looking recycling bin while also creating a space below the container to allow for it to tilt towards the service worker for easier unloading. The flat surface allows for plate steel to be considered in the manufacturing process which has its advantage for its strength and vandalism resistance as criteria developed from the backstage workshop. I am also exploring the shape of the top back edge to find the most pleasing form. The colours used on this iteration of the design are specific to the context in which they are being tested.

Fig. 3.2.6: Perspective view showing the visibility of the icons.

Fig. 3.2.7: Front view of the prototype.

Fig 3.2.8: Back view of the prototype.

3.2.2 Graphics and Icons:

Engaging citizens from multiple distances

I am determining the perspective and orientation of the graphics through my form explorations. Now my goal is to make the graphic communication as clear as possible for the user. Figuring out a graphic strategy means that I need to consider the different ways with which to communicate information. Gunther Kress writes about the different 'modes' in which we use to communicate as a society. Words, language, drawings, sounds and diagrams are examples of this. The modes that I utilize for the purpose of communicating different recycling streams are words, icons, images.

Part of the criteria going into this part of the design phase takes from my research on behavior change (see pg. 11). Following Daniel Kahneman's thinking fast and slow principle, the design needs to engage people in different modes of thinking. When in public spaces people are often on the go, with a future task occupying their mind as was noted in the user observations. My approach to the graphics is to create as much clarity for the user, with out taking away detailed information that is necessary for completing a complex task.

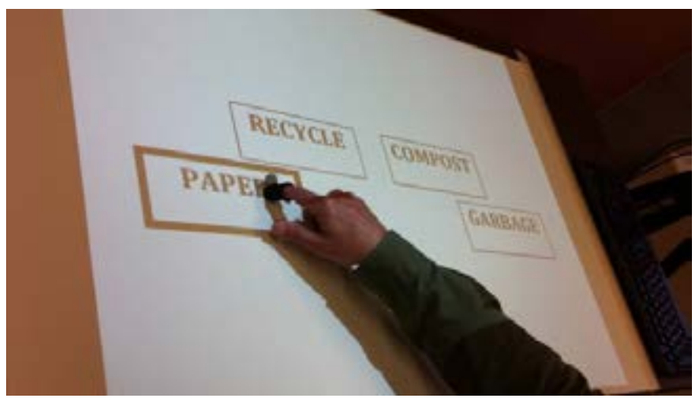


Fig 3.2.9: UBC testing reaction times with users.

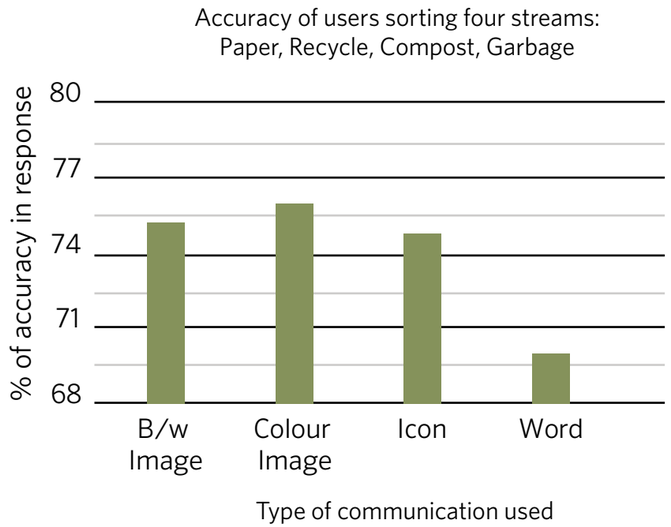


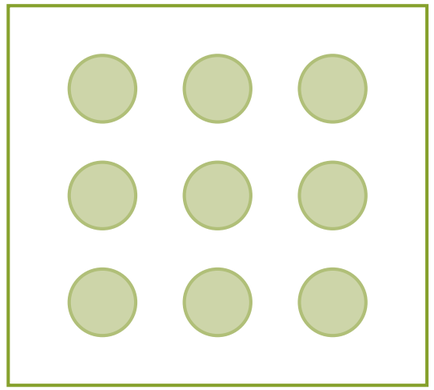
Fig 3.2.10: Graph of user accuracy in the testing results.

At the same time that this research was being conducted, the Brain and Attention Research Lab (BAR Lab) at the University of British Columbia was also conducting research in recycling cognition. Their investigation is to determine the best method of communicating the different streams of a recycling station in both accuracy and efficiency.

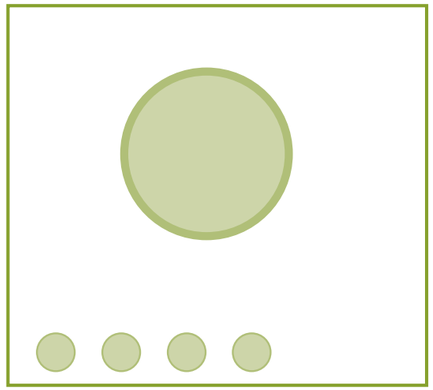
The team set up an in-lab experiment where they asked users to pick which stream they would place a certain piece of waste (see fig. 3.2.9). Their hands were tracked using cameras to get an accurate response time. They tested four different types of communication methods to represent each stream separately; black and white image, colour image, icon and word.

The accuracy results are shown in the graph (see fig. 3.2.10). Images and icons proved to be the most accurate method for users to correctly chose where a waste item should be placed. Users were interviewed after the exercise to find out what they felt was the most effective method. Interestingly they stated that they felt words were both more accurate as well as a faster way to sort, whereas the data shows that words had the least accuracy with the slowest response time.

My interpretation of this data for use in my design is based on a couple of factors. The fact that this testing took place in a laboratory means that it is missing many of the real world stimulations that might distract a user. I think when comparing these results to the theories on behavior change and thinking fast and slow, I begin to make a connection between people taking longer to 'think slow' and engaging with the words as a communication medium.



Current recycling graphic layout



Proposed graphic layout

Fig.3.2.11: Diagram showing the overall layout of current recycling graphics vs the proposed design.

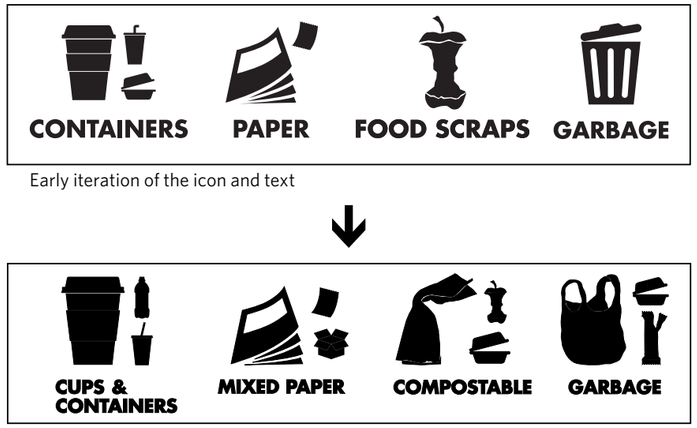
The diagram above left (see fig. 3.2.11) shows the current standard for recycling graphics. They often show many options of items that can go into a particular stream. The problem is that spreading them all out evenly creates no hierarchy for the users to engage with (see fig. 3.2.12). Without hierarchy, the user becomes disoriented and doesn't absorb or interact with any information. The proposed design of the graphics creates hierarchy by creating one icon lager centered on the graphic. This icon is chosen by finding the most common item in that waste stream. There is more than one item that goes into any given stream, so having multiple icons representing different items is necessary. By grouping them together on the bottom of the graphic, they don't distract or take away from the hierarchy and visual clarity.

Fig. 3.2.12: Example of existing graphic layouts with no icon hierarchy.

GRAPHIC DETAILS

The perspective format of the recycling stations physical form created a unique outline in which to place the graphics. It is challenging to find a way to line up the large icon, words as well as secondary icons within a diamond shape. Through an iterative process, many different layouts were tried which allowed for the current version to evolve. A grid was created (see fig.3.2.13) in order to create uniformity between the different streams, considering they had different icons, words and colors to work with.

Fig. 3.2.13: Grid for placement of the graphics on the recycling bin.



Early iteration of the icon and text

More detailed graphic iteration

Fig 3.2.14: Early icon iterations for the set.

Early iterations of the communication design explore different icon variations. I am creating graphics that engaged the user from different distances as they approached the recycling station. This means that there is one large central icon that can be seen from far away, with secondary smaller icons that are viewed from closer up (see fig. 3.2.16). Visually priming the user allows them to begin to make their decision about where they are placing an item in the recycling stream before they actually arrive at the station. This way the user doesn't have to spend extra time stopping, thinking and worrying about their decision.

Fig. 3.2.15: Overview of graphics for the other three streams.

Graphic visibility from multiple distances

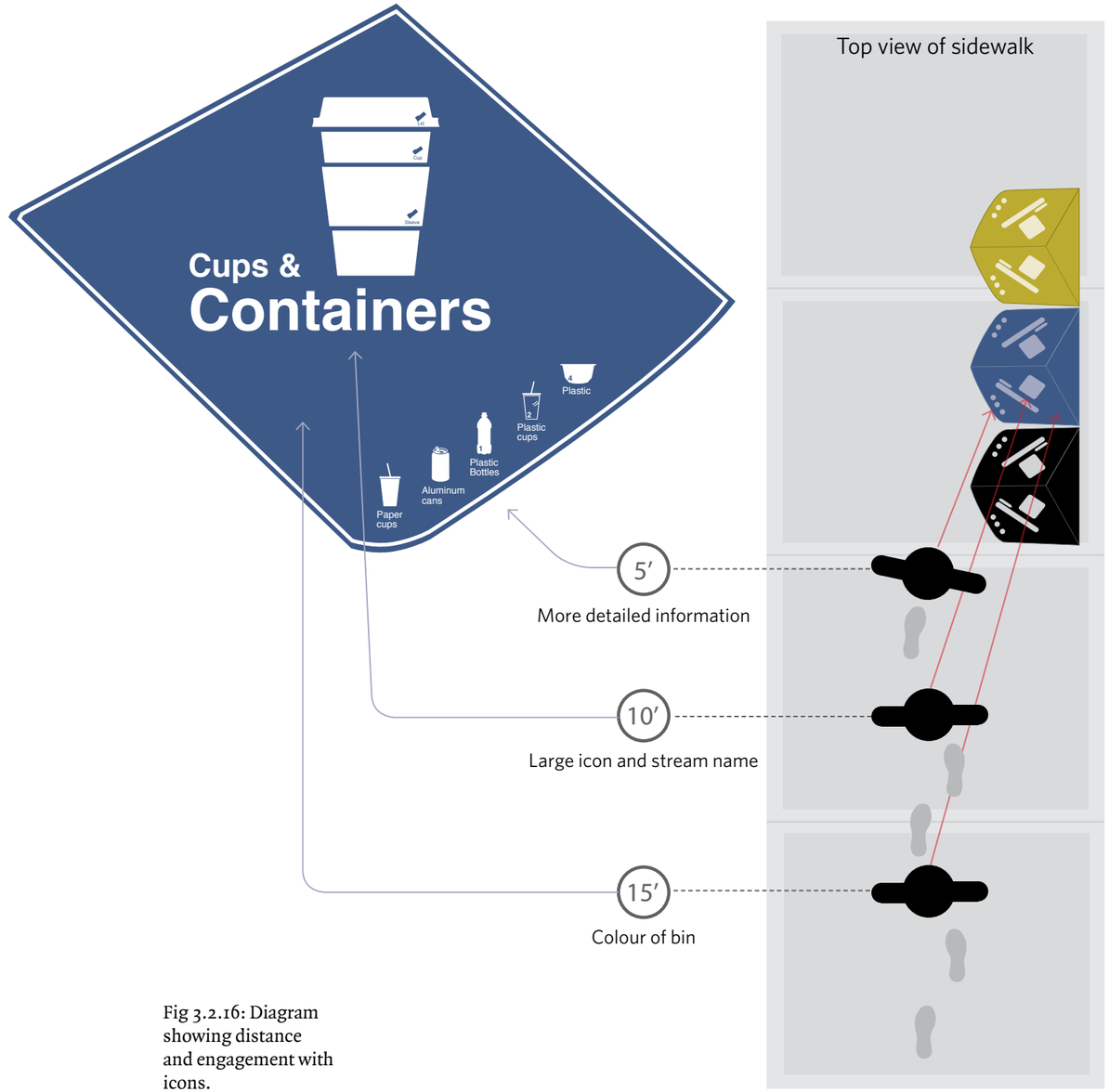


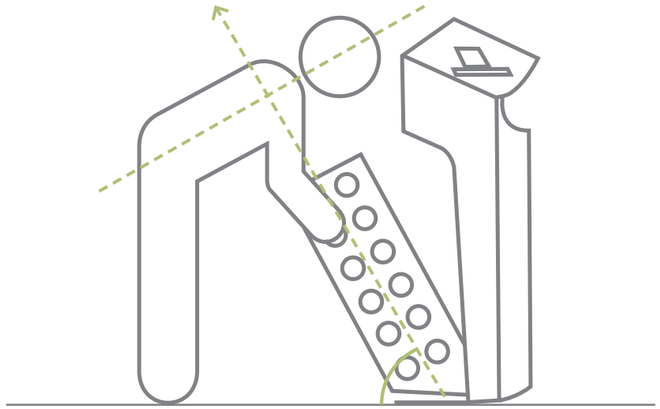
Fig 3.2.16: Diagram showing distance and engagement with icons.

3.2.3 Maintenance Design:

Backstage service workers

The criteria going into designing the recycling bin to be used by the service worker comes from the ethnographic ride along I conducted in the city of Richmond. I had the opportunity to interview, observe and take notes on the service workers routines. The repetitive motion of their work includes emptying up to one hundred garbage cans in a day. This means that ergonomics have a huge factor to play in the design. While one of the workers was lining a garbage can they had emptied with a new bag, they propped it up (see fig. 3.2.17) in order to create a more ergonomic angle to put in the new bag liner, rather than it being straight up and down.

Fig. 3.2.17: Observation of how the worker ergonomically lined the bin.



I am mimicking this angle in the design by creating the opening mechanism as a cantilever instead of a swing out door. This solves two problems at once, creating an ergonomic angle, as well as a method to open and empty the bins at the same time.

Fig. 3.2.18: Diagram highlighting the bin's angle in relation to the service worker.

Fig. 3.2.19: First prototype visioning the angle of the emptying mechanism.

Fig. 3.2.20: Second prototype with more resolved opening mechanism.

Fig. 3.2.21: Top view diagram of a street in which service workers are emptying recycling stations in public spaces.

VISIBILITY FROM A DISTANCE

The second observation from the ride along is that the service workers have to get in and out of the vehicle that they are driving to check and see if a bin needs emptying. They are limited by not being able to see inside the bins to know how full or empty they are. I resolve this issue by placing holes on the back side of the container, in combination with clear bags. This allows the service workers to see how full the container is before getting out of the truck (see fig. 3.2.21). This way if the station doesn't need emptying, the workers can save time and energy by not stopping, and getting out of their vehicle at that station.

BAG LINER & NOTCH

Having a bag liner for recycling stations is a requirement for most municipalities as a method to keep the different recycling streams separate, as well as a way to empty stations that are in remote locations where a service vehicle can't reach, like a park or plaza.

When searching for a method to secure the bag, the 'belly wrapping' technique (see fig. 3.2.17) where the bag comes over and outside the top edge of a standard bin liner, is described as the most reliable by service workers. This method usually works when there is a 'shell' or an aesthetic cover on the outside of the container. My goal for the design of this container is to reduce as much material as possible and keep the components as simple and strong as possible for their repeated heavy use in public. Adding an extra aesthetic shell is just another piece that can be broken or stolen.

Following the criteria as described above, I am designing a method to utilize the 'belly wrapping' bag liner technique, without having to add any extra material by creating a notch towards the back of the section of the container that hinges towards the service worker (see fig. 3.2.22-23). This prevents the edge of the bag from being seen by the public, and performs the same functionality as belly wrapping

Fig. 3.2.22-23: Details showing the notch created to allow the bag liner to wrap around the bin mechanism without being seen when closed.

3.2 .4 Design for unexpected scenarios

When designing objects for public spaces, they are susceptible to being used and interacted with in unintentional ways. The most common challenge as described by municipal staff and service workers is having the recycling stations opened by people collecting refundable bottles and cans. The problem is not the fact that people are collecting cans, it is that the collectors will often leave the door mechanisms open, or leave the lid off, depending on the type of receptacle. This poses safety challenges for the public as well as the overall functionality of the station. I approach this problem by figuring out a way for the angled bin mechanism to close automatically. This is achieved by integrating a torsion spring into the hinge at the base of the bin (see fig. 3.2.24-25). This way if the bin is opened by somebody other than a service worker it cannot be left open.

Fig. 3.2.24: Emptying mechanism in the open position, arrow indicating direction of force for auto-closing.

Fig. 3.2.25: Emptying mechanism in the closed position.

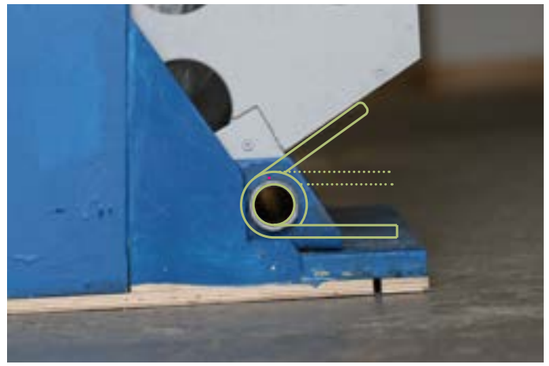


Fig. 3.2.26: Side view of torsion spring mechanism.

Fig. 3.2.27: Torsion spring installed on plywood prototype.

The correct amount of force is needed from the torsion spring in order to close the back section of the container. Depending on how much material is in the bin, the weight will vary. The force required by the torsion spring was calculated by looking at the average density of the different material streams, paper, garbage and containers. Based on the heaviest stream (garbage), I calculated how much force is required to close the container at full capacity. The force required was sent to a torsion spring manufacturer which then provided spring samples for testing on the plywood prototype (see fig. 3.2.26-27).

Unintended scenario

Bottle collector approaches recycling station

Opens station to search for refundable items

Upon leaving, the force from the torsion spring closes the back of the container

3.3 Testing & Feedback

Testing the front end user experience is done with both qualitative and quantitative methods.

Testing prototypes in context in different municipalities in the region leverages my research partnership with Metro-Vancouver by. By placing prototype recycling stations in public spaces I quantitatively measure how effective the prototypes are at diverting recycling streams correctly. The results inform the next iterations of the design. The testing in context happens in two phases with two subsequent prototypes.

Qualitative testing is conducted with participants in a studio context with a prototype of the second major iteration of the bin design. This exercise is directed towards understanding the user's experience for the recycling station and how participants think through the process of recycling. Combining both quantitative and qualitative methods for testing the citizen facing aspects of the design creates greater understanding of how effective the design is at diverting waste correctly.

A full scale prototype was brought to service workers in two different municipalities to get feedback on the design and components that related to their needs.

Fig. 3.3.1: Contents of the 'Containters' stream from on-site testing in Vancouver.

Testing overview

3.3.1
Qualitative
User Testing

3.3.2
Quantitative
In context
testing

3.3.3
Prototype feedback

3.3.1 User testing:
Think out loud exercise

This exercise asks participants to interact with a working prototype. It is an interactive form of user testing in which the participant is given an item that needs to be recycled at the station. They are asked to 'think out loud' while performing the task (see fig. 3.3.2). They are told to take their time and analyze what is going through their mind while attempting the task at hand. The activity is filmed, so that I can watch the footage afterwards to see user's body language and to listen to what they say during the exercise. After the exercise, I come out to the station and have a reflective conversation about what the participant said, or didn't say (see fig. 3.3.3).

The main concept of the user being able to see the larger icons from a distance on the angled tops of the containers was verified with participants throughout the activity. It is apparent that they are able to begin processing and making their decision from far away. Users attested to the need to see all of the options in the station before they made their decisions of where to place an item. This is made easier by the perspective and size of icons.

This approach acts as both an opportunity to test the prototype, as well as a way to generate insights to further iterate the design.

Fig. 3.3.2: Participant examining the options.

SELECT QUOTES

On sorting a plastic food container

"I'm pretty sure this is a container; it is not physically on here, but I'm guessing from the material that it's the same sort of plastic that goes in here."

On first approaching the station

"I don't want to automatically default it into the garbage, so I checked the other streams to make sure it doesn't go into one of them."

On how they came to their final decision

"I know it's not garbage because it's plastic, its not food scraps, its not paper. It's still confusing, but by process of elimination…"

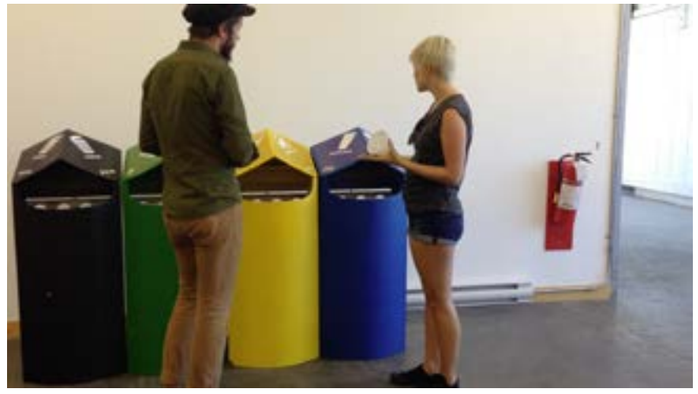
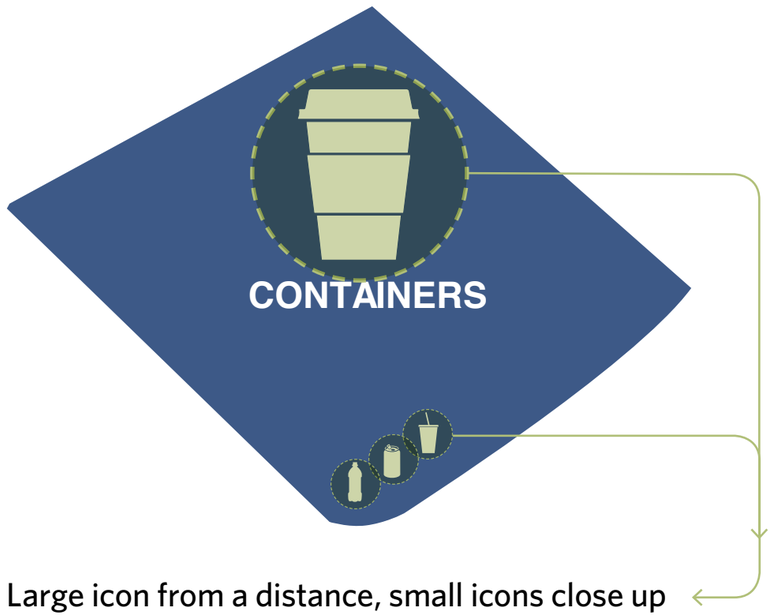


Fig. 3.3.3: Conversation with participant after the exercise.

Select insights



Large icon from a distance, small icons close up

CONCEPT

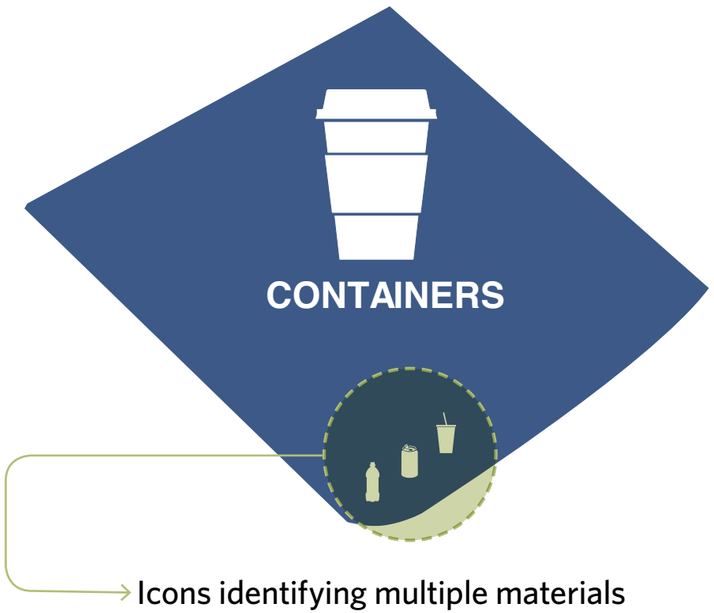
The larger icons on each stream are designed to be seen from a distance, so that the user can begin to make their decision before they actually arrive at the recycling station. The smaller icons below are designed to be seen from closer up, to act as a secondary set of more detailed information for the user to make their decision. I am attempting to strike a balance of too much information (where nothing is seen) and too little information (where there is not enough info to make a decision).

RESULTS

Most participants engage with the smaller icons upon arriving closer to the recycling station. Participants repeatedly want to 'match' the item in their hand with the icons they are seeing on the graphics in order to verify that the decision they are making about placement is correct.

INSIGHT

The larger and smaller icons are confirmed to be working as intended. The number and type of icons needs to be further iterated to discover the best representations of items that go into that stream. Adding a written description of the secondary icons can add further clarification.



Icons identifying multiple materials

CONCEPT

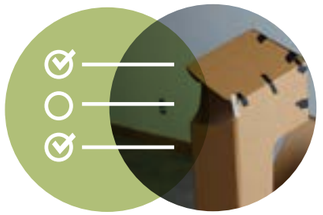
The smaller icons are purposefully placed at a distance from the large main icon and text. The purpose of these smaller icons is to represent the multiple different items that could be placed in that stream. For this prototype I use simple graphic icons with no text showing a plastic bottle, aluminum can and a clear plastic drinking cup with a straw. These three items represent a majority of the items that go in this stream.

RESULTS

Participants used the icons, but would often make decisions based off of the type of material that the object in the graphic represented. They would say that the plastic food container was the same type of plastic as the bottle in the icon, and would therefore feel confident enough to place the item in that stream.

INSIGHT

Not only does the graphic need an icon of the item it represents, but it also needs a written description of the material that the icon is made out of, not a written description of the item that the icon represents. This is to clarify that the 'containers' stream represents multiple materials like aluminum, plastic and laminated paper.



3.3.2 In context testing

EARLY PROTOTYPE TEST

Working with a government body as a research partner, a lot of their decision making processes are driven by data. This means The design of the recycling station needs to be tested in terms of how effective it is in getting citizens to recycle accurately. Evidence-based design is a methodology that "bases decisions for effective design on the implications of credible research and assessed outcomes, rather than sole reliance on intuition and anecdotal information" (Martin and Hannignton, 2012, p. 76). Due to the scope of this project, it is not viable to do long term testing of each prototype so another method for testing efficacy needs to be developed.

I presented my research and current prototype design to the 'Behavioural Sustainability' working group within the University of British Columbia (UBC) Psychology department and the Brain and Attention Research Lab (BAR Lab). They have specialized tools and techniques for observing user behaviour in a public context setting. This is an example of a designer reaching out between disciplines and institutions when faced with a challenging research space. This gives an opportunity to test the efficacy of bins without having to install them over long periods of time.

My testing process connected with the BAR Lab at the UBC. The BARLab studies cognitive psychology, and researches the effectiveness of iconography on recycling stations. During May of 2014, the second iteration of the recycling station design was delivered to the BAR Lab at UBC. Over the next two months, the team at the BAR Lab conducted multiple studies on the design. The goal of the collaboration is to not simply test concepts that are designed, but to also discuss an area of mutual interest to explore, and then design for that area. To facilitate this discussion with the researchers from UBC, as well as a key stakeholder from Metro Vancouver, I set up the meeting space with a rough prototype of the observations I had made, diagrams of the basic observations and taped a 'sidewalk' on the ground to simulate the approximate real world surroundings, at least in size. The goal is to bring the other researchers as far into my idea as possible, early on in the process. Here we could discuss the merit of the idea, and possible ways to test it.

The main goal of the collaboration is to test how effective the recycling station design is in reducing contamination in the recycling streams. During the testing process, the stations were placed in a public location on the UBC campus while student researchers observed and documented people using the bin. The contents of the bin were then examined to determine the contamination levels.

Fig. 3.3.4: Still from video footage of testing the station at the University campus.

First prototype for testing: overview

Icons are oriented toward the user as they walk down the sidewalk.

Large clear icons are designed to be seen from a distance so that users can begin to decide what stream they will place their item in before they arrive at the recycling station.

This version of the prototype had only icons as a communication tool to see how not having text effected efficacy.

Each stream is colour coded. The colours used here are specific to the testing location.

It is important that the garbage stream is included in the station, so that it becomes the default choice. It is better to keep the recycling streams uncontaminated and have some recyclables in the garbage

The overall front form of the bins in a series is pointed to help see each stream from the side. This angle is subtler than the top where the icons are placed.

Prototype 1:

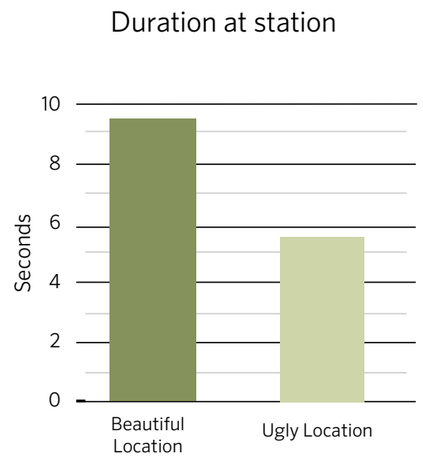
Testing at the University of British Columbia campus

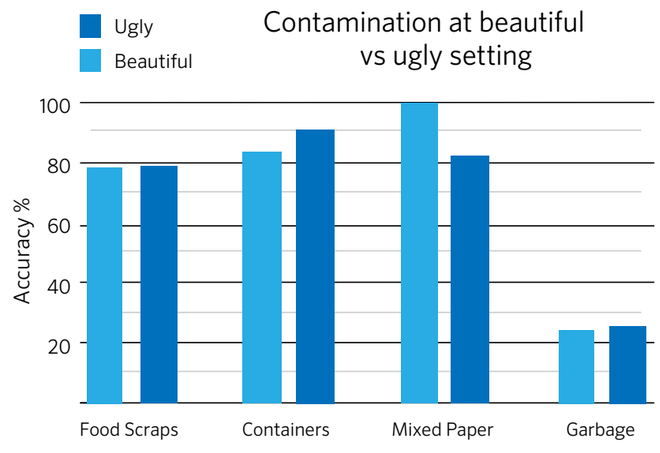
This study conducted at UBC assesses the impact that the type of surrounding has on the accuracy of users of the recycling station. Are people better at recycling in a more beautiful location?

The bins were placed on location at UBC, in a beautiful location and an ugly location (see fig. 3.3.4-5). After each installation the contents of each stream were counted to see how accurately people used the bins. The graph shows the accuracy of each stream as a percentage, as well as how long they spent at the station. The Garbage stream shows an accuracy of approx 25% which at first seems like a negative result. When users didn't know what stream to put their waste in, they defaulted to the garbage, which keeps the other recycling streams less contaminated.

The results from both locations are not consistent in each stream, but overall there is a slight increase in accuracy in the beautiful location. When placing recycling stations in public spaces, can we place them in more beautiful locations?

Fig. 3.3.5: Recycling station on UBC campus being filmed for observations.





INSIGHTS

The testing conducted at UBC showed an overall user accuracy in the recycling streams is 85% (see fig. 3.3.6). This does not include the garbage stream, as the main goal of the project is to keep the recycling streams free of contamination so that they can be recycled. A few key insights came out of the testing at UBC. The duration of the individual tests were only long enough to collect on average 100-110 items in the stations. This sampling is not large enough to show definitive results. There is consistency in the results between the two tests, but for more concrete results, longer testing is required.

The researchers at UBC observed that the recycling prototypes that they were testing didn't look 'real' enough as they are made of foam-core (a temporary material) and not metal. The overall results are very promising, as this is only the first iteration of the design. The next section covers longer term testing in participating municipalities in the greater Vancouver region.

Fig. 3.3.6: Graph showing time spent at the station based on its surroundings being beautiful or ugly.

Fig. 3.3.7: Graph showing how effective each station was based on its surroundings.

Second prototype for testing: overview

Icons are based on the most common items found in that stream. The recycler will take both laminated paper and plastic coffee cups in the container stream.

Bins are larger to accommodate large volumes. Items such as coffee cups take up a lot of space quickly.

Words are added to the icon to add extra clarity in the decision making.

More realistic prototypes are made of wood for the wear and tear of longer testing.

Opening is on the side to keep rain out of the bag liner. This keeps the weight down for transportation and lifting. It also keeps the paper stream from getting wet thereby retaining material value.

The concept is designed to be made out of sheet metal.

Prototype 2:

Long term testing in municipalities

Another more robust iteration of the station design is made for longer term testing in various municipalities. Insights from the testing at UBC are used to help inform the next design. The recycling station was installed for one week full-time (24 hours a day) in three different local municipalities (see fig. 3.3.8). The station was emptied regularly and the contents of each stream were counted to determine the accuracy and how effective the station was in that location. Each municipality that participated helped in co-ordinating a suitable location to do the testing. Locations were chosen that had the highest pedestrian traffic in order to get the most use of the station and therefore the most results.

After the week long testing in three municipalities the contamination results proved promising. The average accuracy between all three test installations was 83% (see fig. 3.3.9). Precedent recycling stations that have been used in the region have such bad contamination rates (some reporting around 50%) that all of their streams are thrown in the landfill as a standard practice. The garbage stream is not counted in the accuracy percentage as the goal is to keep the recycling streams as clean as possible.

Fig. 3.3.8: Second prototype on location in Surrey B.C. for a week-long installation

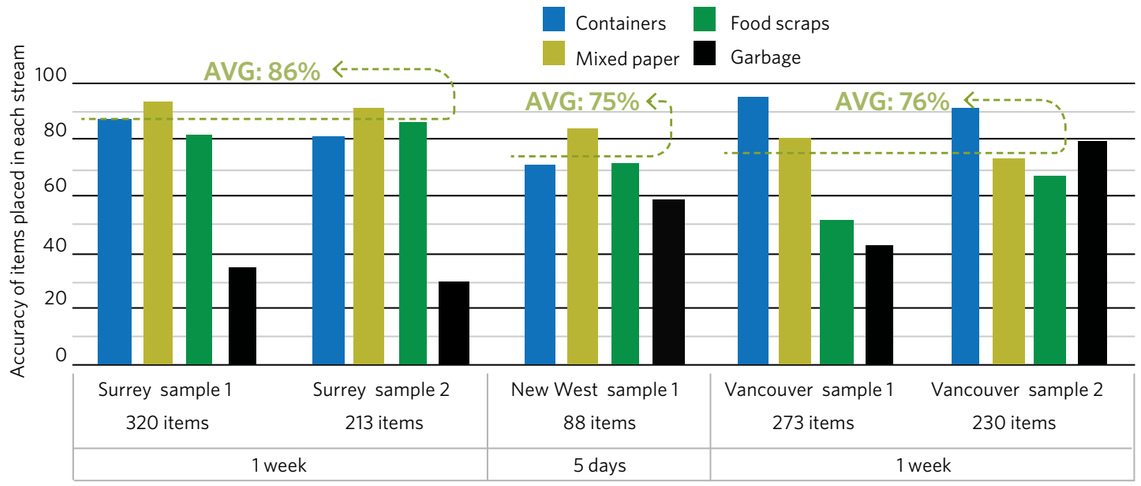


Fig. 3.3.9: Contamination results from long term testing in municipalities.

SELECT INSIGHTS

The long term installations validated the overall concept and form of the bins. Insights included:

• An average accuracy of 83% is a very positive result compared to existing stations that are around 50%, or so bad that they don't measure
• Four streams is too many choices for users in a public context.
•Don't include a foodscraps stream unless it is context-specific, e.g. a "busy intersection" location where people frequently stop to eat their lunch.
• Bottle collectors can easily contaminate a recycling stream by stealing bags liners and dumping the contents into another stream.
• Icons need to be fine-tuned to improve clarity for each stream.

Fig. 3.3.10: Counting items collected in each stream.

3.3.3 Service worker feedback

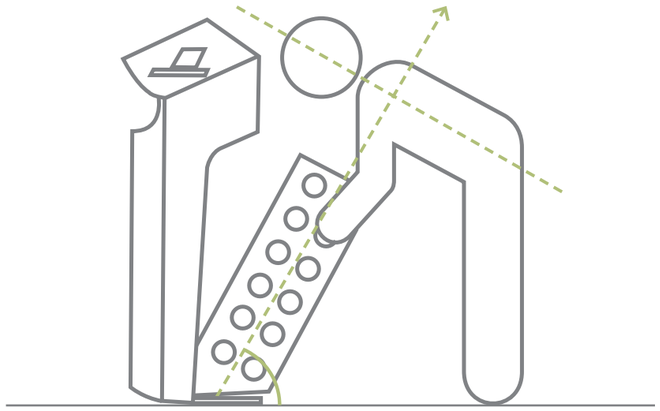
The process of installing the recycling stations in multiple municipalities is done to quantitatively verify how effective the design is with citizens attempting to recycle. This testing scenario is only effective at looking at the citizen's experience, not the people emptying and maintaining the station. In order to get feedback from the waste hauler, the recycling station prototypes were driven to the works-yard of two different municipalities and one recycling company in the region (see fig. 3.1.11) . Insights that inform the design of the service facing features of the station come from primary research conducted with the service workers themselves. This exercise is to see how effective the resulting concepts are to the workers based on their original participation.

If this process of getting feedback from stakeholders is integrated into municipalities problem solving process, there would be an opportunity to gather much richer input on the design. As a designer operating in the context, I am limited by the scope of this project in through the methods I am using.

Fig. 3.3.11: Showing the wood prototypes to service workers in Richmond.

In place of observational studies and test installations, full scale working prototypes were presented to the workers. They were shown specific aspects of the design to give their input on. General feedback has to do with details like a concern over the capacity of each container. These details are important, but I wanted to find out about core functionality as a user of the station.

Select insights



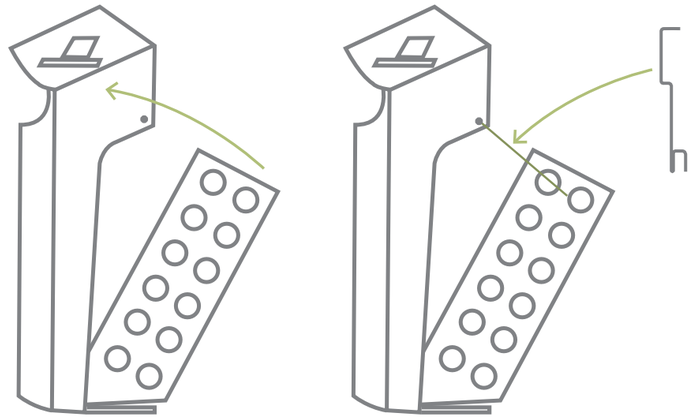
Ergonomic angle for emptying the bins

CONCEPT

The emptying mechanism is ergonomically angled towards the service worker as to alleviate back strain through repetitive lifting. The prototype that was brought to this feedback session had the opening and closing mechanism fully functioning to allow the worker to try it out.

FEEDBACK

Feedback was very positive about this functionality. Due to the scope of the feedback session, the workers didn't have the opportunity to use the prototype repeatedly throughout the day. This type of in-depth testing will require metal fabricated prototypes installed as a pilot in a public space.



Auto closing & staying open

CONCEPT

The closing mechanism is designed for when refundable bottle and can collectors open the station. Municipal staff have observed that these collectors do not always close the stations after they have searched for items. This concept addresses this problem by closing the back section automatically. At this stage in the design, I am still looking for a way to keep the back section open while the service worker empties the station. The metal hook (see fig. 3.3.12-14) is designed to prop open the back section. In this scenario, the service worker has to carry the hook as a 'key' to keeping it open.

FEEDBACK

The workers were concerned that the 'key' would be too much of a burden for them to carry around on their routes. As part of the ride along that I did with the workers for my research, I noticed that they did have a set of keys that they used to unlock various recycling stations on their route. I was told that a key this large was undesirable for such a repetitive task. The big takeaway from this feedback is that I need a method to keep the station open that is integrated into the overall form, not a separate piece or key that can get lost. This creates an interesting criteria in which the service worker knows how to keep the station open, while having unintended users not be able to use that mechanism.

Fig. 3.3.12: Metal 'key' being used to keep the back section of the bin open.

Fig. 3.3.13: Close up of the 'key' utilizing existing parts of the bin to attach to.

Fig. 3.3.14: Metal 'key' that would need to be carried by service workers to keep the station open while they emptied and maintained the bins.

3.4 Final prototype

The unique challenge of this case study is the integration of three different stakeholders needs into one physical touchpoint in a service.

The final prototype consists of one recycling station manufactured in plate steel for pilot implementation in three municipalities in the region. This pilot program will be a long term installation testing how effective the station is at helping the public divert waste.

The final prototype has three streams, garbage, paper and containers. Throughout the research and testing phase, the station has had a fourth stream, ‘compostable’. Traditionally in streetscape recycling this fourth stream has not been included. I included it in the testing of this project to gauge how effective it could be as more people are becoming normalized to diverting organic waste as well as other recycling materials. Through analysis of the waste streams during testing, there was not a significant enough amount of compostable materials being collected in a majority of the streams to justify its inclusion. From primary research with users, I also found that having four streams is too many for someone trying to make a quick decision of how to recycle in public spaces.

Citizens

Sanitation workers

ORIENTATION

Graphics are oriented towards the citizen as they are walking on sidewalks.

GRAPHICS

Graphics are designed to be seen from different distances, with information relevant to each distance.

COLOUR AND OVERALL FORM

Colour is the most visible way to distinguish different recycling streams from the furthest distance.

TRANSPARENT BACK

The back section of the recycling station has holes in it so that it is visible how full the station is.

ERGONOMIC ANGLE

The back section of the container opens on an ergonomic angle towards the sanitation worker as they empty the contents.

HOLDING THE BACK CLOSED

A torsion spring integrated into the hinge of the back section ensures that the bin stays closed at all times.

3.4.1 Recyling station overview

The Frontstage

SIGHT-LINES

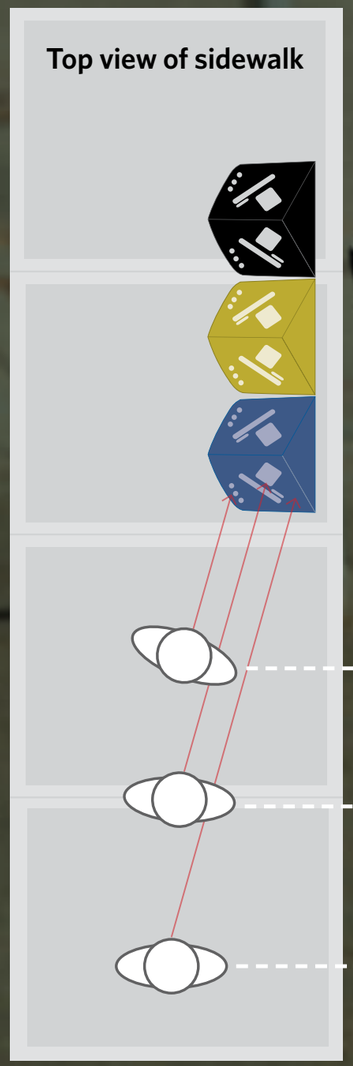
The final prototype angles the most important information towards the user in outdoor public spaces. The most common use case scenario for people to dispose of waste in public spaces in on sidewalks (see fig. 3.4.1). This means the graphics need to face the path of people walking down the sidewalk. The multi-stream station is made up of three separate units instead of one larger station for two reasons. The first is to accommodate flexibility in the number of streams needed depending on the context. Some municipalities only want two streams, and other contexts might want to incorporate a fourth compostable stream if it is located in a place that has a lot of restaurants and food vendors in the proximity. The second reason for individual units within a multi stream station is the form factor that is needed for orienting graphics towards the user. I designed the angled top of the bin to be integrated into the overall form of the structure, not the other way around which would have seen the angled top as part of a shroud or covering of an internal mechanism. This was done to reduce materials and increase the strength and integrity of the form for an object that needs to withstand the abuses of streetscape furniture and frequent maintenance routines.

Fig. 3.4.: Final station in context on a busy sidewalk.

GRAPHICS

The graphic icons are designed to be engaged with by the user from different distances. My explorations in the research phase show that users need different information when deciding on how they are going to recycle an item. First they need to know what the options are, this is represented by the large single icons and a word for that stream (see fig. 3.4.2). These words and icons are larger so that they can be processed from a distance giving the user more time to understand the information. The second set of information shows multiple smaller icons of different items that go into that stream. The layout went though multiple iterations in the design process in order to end up with this final output. They are meant to be interacted with up close as a final reassurance for the user that the decision they are making is correct, or simply as a reference.

Fig. 3.4.2: Close up shot of the final graphics .


Top view of sidewalk
5′ away
More detailed information
10′ away
Large icon and stream name
15′ away
Colour of bin

3.4.2 Recyling station overview

The Backstage

STAYING OPEN

Re-thing the way that multiple stakeholders interact with a utilitarian piece of public street furniture means that a regular locking mechanism isn't going to work with a concept like this. Municipal employees noted that locking a recycling station means that people who want to collect refundable bottles and cans will often break the locks in order to gain access. It ends up costing more money for the municipality to repair broken locks than it does to leave them unlocked.

With the service back section of the container closing automatically, I needed to develop a way to hold the container open while the service worker empties the waste stream and lines the bin with a new bag liner. This acts as a reverse lock, because the maintenance people know how to prop it open, while with other unintended users don't.

The criteria for the design of the 'reverse lock' is established by the working habits of the service people. When doing their routes, they have multiple stations to empty, so they are working very quickly, which also means they are handling the equipment in a rough manner.
The mechanism (see fig. 4.4.3-4) doesn't require any keys and isn't complicated to use. A simple rotating handle is easily accessible to the worker. Depending on the position that the handle is in on a 360 degree axis, it serves different functions. Position A below is the closed position that holds the back section in place. Position B is the open position for when the service worker needs to open the back section for maintenance. Position C is the where the latch holds the back section open while being emptied.

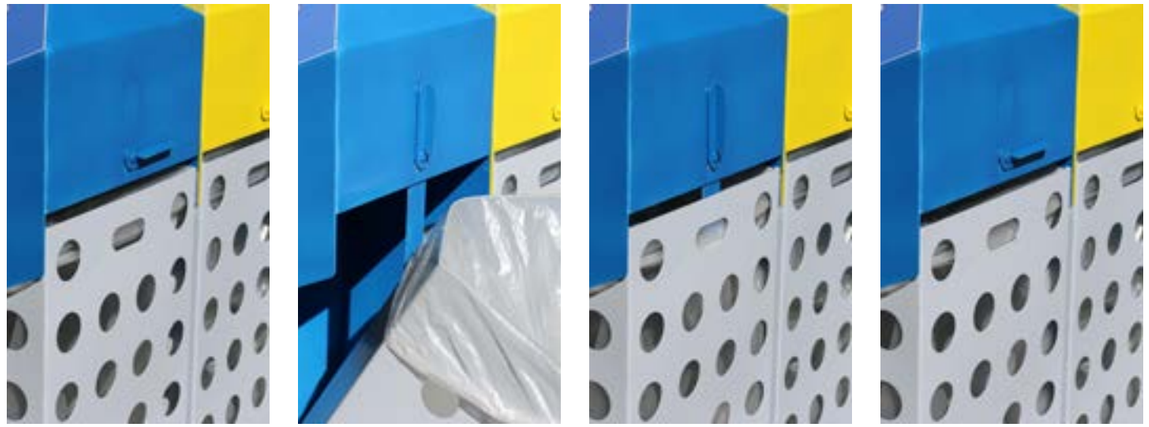
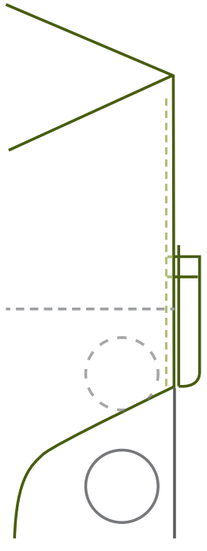
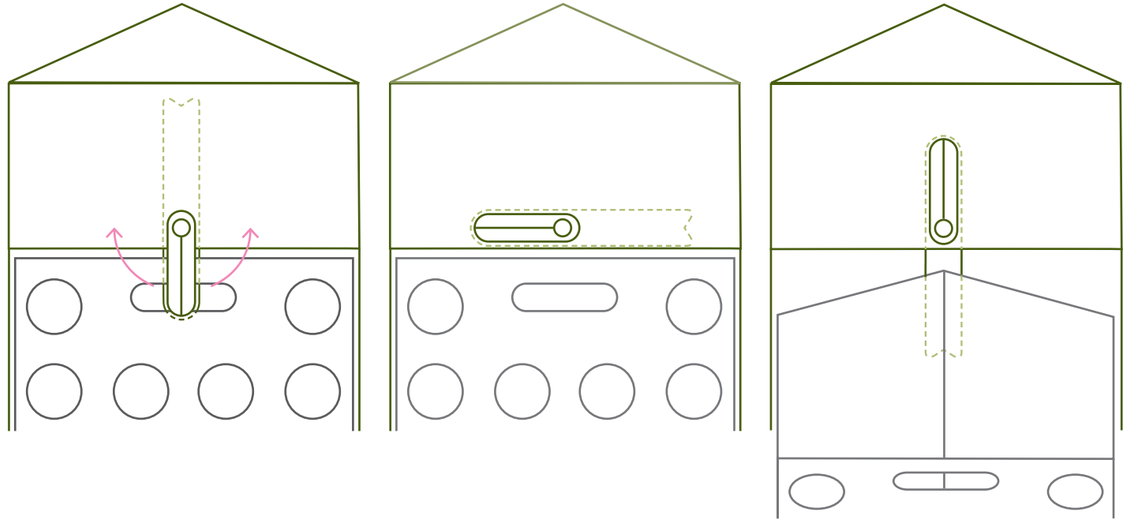


Fig. 3.4.5-7: Mechanism for holding the container open and closed as a full scale cardboard prototype.

Fig. 3.4.3: Cardboard prototype showing stopping mechanism to keep the back section open .

Fig. 3.4.4: Side view diagram of latch mechanism.





A Holding closed position

B Opening

C Holding open


Mixed
Containers

3.4.3 Implementation and next steps

With the design of the recycling station complete, the next step is to pilot the design in the Metro Vancouver region. In collaboration with the local waste handling organization Multi-Material British Columbia (MMBC) we are installing three sets of stations in three different municipalities. The stations are being produced out of plate steel as a fully operational station.

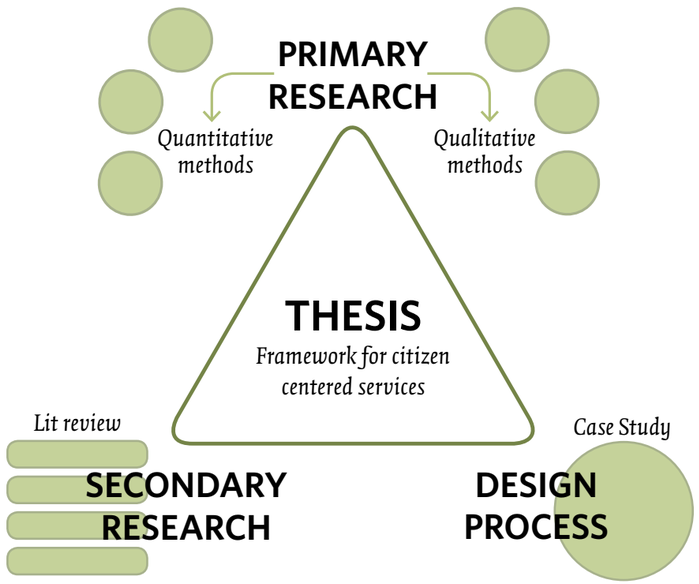
MMBC is in the process of establishing a strategy for streetscape recycling in the province of British Columbia. They are looking to find the most effective recycling stations to use in the various municipalities in the province. They will be testing three different types of recycling stations of which my design is included. The results of this testing that is taking place over the summer of 2015 will dictate further implementation opportunities. If this design proves to be the most effective at getting users to divert their recycling correctly, it has the possibility to be used in the province by MMBC.

Fig. 3.4.8: First sample of the fully operational set being produced out of metal.

4.0 Citizen centered services

Municipal services are increasingly being called upon to help ameliorate complex issues surrounding sustainability in urban cores.

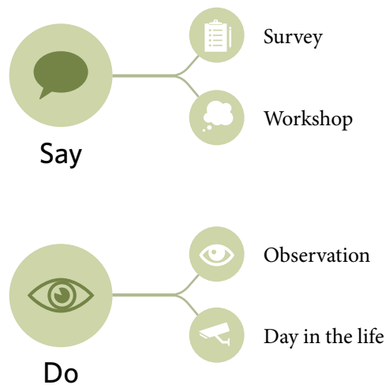
For the most part municipal governments current approach for creating and designing services don't adequately understand the user's experience. There is increasing integration of designers and the design process into government contexts as highlighted in the precedents section of my research. This thesis uses a case study with a government organization as a research partner to explore how researching the end users of a service during its creation can lead to new and more effective solutions to increasingly tougher challenges. Through the design of a streetscape recycling station, I have the opportunity to use design and participatory research methods in this relatively new context. My goal for this thesis is to showcase an example of this process in action with tangible real world impact with it results. Showcasing the decrease in recycling contamination as a result of my research and design is another step in validating the importance and need for research like this to take place in government contexts. As my case study acts a validation for the use of this type of research, my proposal for citizen centered services acts as tool and framework for cities and governments that want to integrate this approach into their processes for creating different kinds of services for their citizens.



THESIS TRIANGULATION

My thesis is triangulated with primary research, secondary research and design process as a balanced approach to developing my framework for citizen centered services. The opportunity to work with a governmental organization means that my focus is on exploring primary research methodologies within that context. This document examines the role of primary research in a real world context.

4.1 Insights from the case study



METHODS OF ENGAGING WITH STAKEHOLDERS

A significant portion of my research is spent engaging with users using different methods. As a designer I am trained to go an examine the people and contexts that are being designed for. One of the richest experiences in my research is the ride along exercise I conducted with the sanitation service workers in the City of Richmond. Spending a full day with a worker while they perform their duties gives the opportunity to observe their latent needs and speak to them about their desires for their work place.

Reflecting on the various research methods that I engage in for this project, I categorize them into two main sections; 'saying' and 'doing' (see fig. 4.2). 'Say' represents the techniques that focus on examining what users, or in this case citizens, say about a service or problem they are facing. This category is the most common for of interacting with users. Surveys can be conducted at a relatively low cost through internet services. What people say is often only the first layer of insight into a users need and often contradicts what they actually do in certain situations. This is demonstrated in my research by participants saying that words are easier to use when choosing recycling streams, but the observations showing that words had the least accuracy, and slowest response time. This is also shown in the ride along with service workers where they state that recycling stations need more capacity, until they arrive at a larger capacity station and talk about the weight being hard to lift and a strain on their back. These insights can only come out of observations of what people do.

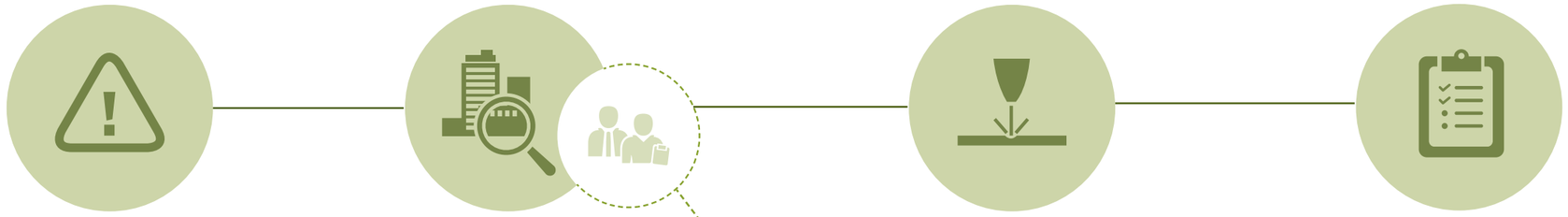
Fig. 4.2: Two main methods for engaging with users.

4.2 Current municipal problem solving process

The diagram below visualizes a consolidated version of the steps that a municipality currently takes when approaching a problem they need to solve.

Problems are easy to identify, and cities are experts at knowing what isn't working. The main insight I drew from my experience of working with municipalities is that they often don't look to the user's experience when attempting to solve problems that involve citizens. They have access to vasts amount of data surrounding a problem they are facing. Data is often the first metric that is examined, in combination with looking at the best practices of other cities. Best practices are good for finding solutions to problems that other cities are facing, but each city and context has different demographics and different needs. Looking to what has already been done isn't going to new solutions to emerging problems.

I identify the research phase in the current process for engaging in with citizens about the problems they are facing. These user insights in combination with data, cost and best practices can provide a robust foundation for a propped solution. The pilot phase of a city project is similar to the design process where a concept is being tested by users. It is important to utilize this similarity and use the pilot phase as another place to gather user input. Based on my insights into methods that examine what users are 'doing', the piloting of a new concept is a prime opportunity for municipalities to engage in observational studies of the effectiveness of their concepts.



Problem

A City has a problem with a current service, or is planning a new one .

Research

The City looks to data, statistics and best practices from other cities to find solutions.

Making

Solutions are based on data and cost, not user needs or insights.

Implement

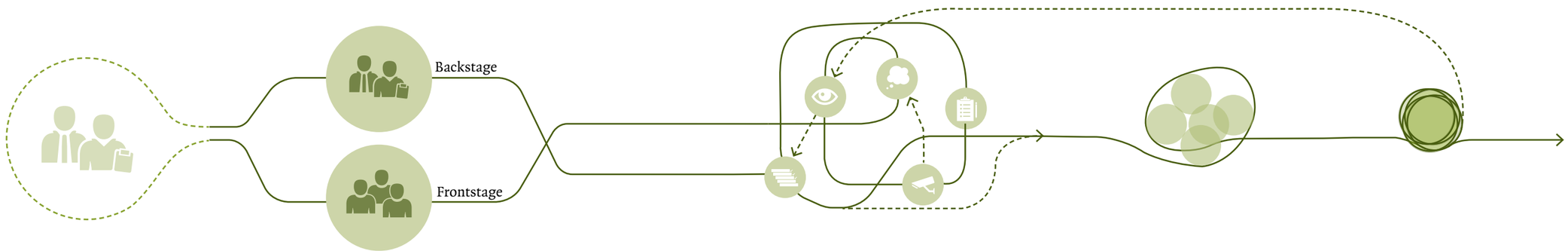
Pilots of concepts are tested for efficacy.

Missed opportunity

The current process is not engaging with the citizens that are using the services they are making and providing.

Fig. 4.3: Visualization of a consolidated municipal problem solving process.

4.3 Citizen-centered services framework



A need to engage

City identifies the need to engage with users to gain insights.

Map stakeholders

Identify all the users of a service, both citizens and workers.

Methods

Use research methods that engage with the stakeholders and users of the service.

Synthesize

Synthesize the insights and use them in the design.

Implement

Pilot the new design and use this opportunity to get more user input on effectiveness.

Fig. 4.4: Proposed framework for citizen centered services.

Mapping out the municipal problem solving process and identifying where user research can be integrated allows me to reflect on the work done in my case study. I can see how that process went, and how I can use that research to start informing what a framework for citizen centered services looks like. I divide the framework into four stages (see fig. 4.4). The process starts with the need to engage with uses as highlighted as a missed opportunity in municipalities current problem solving process. Mapping the stakeholders is integral when working with services. Throughout my research I frame the basic structure of services as having a backstage and a frontstage as used in a service design methodology. This tool helps to identify who the behind the scenes workers of a service are, whose needs are as important as the citizens using them. In order to understand the user experience, cities need to know who the user is.

Based on the users and the context of the service that is being worked on, the methods in which municipalities engage with their citizens will change. I group the methods in which cities can engage its users into two main categories (see fig. 4.2), examining what users say and what users do. This consolidation is based of off the methods that I use in the case study and that were effective at engaging this user group.

Once the citizens have been engaged with sufficiently, all of the observations and insights from the user research needs to be synthesized. This is achieved by looking for themes and common results from the citizen's input.

The last phase is to implement the findings into the design of the service. This can manifest itself in many ways, but the most important of which is to ask the question, how can the users' needs be more effectively met by this service, based on what we found out in this research? Having this as a foundation for the implementation of insights brings the focus back to the user's needs.

4.4 Designer implementation

The Citizen centered services framework draws a path for how cities can begin to engage with its citizens the create better experiences for its people. This framework is inherently a design driven process created by a designer. The next step is to outline how a process like this can be implemented in the functions of a city. I am proposing three possible scenarios to showcase how a designer can be involved in the implementation of this framework:

Designer as consultant

Municipal governments have the option to hire designers as consultants based on the need for a specific project. This model has the designer temporarily working with city staff to help solve a problem.

In-house designer in the city

Hiring a designer as a full time member of a city's staff allows for a richer integration of the citizen centered services framework to be utilized for different problems and projects. This also means that a focus on the citizens experience can be brought into the culture of the organization.

Designer as facilitator of the process

This models see the designers in a teaching role. Similar to the consulting role, but instead of the designer working on the project at hand they guide municipal staff through the citizen centered services process. This allows for the staff to learn the process themselves without further help from outside consulting.

4.5 Future directions

Recycling compliance by citizens is only one of many contemporary challenges that cities around the world are currently tackling.

Our daily experiences as citizens are defined by the multi-modal interactions we have with the city and its affordances that aim to serve us. As we strive toward ecological sustainability the tools and methods that we for problem solving need to evolve.

This thesis explores the use of participatory design methods in the context of creating services for governments. My case study is situated within an emerging field of design researchers working to integrate design practices into government processes. The purpose of my research project and its supporting framework is to showcase 'design for government' being used with a real local government. The success of the processes used in Metro Vancouver's recycling station design act as a validation of its merits to accompany other designers working in this area.

The Citizen Centered Services framework is designed as an introductory guide for city governments to begin the journey of engaging with its citizens for a greater understanding of their needs. Civic employee's at any level that see this project are encouraged to use its examples for showcasing what design research can do in this context for other cities around the world. This framework can be built upon and iterated by other designers that want to continue the explorations of bringing design to their own cities.

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6.0 Appendix

Appendix A *List of figures*

Appendix B *Research Ethics Board letter of approval*

emily carr
university of art + design

1399 Johnston Street, Vancouver, BC, Canada V6H 3P9 ecuad.ca

Office of the Director of Industry Research

Emily Carr University of Art and Design
Research Ethics Board

June 24, 2014

MEMORANDUM TO:
Andreas Eiken, Principal Student Investigator, Faculty of Graduate Studies (Design)
Deborah Shackleton, Associate Professor, Design and Dynamic Media

Re: Application for Ethics Approval (ECU-REB #2014021803)

The research ethics application for **"Public Space Recycling Design: User Centred Primary Research"** was reviewed by the full board of the Emily Carr University Research Ethics Board on February 25, 2014. As a result of that review and your subsequent revisions this project **has full approval to proceed with participant research.**

Please note, the following:

- If you need to make any changes to any aspect of the approved application, you are required to inform the ECU-REB *prior* to the implementation of changes. **FORM 204.1 Annual Review / Request to Amend Approved Research** should be used to communicate changes. This form is provided with this letter.
- In the event of an adverse incident associated with the participant research, the applicant must notify the ECU-REB within five (5) days. **FORM 204.2 Adverse Incident Report** is available for you to use to communicate these incidents. This form is provided with this letter.
- At the conclusion of the project, please complete **FORM 204.3 Research Ethics Completion** so that the file can be closed in an appropriate manner. This form is provided with this letter.

This signed Approval Status Letter is an official ethics status document. Please keep it for reference purposes. If you have not received a signed paper copy of this letter please contact me at ethics@ecuad.ca. The approval status listed above, the date of this letter, and the ECU-REB file number should all appear on materials that are circulated to the participants in this way: "This project has Research Ethics Approval from the Emily Carr University Research Ethics Board (June 24, 2014, ECU-REB #20140218032)."

- For multi-site or partnered research, such as this one, researchers must adhere to the research ethics protocols or procedures at the other sites of research, where they exist. Thus, the researcher is expected to share notice of this approval with partners or other sites of research.

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On behalf of the ECU-REB Chair and members, I wish you much success with this research.

Sincerely,

Lois Klassen
Research Ethics Board Coordinator

Cc: Bonne Zabalotney, Dean, Faculty of Design + Dynamic Media
Dr. Maria Lantin, Director, Research
Dr. Glen Lowry, Vice Chairperson ECU-REB

Appendix C *Memorandum of Understanding; Metro Vancouver*

Memo of Understanding **between Emily Carr University of Art + Design (ECUAD)**
and the following Project Partner(s):

Organization Name: Metro Vancouver (Peter Cech)
Address: Peter Cech, External Relations Department, Metro Vancouver, 4330 Kingsway, Burnaby, B.C. V5H 4G8

ECUAD project supervisor(s): Louise St. Pierre (faculty), Andreas Eiken (MDes Candidate, Research/Teaching Assistant)

Project Title: **Local Futures; Phase 1** (also known as Living Lab)
Project description: Students will explore redesigns of recycling stations to ease use, and to change the paradigm of recycling.
Project Timing: As the academic calendar is fixed, all the parties involved in this project will work within the tentative schedule outlined here. This is particularly critical where projects are embedded within a course, as students have responsibilities and deliverables to their course instructor that cannot be changed.

Activities **Phase 1.1 Summer/ Fall Semester 2013 Report**

Aug - initial research • Initial research document
Sept. 09, project kickoff • none
Early Oct. concept review • Presentation materials/visuals
Oct. 21 – 30, Phase 1Test • Exploratory concept/models, and observations of interactions
Nov. - Phase 2 Test • Developed concept models, and observations of interactions
Dec. 02 begin wrap-up • Formal presentation to Metro Vancouver and stakeholders
Dec. upload digital content • Website featuring project
Student documentation phase • Final models and individual documentation due (one package per student team)

Activities **Phase 1.2 Spring Semester 2014 Report**

Jan-Feb, collate documents • February 2014 collated documentation complete
Fabrication supervision • Organize production documents and supervise fabricators to deliver a prototype for full testing. Note that manufacturing costs for prototype are not covered by the research partnership budget. The prototype may be singular or multiples, depending on budget availability.

Subsequent work **Phase 2 Academic Year 2014/15 (not included in the above)**
Phase 2 of the research partnership will address deliverables that are not included within the scope/budget for Phase 1. Detailed budget and schedule for Phase 2 will be developed as the project progresses, and in consultation with the UBC BAR lab. Phase 2 will include observations of the prototypes in the field to determine effectiveness as well as waste composition/ contamination of recycling streams, design revisions, and specifications for final production.

Prototype testing **Phase 2.0 Summer 2014**
A physical prototype, as well as context guidelines will be developed to test over the summer by the principle student researcher. This is an opportunity for long term testing of efficacy and ease of use. The testing site and documentation methodologies will be developed with the BAR lab and Metro Vancouver staff to see if any unique observation techniques can be used for long term monitoring subject to REB approval where such procedures exist at all sites of research.

Note - This prototype will not be 'manufactured' as originally planned, but made with rugged prototype materials that will withstand multiple temporary installations.

Methodologies: Testing can take place for 1-2 weeks (or however long is deemed sufficient to get enough volume) within a partner municipality. The installation would then be moved to another municipality for an additional 1-2 weeks in order to capture regional diversity.

Full scale recycling bin models will be tested in high traffic streetscapes including sidewalks and plazas in specific municipalities in Metro-Vancouver (municipalities TBD). They will be acting as real recycling stations for the general public to use as necessary. The prototype will be installed for a 2 week period in each participating municipality. During this period the contents of the bins will be collected and examined to determine their efficacy. At a certain point during the installation, researchers may be present to take notes and document with photographs the users interactions with the prototype bins. During this time a waiver will be placed on the bin to indicate to

users that they are participating in an experiment. Each location will be determined through conversations with a municipal employee contact in each respective municipality. For each installation the principal investigator will consult with appropriate municipal staff to determine that the prototype and installation site are for safe and suitable for the experiment.

Data produced: Volume and composition of the individual streams will be measured to show contamination rates.

Summary report: A report summarizing this prototyping phase and how it influenced the design of the resulting model. Results from long term testing over the summer will be synthesized into a report, outlining the outcomes and criteria for the final design phase.

Concept Development **Phase 2.2 Fall 2014**

Gather insights from summer observations to create final criteria and recommendations moving forward. The fall semester will consist of prototyping, including feedback from Emily Carr University faculty and fellow industrial design students. This portion will also deal with details pertaining to manufacturing and maintenance of the bins.

1. Final design of the bins form and function
2. Design of system and guidelines

Note - There is an opportunity to engage a 4th year communication design student to work on refining the graphic element to the system, as well as 'branding' the guidelines and recommendations. This can include all communication material that will be used to showcase the project, and the bin concepts. A fourth year design student does a thesis project that takes place over the spring and fall semesters.

Concept Development **Phase 3.0 Spring 2015**

Final bin design and system guidelines – This includes technical drawings and prototypes.

The final design and guidelines will be presented in a way to most effectively engage municipalities in the region for uptake the proposed solution.

Manufacturing will be subject to interest from municipalities and funding.

The thesis will also be looking at how the Living Lab model can be used to further engage municipalities in the design process to address other problems that cities are facing.

ECUAD responsibilities: ECUAD is committed to promoting a positive educational research environment. For this project, ECUAD will assign an appropriate number of faculty, staff and students, and provide necessary facilities in order to carry out the research project as described above. Upon completion of the project, the project supervisor will submit the key deliverables for this research project to the partner as described above.

Project Partner responsibilities: Partner agrees to sponsor this project in the amount of $15,000, and to contribute to the project via critique, and class participation, tours, connection to municipal research participants, and access to research materials and information. As the academic calendar is fixed, the partner agrees to meet as needed, as the project needs evolve, primarily during class time on Monday and Wednesday afternoons. The partner will be an active participant in the project. This is usually defined as initial project meetings, student briefings, participation in research (ethnographic probes, co-creation activities), critiques, etc.

Intellectual Property: At this preliminary stage of collaboration, the purpose of the proposed research project is to explore the project space widely and freely, without concern for the development, ownership, or assignment of any specific intellectual property. At this stage it is expected that all project partners and participants (Emily Carr, faculty, students, Project Partner) will contribute to the design and

exploration of the project. The results of this research will inform and be part of the principle student researchers graduate thesis project.

In accordance with Emily Carr's University Policy 5.2 Intellectual Property*, until otherwise agreed, ownership of all intellectual property rights arising from this project will remain with ECUAD and/or the relevant student(s) and faculty member(s). All project participants, including ECUAD, student(s) faculty and Project Partners may use the results of the project for their own purposes as they deem appropriate, provided that they acknowledge ECUAD/ student(s)/faculty and the Project Partner's sponsorship in any public use. This would most usually include the right to publish the results in appropriate professional and academic publications, the right to use the outcomes in students' portfolios and university promotions and publications. Notwithstanding the foregoing, the Project Partner will have license to use the results and designs throughout Metro Vancouver, as long as they acknowledge the work as originating with Emily Carr and the faculty, students, and participants. However, should the Partner wish to acquire any additional intellectual property rights for extended commercialization, it must negotiate a further agreement (ie a "Stage 2 IP agreement") with ECUAD on behalf of faculty, students, and the relevant participant or participants.

Confidentiality: During this project, it is possible that the Project Partner may disclose confidential information that they would not want shared outside the project group. Emily Carr agrees that it will not disclose this information to any parties not involved with this project and bound by this agreement. This is not a blanket confidentiality agreement as to the project itself, but only to particular specific information disclosed by the partner and indicated as such. This confidential information is fully defined in the Appendix of this document.

on behalf of ECUAD

* This policy is available on the ECUAD website, and can be provided upon request.

Name: _

Title: _

Signature: _

Date: _

on behalf of Project Partner

Name: _

Title: _

Company Name: _

Signature: _

Date: _

Appendix D *Memorandum of Understanding; University of British Columbia*

Stage 1 *Memo of Understanding* between Emily Carr University of Art + Design (ECUAD)
and the following Project Partner(s):

Organization Name: Brain and Attention Research Lab - Department of Psychology at the University of British Columbia

Address: Department of Psychology
2136 West Mall
Vancouver, BC V6T1Z4
Canada

ECUAD project supervisor(s): Deborah Shackleton
ECUAD Student
Principle Investigator: Andreas Eiken
UBC Principle Investigator: Alan Kingstone
UBC *Student*
Principle Investigator: Alex DiGiacomo

Project Title: Public Space Recycling Design: User Centred Primary Research

Project description: This graduate thesis project aims to design recycling stations for public spaces as well as guidelines for their placement and arrangement in context. Metro Vancouver as a client needs design concepts to be validated in the form of efficacy testing and results. The rigorous testing that is required by the client is beyond the scope of this project and is why the student principle investigator has partnered with Alan Kingstone the Lab Director at the Brain and Attention Research Lab to help with testing designed concepts.

Project Timing: This testing collaboration does not exist with in the confines of an undergraduate course schedule. The production of prototypes by Emily Carr University is based on the principle investigator's thesis work plan. Production of prototypes and testing will take place from March to September 2014. A prototype recycling station consists of a 100% scale designed and built model usually made from cardboard, plywood and foam core. This prototype is financed by research funds from Metro Vancouver. Upon completion, arrangements are made for member of the BAR Lab to pick up the prototype to be taken to the UBC campus for testing. Both Emily Carr and UBC researches will discuss what aspects of the design are to be tested before testing begins. Thus the results will be beneficial to both parties, subject to REB approval.

Research Methods: Recycling station prototypes produced by the principle investigator will be tested on UBC's campus. The testing will include placing designed recycling stations in a high traffic public area. Users in the vicinity that engage with the recycling station will be filmed in order to observe their body language, facial expressions and time they spend deciding on which stream to place waste into. The research will be conducted by students of the BAR Lab under the direction of Alan Kingstone. The principle investigators prototypes will be used as a 'stimulus' in their investigation. The principle investigator will be using the results of the research conducted at UBC, but will not participate in the study itself.

ECUAD responsibilities: ECUAD is committed to promoting a positive educational research environment. For this project, ECUAD will assign an appropriate number of faculty, staff and students, and provide necessary facilities in order to carry out the research project as described above. Upon completion of the project, the project supervisor will submit the key deliverables for this research project to the partner as described above. Ownership of the prototype belongs to the Emily Carr principle student investigator Andreas Eiken. They are responsible for making, transportation and disposal of the prototype.

Project Partner responsibilities: Partner agrees to share the results of the research and testing conducted on the UBC campus. The partner will manage safety testing of the installations by UBC facilities. The partner will be an

active participant in the project. This is usually defined as initial project meetings, and project updates.

Intellectual Property: At this preliminary stage of collaboration, the purpose of the proposed research project is to explore the project space widely and freely, without concern for the development, ownership, or assignment of any specific intellectual property. At this stage it is expected that all project partners and participants (Emily Carr, faculty, students, Project Partner) will contribute to the design and exploration of the project.

In accordance with Emily Carr's University Policy 5.2 Intellectual Property*, until otherwise agreed, ownership of all intellectual property rights arising from this project will remain with ECUAD and/or the relevant student(s) and faculty member(s). All project participants, including ECUAD, student(s) faculty and Project Partners may use the results of the project for their own purposes as they deem appropriate, provided that they acknowledge ECUAD/ student(s)/faculty and the Project Partner's sponsorship in any public use. This would most usually include the right to publish the results in appropriate professional and academic publications, the right to use the outcomes in students' portfolios and university promotions and publications. Notwithstanding the foregoing, the Project Partner will have a non-exclusive license to use the results and designs for their own internal non-commercialized purposes, as long as they acknowledge the work as originating with Emily Carr and the faculty, students, and participants. Should the Partner wish to acquire any additional intellectual property rights for commercialization, it must negotiate a further agreement (ie a "Stage 2 IP agreement") with ECUAD on behalf of faculty, students, and the relevant participant or participants.

Confidentiality: During this project, it is possible that the Project Partner may disclose confidential information that they would not want shared outside the project group. Emily Carr agrees that it will not disclose this

* This policy is available on the ECUAD website, and can be provided upon request.

information to any parties not involved with this project and bound by this agreement. This is not a blanket confidentiality agreement as to the project itself, but only to particular specific information disclosed by the partner and indicated as such. This confidential information is fully defined in the Appendix of this document.

on behalf of ECUAD

Name: _

Title: _

Signature: _

Date: _

on behalf of Project Partner

Name: _

Title: _

Company Name: _

Signature: _

Date: _