Designing for human behavior to enable
circular packaging

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Abstract

Society's linear model of consumption - make, use, and throw - is not sustainable. Waste management systems have not been built to handle the production and consumption patterns of the modern age nor are they equipped to swallow the dramatic escalations and changes in product packaging. Single use packaging is an issue that resonates with customers and helps them understand the impacts of climate change, which creates an opportunity to engage with interested stakeholders and incite customer action that could lead to wider and longer-term behavioral and system changes that benefit the environment.

This thesis leverages the human-centered design process to understand the context of and challenges with packaging today for a consumer technology company, uncover insights and form a specific research question, generate potential solutions, and gather user feedback on the potential solutions.

This thesis presents findings from users on concepts to reduce the environmental impact of single use packaging and highlights themes in human behavior that could inform packaging design for sustainability.

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I would like to dedicate this work to my Lakhani parents, who not only dedicated their lives to prioritizing their kids' education, learning, and growth but also encouraged us to chase our unconventional career paths. To Nabs, who gives my life meaning while making me laugh every day. To Omar, for being the sweetest fruit of life. To my friends, whom I consider family, for making this journey joyful.

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Chapter 1 | Introduction, Objectives, and Methodology

Background and context

Product packaging serves many functions for a company and more recently for consumer technology products, packaging is treated as part of the product experience. Unboxing packaging is the first moment that a customer kindles a relationship with their newly purchased personal product inside the box. In addition to being a beacon of the brand and making the product recognizable and identifiable, the purpose of packaging is to protect the product during the often wild journey to the customer, and communicate important and relevant information.

The growth in the consumption of consumer electronics and other consumer goods is associated with the growth of single use, disposable packaging being designed and used to protect the products. In 2018, 7.2 billion units of electronics were consumed worldwide,[1] and consumption is expected to grow annually. This growth, not only in durable goods, but also in single use consumables, has had unintended consequence. Humans produce an estimated 400 million tons of plastic every year, which has a variety of unintended consequences. For example, more than 8 million tons of plastic flow into our waterways and it is estimated that our oceans now contain 51 trillion microplastic particles.[2]

U.S. municipal solid waste generation from 1960 to 2017 (in million tons)
U.S. municipal solid waste generation 1960-2017
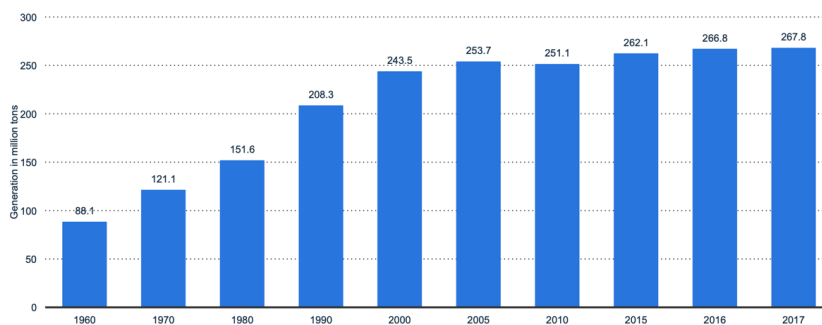
Figure 1. US MSW Generation from 1960 to 2017

Waste management systems, including collection, sorting, and processing, have not been built to handle the production and consumption patterns of the modern age nor are they equipped to manage the dramatic changes in packaging. Volumes of waste generated, and the seemingly infinite types of materials being created are overwhelming the capacity of and clogging the existing systems in place. This has been an issue for decades, partially hidden because materials consumed around the world had been sent over to China since the 1990s.[3] China began accepting and processing the world's waste when it joined the World Trade Organization. Empty shipping containers destined to return to their origins in manufacturing cities China by sea freight enabled the shipment of recyclables to processing facilities, reducing recycling costs. In an effort to protect its own environmental resources, China issued a National Sword Policy in 2017 which closed off the country as a destination of post-consumer materials. This not only shocked the global recycling and waste management system, leaving waste generators without a destination to send waste, but also created a sense of urgency among the wider global community that growth in consumption would create a large pollution problem.[4]

Materials flow is a narrow representation of the larger environmental impact that consumption has had, which is climate change. It has become clear to the global community that the linear model of consumption — make, use, and throw — is not sustainable. To shift to a new model, there is a concerted effort to design a circular economy, "a framework for an economy that is restorative and regenerative by design."[5] Navigating to a circular economy is one of many pathways the international community needs to take to avoid ecosystem collapse caused by anthropogenic climate change.[6]
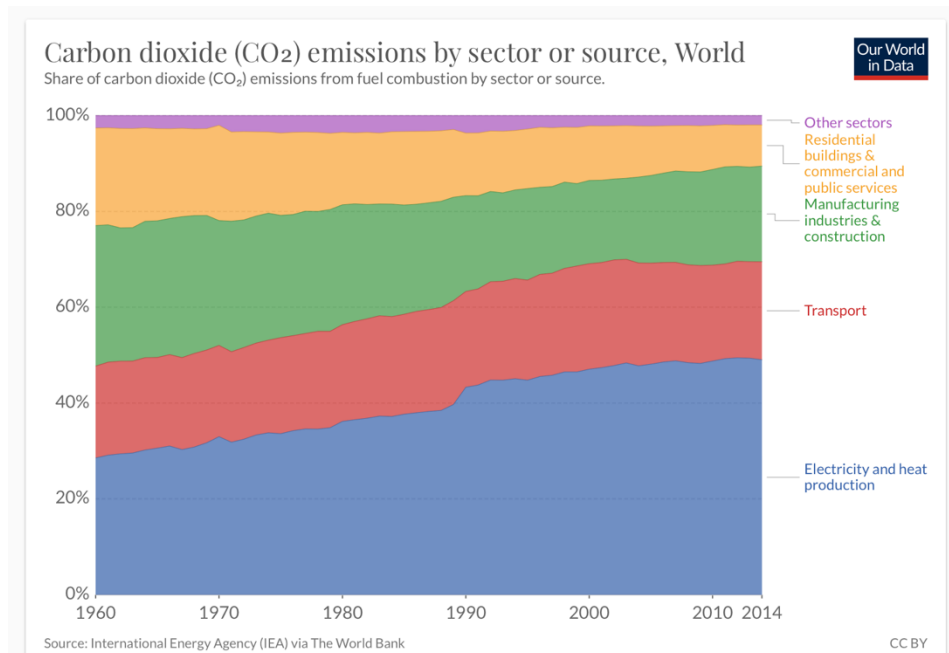
Figure 2. CO2 emissions by sector over time, International Energy Agency

Product packaging is a contributor to climate change, but relative to other contributors is a small part of the problem. However, single use packaging is an issue that resonates with customers and helps them understand the impacts of climate change, which creates an opportunity to engage with interested stakeholders and incite customer action creating wider and longer-term behavioral and system changes that benefit the environment.
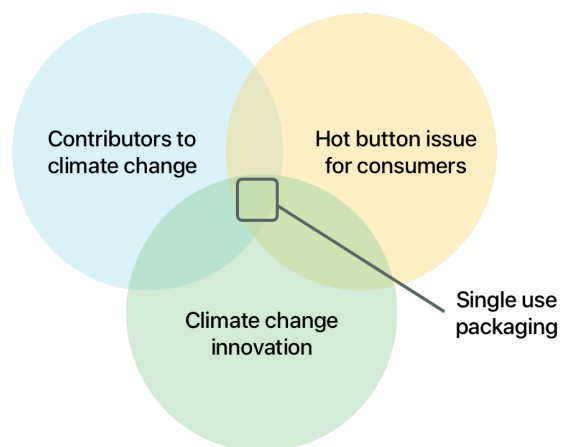
Figure 3. Why design for environmental impact of packaging?

Research Objectives

In 2019, MIT D-Lab partnered with a consumer electronics company to leverage the human centered design process to explore opportunities that would reduce their environmental impact in product packaging. The sponsor engaged the MIT D-Lab team to uncover and define focused objectives. The six-month research project would:

1. Phase 1 - Understand the company's current packaging waste strategies;
2. Phase 1 - Uncover previous projects completed by the company to reduce packaging waste;
3. Phase 1 - Interview users and stakeholders to better understand packaging objectives;
4. Phase 1 - Synthesize user needs;
5. Phase 1 - Prepare a list of opportunity areas for consideration; and
6. Phase 1 – Evaluate opportunity areas and converge to 1-2 opportunities;
7. Phase 2 – Generate ideas and concepts for potential solutions; and
8. Phase 2 - Gather feedback on concepts being considered

The participatory research process was conducted in two design phases. The first phase focused on researching and analyzing customer expectations and experiences, material choices, product life cycles, end destinations, recycling and recovery strategies, and regulations that would shed light on approaches to reduce the environmental impact of the consumer electronics company. The second phase focused on generating and evaluating specific ideas and concepts internally so that they could be eventually tested with customers. The project plan was created by the MIT D-Lab team to follow a participatory human-centered design process, which was evaluated and reassessed throughout the term of the project by the sponsor. The MIT D-Lab research team included MIT Researcher, Sabira Lakhani, author of this thesis and advisor, Libby McDonald.

Methodology: Why design?

Problems that are large, complex, unstructured, and impact many stakeholders often require a deep understanding of the users, the humans who affect and are affected by the product, service, or system. The challenge of closing the loop on consumer electronics packaging

involves engaging the company, its suppliers, consumers, municipalities and recyclers, all of whom have varied motivations and objectives.

Human-centered, product, and system design frameworks offer methodologies to arrive at thoughtful solutions. This research project, which would include iterative discovery, ideation and evaluation, would provide guidance and pathways for the company to move forward. The human-centered design process creates space for the sponsor and the research team to define the problem and solutions together. It is especially helpful to create cross-functional teams, foster collaboration amongst team members that may have different priorities, and focus their time, attention, and expertise on a specific problem.

The design process

There are many variations of design frameworks available including the British Design Council's Double Diamond, IDEO's human-centered design ideology, MIT's integrated design and management process, and @d.school's design thinking process. The diversity in frameworks arises from the need to tailor the process to specific contexts or user group. Still, the design process phases consistently include the following:

1. Discover through Research— understand the problem
2. Define through Synthesis — insight into question of interest
3. Develop through Ideation—generate potential solutions
4. Deliver through Implementation— solutions that work
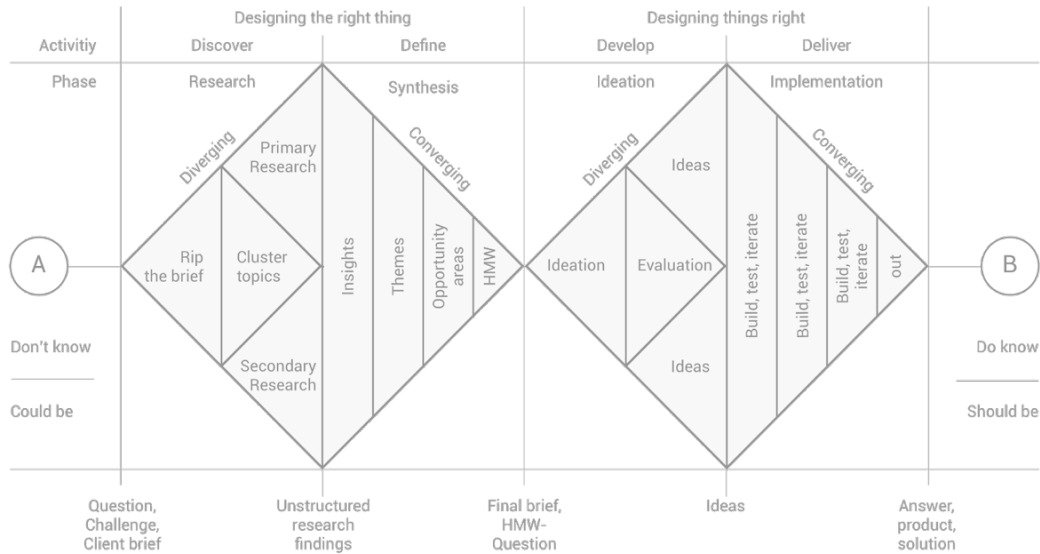
Figure 4. British Design Council's Double Diamond [7]

The underlying principles that drive success in the process are:

<u>Testing and iteration</u>

Quickly prototyping to get user feedback at every point of the design process is crucial to help the designer empathize with and design for the user.

<u>Diverging and converging</u>

Phases of this process are diverging or converging to balance creativity and structure. During a diverging phase, opening up to any possibilities without constraints is key. During a converging phase, there is a concerted effort to focus on synthesizing ideas or findings.

<u>Co-design involving multiple stakeholders</u>

Including designers, engineers, managers, and people with a variety of expertise is important to facilitate informed creativity. It is also important to ensure that throughout the process, voices of stakeholders within the social system are heard.

Research approach

This research project is scoped for the discovery, definition, and development phases of the design process. To apply the design process to the research project, the MIT team conducted primary and secondary research, followed by ideation workshops, and concept evaluation. Primary research internal to the consumer electronics company was conducted to understand the status quo of environmental initiatives related to packaging. Initial interviews with relevant employees were set up by the sponsor of the project and were scoped to provide introductions to the various teams, their past work, roadmaps, and decision-making processes.

Continuing the internal primary research, follow up interviews with relevant employees were arranged by the sponsor. These conversations were scoped to delve deeper into the content of their roles, insights from their teams and stakeholders, and challenges they are facing to identify and prioritize areas of opportunity.

Primary research external to the consumer electronics company was conducted to understand the needs of users and stakeholders in the waste management ecosystem. Observations in retail stores, interviews with users, waste management companies, and academics were also conducted. Secondary research including literature reviews and industry trends supplement the primary research.

After identifying opportunity areas and selecting two to pursue, "How might we" questions were developed. For idea generation and brainstorming in response to the "How might we" questions, employees from across the sponsor company convened in three separate workshops. The research team synthesized the ideas generated into concepts.

To understand the consumer viewpoint on the concepts, two extensive surveys were designed and conducted, and the resulting data evaluated and presented to relevant team members at the sponsor company who could continue building on the conclusions from the research.

Although two opportunity areas and "How might we" questions were addressed in the scope of the MIT D-Lab research project; this thesis only covers one of the opportunities in depth.

Chapter 2 | Industry Trends

Today, consumer electronics companies are chasing growth in a global context where climate change is a severe and growing concern for all societies and populations. The worldwide consumer electronics market is projected to double from 2017 to 2024 to reach $565B[8].

Revenue in the Consumer Electronics market

in million US$ (worldwide)

Year	Revenue (in million US$)
2017	252,501
2018	311,545
2019	371,452
2020	426,188
2021	473,429
2022	511,998
2023	542,231
2024	565,326

Source: Statista, January 2020; Selected region only includes countries listed in the Digital Market Outlook
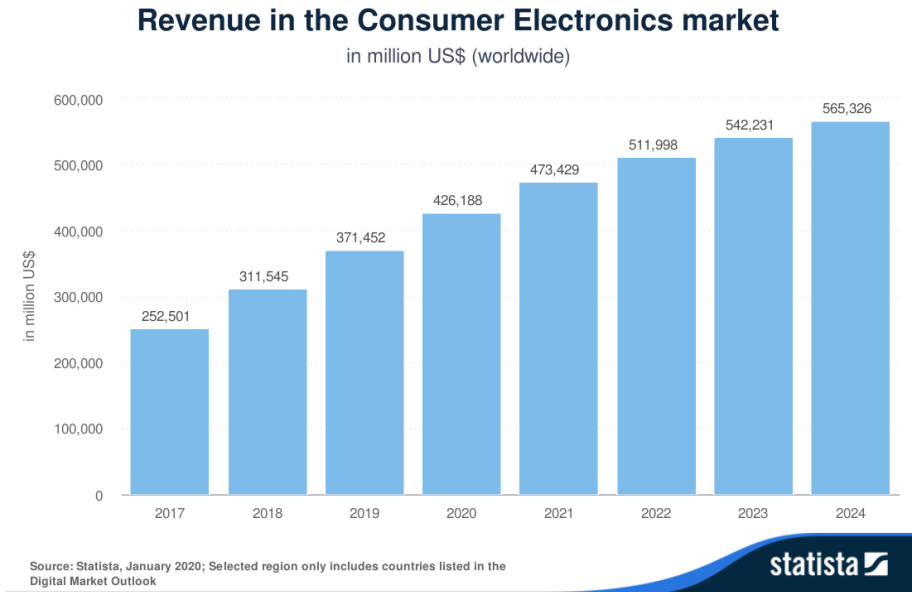
statista

Figure 5. Revenue in the Consumer Electronics market worldwide, Statista 2020

However, customers of consumer electronics are increasingly experiencing the effects of climate change. In 2019, 46% of respondents agreed that they had personally experienced the effects of global warming.[9]
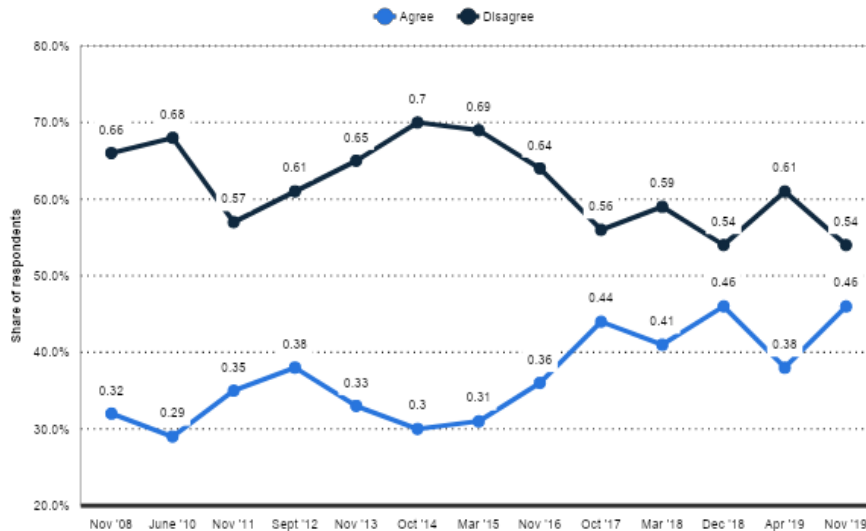
Figure 6. Share of U.S. adults who have personally experienced the effects of global warming, Statista 2020

In this new age, corporations are keen to operate their businesses more sustainably, balancing revenue targets, healthy operations, brand perception, and socio-environmental impacts. As the private sector pursues new ways of doing business in response to the threat of climate change, the world around them is also constantly changing. Cultural norms and behaviors, technologies, infrastructure, and markets are evolving. This section briefly discusses research conducted on the state of the world as it relates to packaging and the environment.

Circular Economy: Overhauling material systems

In the face of climate change, which is largely due to society's linear pattern of consumption, the concept of a circular economy is emerging as an incredible opportunity to "replace the 'end-of-life (throwing products away at perceived obsolescence)' concept with restoration, shift towards the use of renewable energy, eliminate the use of toxic chemicals which impair reuse, and aim for the elimination of waste through the superior design of materials, products, systems, and, within this, business models."[10] A circular economy is a desired industrial system that is restorative or regenerative by intention and design and is distinguished from the linear economy by two characteristics: slowing and closing resource loops. Slowing happens 'through

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the design of long-life goods and product-life extension... [and] closing happens when the loop between post-use and production is closed, resulting in a circular flow of resources,' meaning the linear flows of waste are turned into secondary resources.[11]
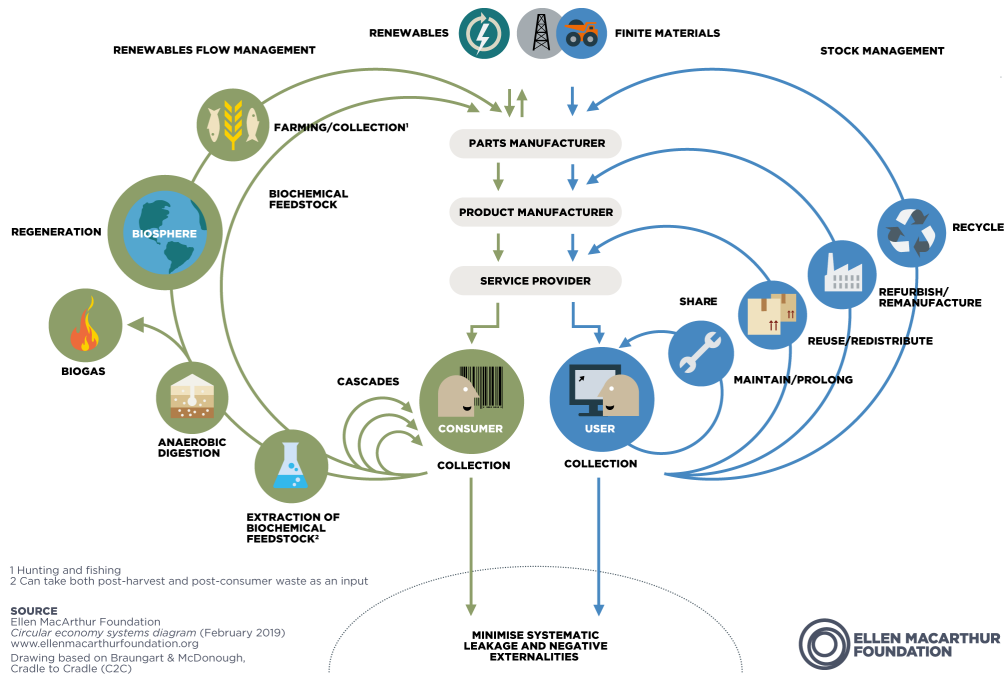
Figure 7. Ellen MacArthur Foundation Circular Economy Butterfly Diagram[12]

Sourcing responsibly: renewables and material choices

Poor management of materials and particularly plastic during the use and end of life phases of product lifecycles has created visibly polluted land and marine environments. Sourcing renewable materials is driven by an effort to avoid plastics (made from fossil fuels), but also to ensure that alternative raw material production and harvesting is sustainable. In order to disassociate with the negative imagery of plastic pollution, many companies search for or develop new materials to manufacture packaging.

Naturally replenishable or renewable resources include solar, wind, waves, and plant materials (energy crops and non-food crops). For packaging, wood, bioplastics, and biomass are key opportunities as alternatives to plastics. Bio-based materials embody sequestered carbon and can act as a carbon sink if the end of life is managed thoughtfully.

Wood fibers, for the purposes of packaging, can be sourced from Forest Stewardship Council certified forests. FSC certification ensures the raw materials are grown and harvested in a way that provides environmental, social, and economic benefits.[13]

Bioplastics are made from vegetable fats and oils, lignin, and starches. Bioplastics are most commonly found as thermoplastic starch. Production of bioplastics is considered more sustainable than plastic from petroleum. The challenges with the material include pollution associated with growing crops, land used and diverted from food production, and lack of infrastructure for end of life processing.[14]
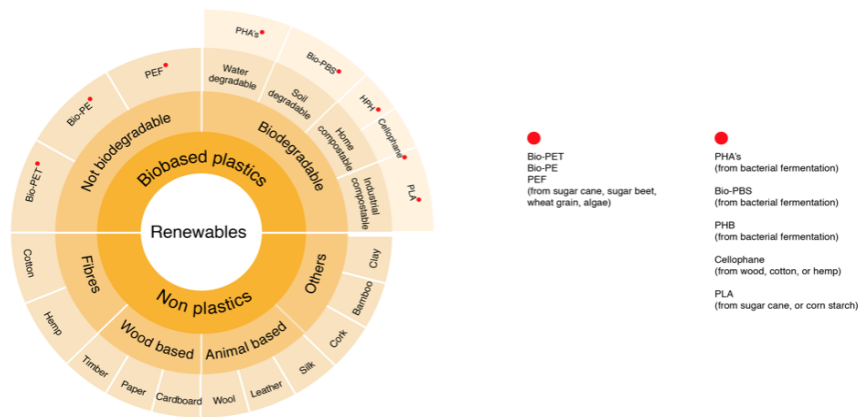
Figure 8. Renewable sources of materials[15]

Avoiding plastics and switching to alternative materials may be automatically considered a sustainable solution, but counterintuitively, it might not be in specific contexts. Companies must deeply understand the contexts within which packaging exists, the systems they are

engaged with, and the types of consumers they interact with while designing packaging alternatives.

Although considered to be a problem, plastic is an efficient material. Data from the US Environmental Protection Agency on municipal solid waste generation rates correlated to personal consumption expenditure reveals that plastic waste generation increased by nearly 84 times from 1960 to 2013 while total MSW increased only 2.9 times.[16]

When designing for the environment, considering human elements, product requirements, and existing systems is required, and companies may conclude that plastic may be the best option at the moment.[17] Companies can and should also consider their role in influencing and developing systems to enable sustainable design, from source to end of life.

Recycling: an industry in flux

Many companies are designing packaging for recyclability. Recycling is a system of individuals and organizations that works when the post-consumer material follows the process below.

1. End customers recognize material is recyclable and place material in correct receptacle
2. Is accepted in recycling receptacles available to end users
3. Waste haulers collect and transport the recyclables
4. Material Recovery Facilities properly sort recyclables
5. Re-processors or recyclers convert it into new material (chemically or mechanically)
6. A market demand for the recycled material that offsets the costs of the operations exists

China is the world's primary hub for recycling capacity. The country processes 55% of the world's scrap paper and is the leading destination for other recyclable materials.[18] Chinese

National Sword, a policy effective as of February 2017, banned 24 types of waste materials and set a high standard for contamination in others. This created ripple effects in the recycling economy which were and continue to be disruptive. The silver lining from this policy is that the world was reminded of the problems of waste and pollution.

Recycling is only effective if the stream of materials collected is clean; not contaminated with non-recyclables or organics and sorted into the right bins at source. This is because manually or chemically recycling material into new raw material requires specific purities to flow into manufacturing supply chains.

Information about recycling packaging is confusing for the average customer because material content is not easily identifiable and recycling systems are not standard. To design consistency for customers, How2Recycle, a non-profit organization, offers "a standardized labeling system that clearly communicate recycling instructions to the public."[19] It includes how to prepare material for recycling, how to recycle, type of material, and recyclable parts. Companies have to opt-in to include this information on their packaging.
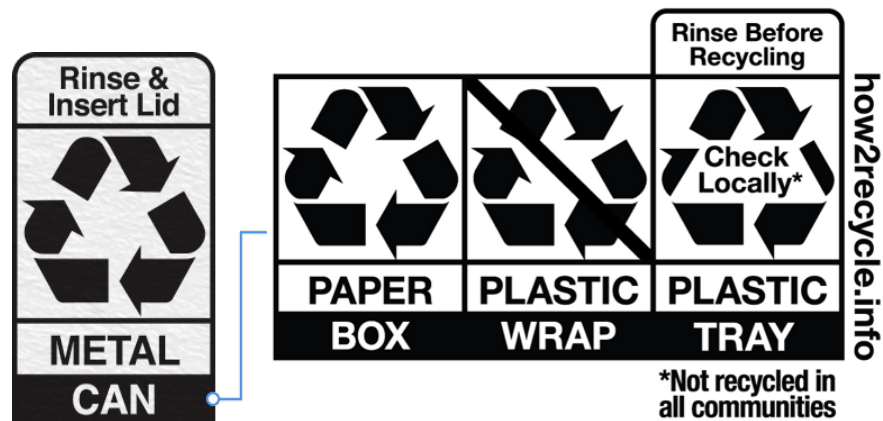
Figure 9. how2recycle Sample Labeling

Using recycled content in packaging also allows brand owners and manufacturers to close the loop, embodying the circular economy principle of a system that is regenerative and restorative. Generally, recycling materials like plastic, glass, and metal, is less carbon intensive than producing virgin feedstocks because raw material extraction is avoided. Recycling paper is carbon intensive but the greenhouse gas benefit comes from avoiding methane emissions from degradation of paper in landfills.[20]

Reusable packaging makes a comeback

Reusable packaging is returning to society as a viable solution in personal care, home care, food and beverage, reverse logistics, and other e-commerce industries. Reminiscent of the milk bottle model, "reuse models can unlock significant benefits, enabled by digital technologies and shifting user preferences. Such models can help deliver a superior user experience, customize products to individual needs, gather user insights, build brand loyalty, optimize operations, and save costs."[21]
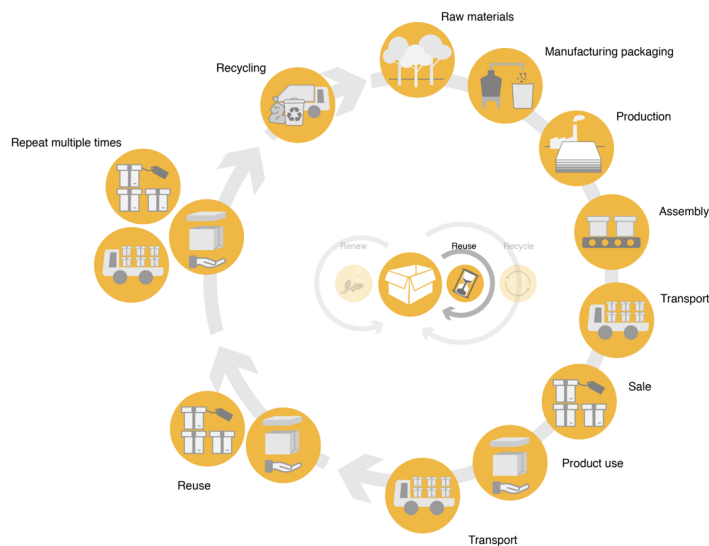
Figure 10. Packaging reuse system[22]

Regulatory landscape

In the United States, regulations regarding the management of packaging waste are fragmented and are largely determined by municipalities and states. Extended producer responsibility (EPR) is a policy concept that extends a manufacturer's responsibility for reducing upstream product and packaging impacts to the downstream stage, when consumers are done with them. The most effective policies are non-voluntary and require brand owners to cover the cost of recycling, which provides an incentive to reduce the amount of material used. They also ensure standardization of material acceptance and educational messaging. EPR packaging laws have been in effect for up to 30 years in 11 countries in Asia, South America, Europe, Australia, and Africa are expanding globally.[22] While a national EPR policy is not likely to become a reality in the near future in the United States, individual states have been proposing legislation and are on a pathway to becoming law in the next 1-3 years.

Chapter 3 | Discover

To begin the design process, understanding and even challenging the nature of the problem through structured and unstructured research is essential.
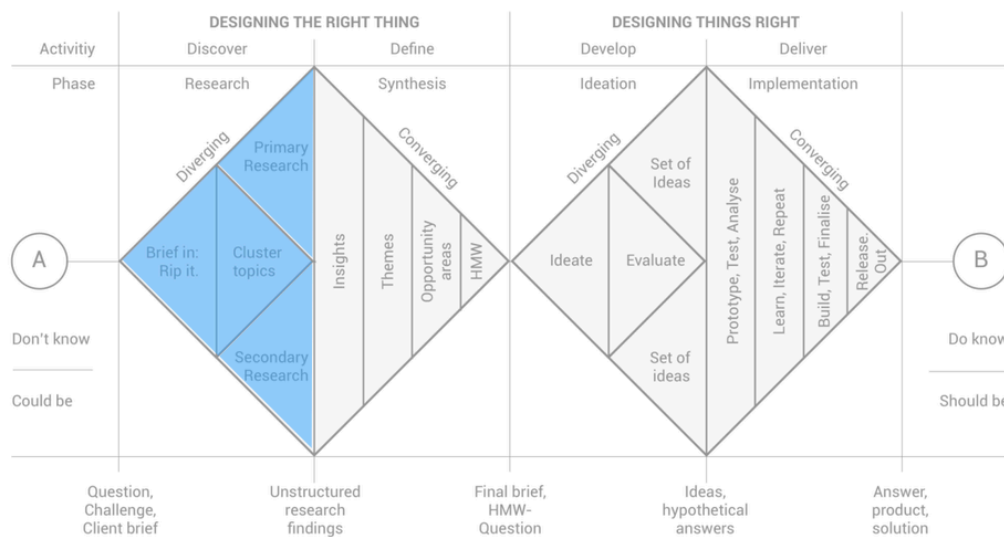
Figure 11. Updated British Design Council's Double Diamond [23]

Primary research

To uncover the challenges and opportunities in designing consumer electronics packaging for the environment, interviews with employees (20) and external stakeholders (16), as well as in store observations (5), were conducted. The research team requested types of employees to interview and the sponsor requested specific team members for this first round of discussions. From these interviews, the research team identified the relevant stakeholders (vendors, NGOs, think tanks, research institutes) to interview and requested the sponsor to make an introduction. Interviews were conducted in person or over virtual conference for 30 minutes each. In store observations were conducted over two hours in two different store locations. The purpose of the interviews was to discover the history, philosophies, and principles of the

company, decision-making and design processes, research and innovations already achieved, progress made towards environmental goals, vision and roadmap for future goals, customer perceptions, systems interactions, and company and stakeholder requirements. During this discovery process, key topics in line with the journey of package emerged:

Materials > Life Cycle Analysis > Customer Behavior > End of Life (Recycling, enabling recycling, reuse, and policy)

The findings of the primary research were reported in detail to the company in a formal deliverable submitted after the first phase of the project and are summarized here:

The company has actively conducted research on the impact of its packaging at end of life. The recommendations made from that research included using recycled, bio-based, and sustainably sourced virgin fiber; using similar materials or making dissimilar materials easily separable; informing customers on how to recycle the packaging; and using fiber-based materials to maximize recyclability.

The team has pursued various pathways to make its packaging efficient and sustainable, particularly on projects that are within the scope and control of packaging designers. Challenges that the team faces in terms of closing the loop on packaging are out of the team's immediate control, including constraints from environmental regulations (or lack thereof), customer behavior, and availability of end of life material processing systems. However, there is an opportunity and eagerness to influence stakeholders to make progress towards success.

Materials: designing for end of life

Raw material, what packaging is made of, was an immediate opportunity to pursue. The company's team actively worked on redesigning packaging to use sustainably sourced, fiber-based materials and has made significant strides over the past four years to increase the recyclability of packaging. The team continues to seek sustainably sourced and recycling

compatible materials to ensure that when packaging finally journeys through Material Recovery Facilities (MRFs) around the world, it is processed effectively into recycled fibers without burdening MRF infrastructure.

The world of materials is vast with many options for Materials Engineers to choose from to meet performance requirements, which are primarily driven by customer experience, protection of product throughout its journey to the customer (including environment and security), environmental impact, and cost. When testing a new recipe or material for a packaging solution, the team must consider a few factors such as cosmetic features, supply chain availability (while considering business, regulatory, and environmental risks), technical capabilities and recyclability. For environmental impact, life cycle analyses (LCAs) are also conducted on materials, which will be discussed further in this paper. Each of these criteria are significant and teams must consider all perspectives, with the end goal of providing finished goods packaging to the consumer and a fully functioning product inside. This approach has worked for a majority of the product lines, however, some of the larger devices pose a challenge, as their size and weight require plastic to protect the device in transit.

Life Cycle Analysis (LCA): measuring the impact of packaging

The standard method to evaluate the environmental impact of materials is to use Life Cycle Analysis (LCA), "the systematic analysis of the environmental impact of products during their cycle of production, use and disposal phases. Environmental impacts are evaluated throughout, also including the upstream and downstream processes associated with the production (e.g. production of raw, auxiliary and operating materials) and with the disposal (e.g. waste treatment). Environmental impacts refer to all relevant extractions from the environment (e.g. ores and crude oil), as well as emissions into the same (e.g. wastes and carbon dioxide)."[24]

"The outcome of any packaging LCA should always be interpreted in light of the prevailing technology and the function of the packaging...A more wide-ranging integrated approach, encompassing economic, social and environmental considerations, in conjunction with more efficient packaging designs, which economize on material and are recyclable, is the key to sustainable packaging."[25]

The sponsor's environmental team conducts LCAs for packaging and leverages existing databases and models and adjusts them to create an internal tool to represent the company's environmental priorities. This tool includes the following rating criteria:

1. Recyclability: how much of the material would presumably get recycled
2. Renewable content: bio-based
3. Recycled content
4. GHG emissions: CO2 emissions, includes from the point of source (harvesting) to end of life
5. Mass: proxy for transport emissions

Consumers and stakeholders: human behavior with packaging

Users of the company's products were interviewed to understand their perceptions of and relationships with the packaging. Customers' immediate feeling is that it has some value, and something of value is not to be thrown away. The closet or the drawer feels like the right place to store the box. Customers also have an idea that keeping the original packaging may be useful or valuable if they want to resell their product when they are upgrading to a new device. This is often a split-second decision and then is forgotten about for years. Customers also shared that they contemplated on what to do with the packaging particularly when they had purchased a new device, were overhauling a room, or moving apartments.

When asked about the material composition for the company's recent packaging, users were unaware that packaging is made from fibers and mistook the material for plastic. Customers shared that if they had known that the packaging was recyclable and should be put into the single stream bin, they would be inclined to do so. Some suggested that if associated with a reward or a benefit they would have recycled packaging right away.

End destination and recycling: what happens to the box?

Although consumers resist putting the company's packaging into recycling streams and would rather keep them in their closets or drawers, once the packaging ends up in the recycling system, it faces another set of challenges.

Material recovery facilities (MRFs) are designed to aggregate similar materials so they can create clean bales, products which they sell to recyclers. A clean bale is an aggregate compressed group of products made from the same material, meeting the purity requirements of the downstream recyclers. Recyclers have the power to reject bales from MRFs, if they do not meet quality standards expected. This is largely driven by the economics and demand for recycled content. Recyclers must sell recycled material in the open market and the value of recycled material fluctuates as commodity pricing fluctuates. This provides the recycler with a budget it must operate within, and the recycler may not have the capacity to process out contaminants and prohibitives from recycling feedstocks. Therefore, based on their existing infrastructure and labor capabilities, they accept or reject bales from MRF based on contamination levels.

For decades, China had a busy recycling industry accepting all types and qualities of post-consumer material. With the newly instated National Sword Policy (which remains in effect today), contamination rates of post-consumer recycled bales are limited to 0.5%. It also effectively no longer accepts mixed plastic and mixed paper. This has impacted the global recycling market, putting significant pressure on waste management companies and MRFs to

reduce contamination levels. Recyclers reject bales, MRFs reject loads, and haulers and collectors charge waste generators for contaminated loads.[26]

As the players in between waste generators and waste processors, MRFs have invested in machines and have trained their staff to sort materials. "Although these upgrading strategies can improve raw material quality, justifications for investment in their development and deployment depend upon defensible assessments of their economic consequences."[27]

Figure 12. Recycling signage and instruction, Arlington, VA

The non-standardization of recycling availability and guidelines makes it confusing for customers to use their automatic decision-making system[28] to execute recycling behavior. As the user summons the more cautious and analytical mental system for decision-making, it is still tough for the consumer to be confident about what to do with the packaging, as there is no information online on what to do with it and what it is made of. The non-standardization also makes it difficult for industry to design packaging for recyclability and limits confident communication with customers on what to do with packaging at the end of life. For example,

paper has a higher probability of getting recycled in Northern CA because collection and infrastructure is robust, and it is at a geographical advantage on the coast with access to sea freight. In certain parts of the Midwest however, the system to recycle paper may not be economically viable, therefore even though packaging is designed for recyclability, it may end up in nature, landfills, or incinerated.

Variability persists across the waste management system. Local municipal and private collection systems, local and regional private sorting and aggregation capacities, regional and global private recycling infrastructure, labor rates, and changing commodity pricing creates a huge amount of uncertainty of recycling operators. At a macro scale, because the system does not align, the variability trickles down to micro scale waste generators who are left to interface with confusing and changing systems.

Policies and Regulations

Globally, environmental regulations have become commonplace and the company's environmental technologies team is monitoring more than 200+ policies worldwide.

From a packaging perspective, the lack of standardization of policies and regulations internationally and domestically lead to ambiguity and uncertainty in designing for end of life and communicating with the customer. This is an added variable that the company has to integrate in the design phase for packaging.

Findings

In the discover phase the research team found that the company has explored concepts on reducing the environmental impact of packaging. However, because the macro waste management context within which the company operates is constantly in flux, the company has

to be cognizant of the system when designing packaging experiences. The next chapter will

further explore the system and users to crystalize opportunity areas.

Chapter 4 | Define

Insights, themes, and opportunity areas

The design process enabled this initial phase of unstructured research of the factors driving the history, status quo, and future of packaging related to environmental impact. The research team synthesized insights and themes exogenous and endogenous to the consumer electronics company, the foundation for exploring and converging to opportunity areas.
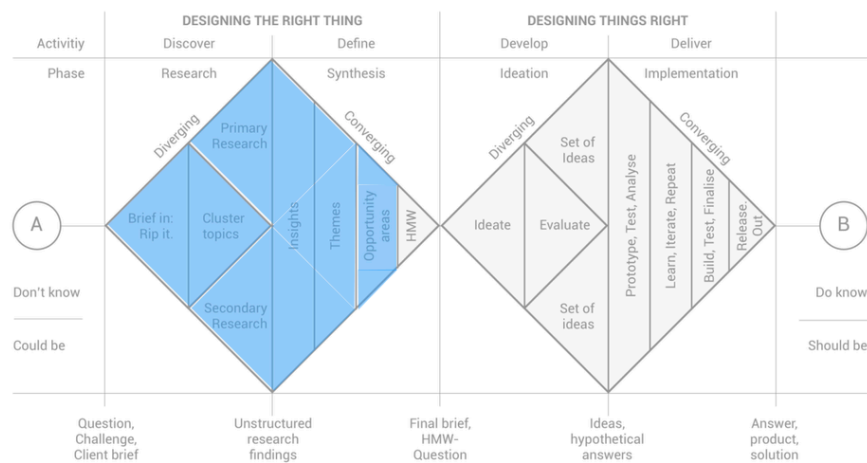
Figure 13. Updated British Design Council's Double Diamond[29]

Journey of a package

Packaging follows a similar journey to products themselves. Below is a map journey map of packaging for this consumer electronics company.

Each node in a package's journey presents opportunities and constraints to reduce environmental impact. In the beginning stages, the company has complete control over how to design the packaging but relinquishes this control to the customer upon sale of the product. The customer relinquishes control of the packaging to a waste handler when they place it in a recycling bin or trash can.

There are key points in the packaging journey to note. The design phase is an opportunity to consider stakeholders, understand constraints across the system and generate data around the desirability of design options. The sale and unboxing experience are key moments to interact with the customer, as their attention is focused on unboxing and using their device for the first time. Additionally, customers' behavior with the packaging determines whether or not the material enters the recycling system. Finally, the collection and processing of material is limited by the availability of local systems across the world.
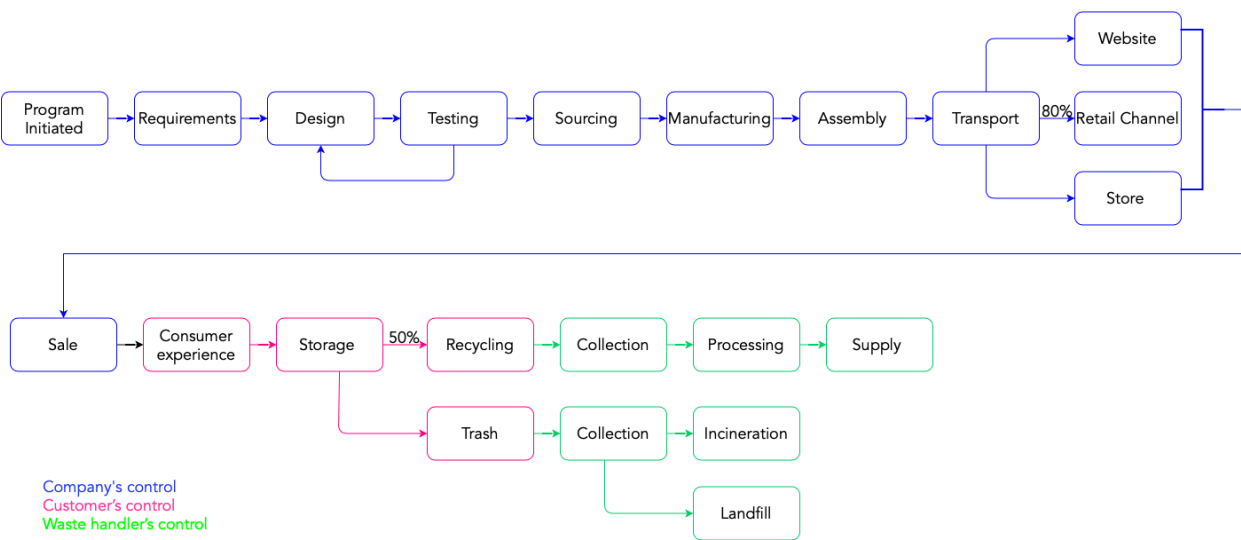
Figure 14. Journey Map – Packaging

When designing packaging and considering the environment, product designers should consider the entire journey of packaging to inform the design and make important tradeoffs on materials, structure, imagery, and information. This particular company has considered end of life scenarios and designed for them by switching from plastic-based to bio-based packaging to increase the likelihood of recyclability in global municipal systems. Packaging could be designed to communicate with customers, to collapse so that it looks like paper, to be plantable or dissolvable, to be the color green, or many other design options.

The design team considers the packaging to be a part of the product and the customer experience with the entire product is first priority. Tradeoffs are constantly being made at each stage of the packaging journey that interfere with the probability that the material is recovered as a resource.

Stakeholder map: Who is involved in the packaging experience

The customer is the key stakeholder in this map. Through consistent demand, the customer provides the company and its employees the opportunity to work with its partners to deliver innovative products and experiences to the world. While seeking to achieve growth and groundbreaking achievements, the company spends CO_2 and creates an externality of packaging waste. The company considers the environment and the communities it operates in as stakeholders. Packaging product designers are familiar with the stakeholders in this ecosystem so that when prioritizing different requirements, they can understand the impacts of the decisions they are making. There are opportunities to partner with each type of stakeholder and minimize the climate impact of packaging holistically.
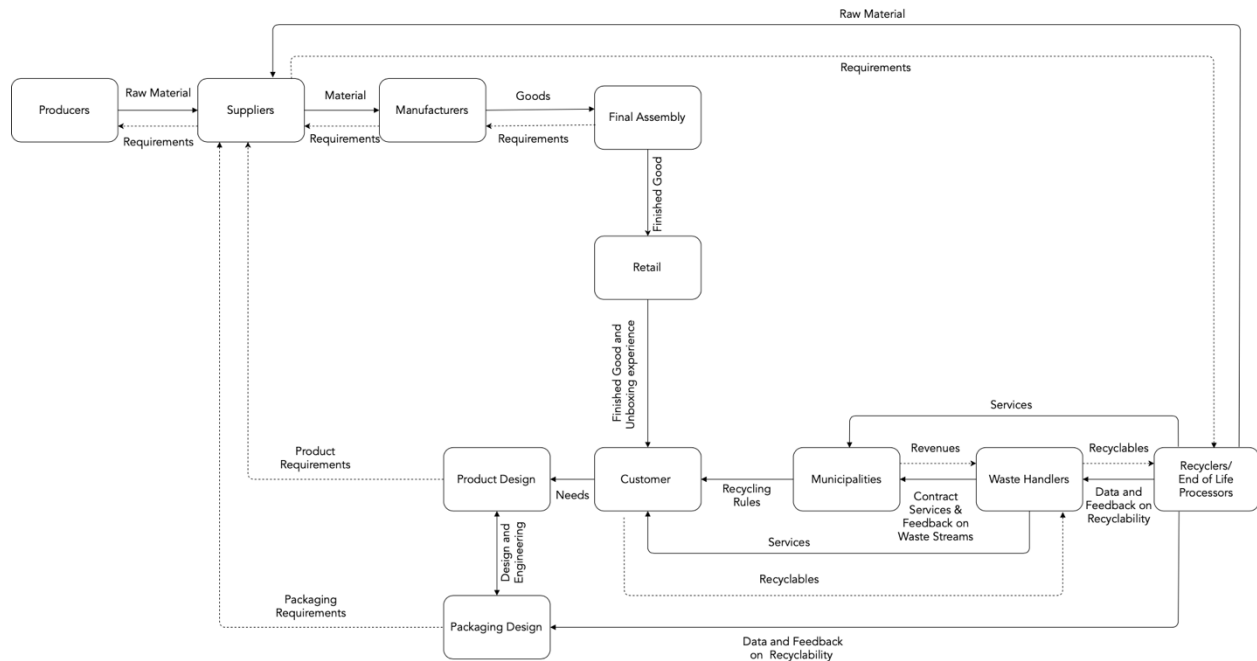
Figure 15. Stakeholder Map – Packaging

The company has a list of design goals, initiatives, and R&D projects that demonstrate its deep understanding of the ecosystem and efforts to meet environmental goals. For example, because its packaging is made primarily from biogenic sources, the company has made an effort to protect working forests. Supply teams are working to shift manufacturers onto renewable energy, thus helping to reduce the overall carbon impact of production. As discussed above, packaging product designers have already nearly eliminated all plastic in product packaging, moving packaging towards recyclability.

These initiatives illustrate that the company is willing and able to make changes ahead of or alongside stakeholders, especially for what it can control (raw material to customer experience). It has incorporated inputs from the recycling industry to factor their requirements into the packaging design. The company does however lose control of their impact once the product and packaging are in the hands of customers, its primary stakeholders.

Journey Map: How does the customer interact with packaging?

Because the customer is the key stakeholder for the company, the touchpoints in the customer journey are potentially an opportunity for designing packaging for the environment. Observing users during different parts of the user journey is important to glean insights on user behavior, emotional relationship with the experience, and needs. The company has the customer's attention mainly during the transaction. During purchase, unboxing and initial use are key opportunities for behavioral interventions. Before purchase and end of life are key opportunities for educational and informational interventions.
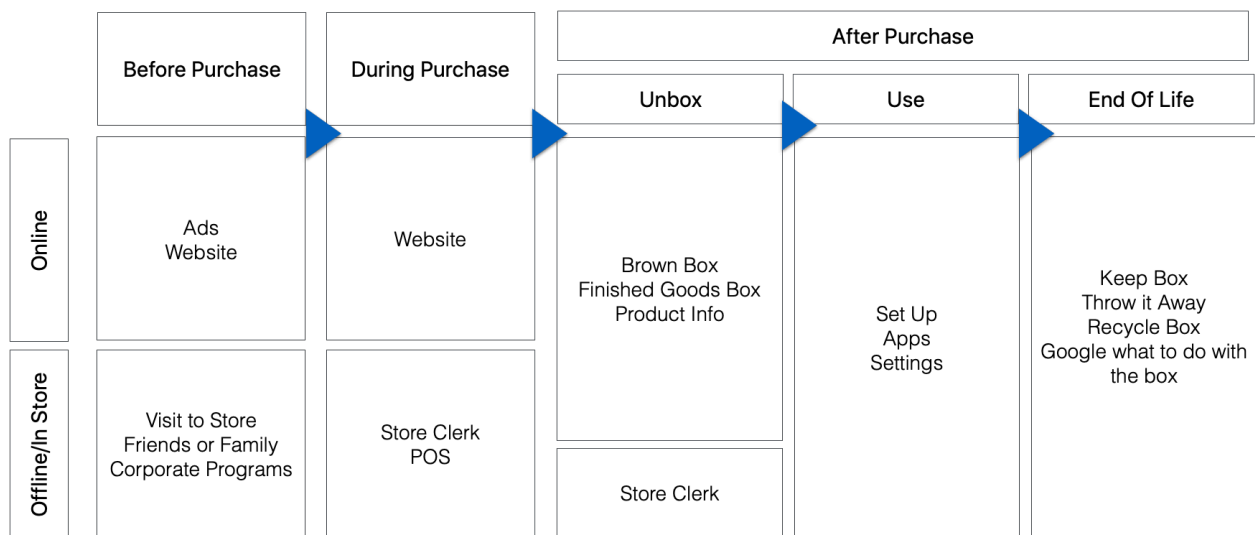
Figure 16. Journey Map - Customer Interactions

User Insights: What is the customer experience with packaging?

These user insights were generated from observing customers unboxing the company's product in a store setting and from interviewing customers.

1. **Unboxing is thrilling and personal** - The customer experiences moments of anticipation while opening the box
2. **Assigned Value** - The customer knowingly or unknowingly assigns some value to the packaging and keeps it

3. **Reflection during a deep clean or a move** - The customer considers why they have kept the packaging when they come across it months later
4. **Used for other things** - The customer may find an alternative use for the packaging because it is sturdy and attractive
5. **User does not know what the material is** - The customer has a hard time identifying the material the packaging is made of

Packaging requirements

This list of requirements outlines what packaging must achieve:

1. Packaging must deliver an experience that is deeply associated with the company
2. For the highest quality customer experience, packaging should
    a. Create an unboxing experience that is exciting
    b. Be intuitive - user should understand what to do next
3. To leverage physical space, the packaging should
    a. Have minimal copy
    b. Have beautiful, memorable imagery
    c. Meet regulatory standards
4. To leverage physical space, the packaging should efficiently contain
    a. Accessories for the device
5. To ensure authentic products are securely delivered to the customer, the packaging should
    a. Protect the battery
    b. Meet international import & export requirements
    c. Limit likelihood of theft
    d. Communicate that the product is brand new
6. To ensure that products are not compromised during transport to the customer the packaging should
    a. Meet technical specifications
7. To ensure the packaging is designed for reducing environmental impact, it should
    a. Be sourced from renewable material
    b. Be recyclable
    c. Contain information on how to recycle (Designing for Environment)
    d. Minimized carbon impact
    e. Consider cost but not prioritize it

In addition to meeting and exceeding traditional packaging requirements, the company has made a true effort to design packaging for the environment, but the intention of designing for the environment can only come to fruition when other elements and actions of stakeholders align.

Concept selection criteria

Prior to generating ideas and concepts on how to further align the company's design for the environment and external elements, outlining the criteria to assess the concepts is critical to determine what is most important to solve.

<u>Desirability</u>

Will the solution solve the problem?

- Will customers experience joy? Is the solution seamless, easy to understand, intuitive to use and in line with the brand? Does it increase brand loyalty?
- Is the solution a leadership opportunity for the company?

<u>Feasibility</u>

Does the solution leverage a core operational strength?

- Is the solution technically feasible in 1-3 years? Will it get internal buy in? What resources are required to implement?

<u>Viability</u>

Does the solution contribute to the long-term success - in this case, meet the environmental goals?

- Does it have a positive, measurable, environmental impact? What is the cost to achieve the environmental impact? Is it worth it?

Concept generation

The journey of the package served to guide concept generation. Fifty-six ideas were generated and evaluated using the above selection criteria. These concepts were generated alongside interviewees. Individuals shared their thoughts on what they dreamed of in a world without

constraints, what they thought was possible in the next five years, and what they thought of years ago or right there in the moment. From the ideas, patterns of opportunities to leverage to develop new concepts began to emerge.

Customer information

At what point or points in the customer journey is it most impactful to share information that customers will act upon to increase recycling?

Design the box

Could we design a box that is better managed by the recycling systems across the US?

Recycling infrastructure

Could we influence policy or technology to enhance or standardize recycling infrastructure across the US?

Reusable packaging

What would a reusable packaging design and system look like?

Carbon sequestration

What could we do to design the packaging with a goal of increasing carbon sequestration from the environment?

Packaging take back

How could we leverage the trade in program to recover and recycle packaging on behalf of customers?

Materials

Could we invent a magical new material that would be environmentally preferable?

Concept evaluation

To evaluate the opportunity areas identified from above, the concept selection framework described above was utilized. This simple rating system, with equal weightings across criteria, showcase the desirability, feasibility, and viability of each opportunity. The ratings themselves were generated considering contributions from interviewees, background research and context, and a bit of intuition.

	Customers experience joy	Leadership opportunity	Technically feasible in 1-3 years	Short term win	Long term win	Resources required (1 is resource intensive)	Sum
Customer information At what point or points in the customer journey is it most impactful to share information that customers will act upon to increase recycling?	3	3	5	5	5	5	26
Design Could we design the box that is better managed by the recycling systems across the US?	4	5	5	5	5	2	26
Recycling infrastructure Could we influence policy or technology to enhance or standardize recycling infrastructure across the US?	1	5	5	2	4	1	18
Reusable What would a reusable packaging design and system look like?	4	5	5	3	3	3	23
Carbon sequestration What could we do to design the packaging with a goal of increasing carbon sequestration from the environment?	2	4	5	3	4	1	19
Takeback	4	4	5	3	3	4	23

How could we leverage the trade in program to recover packaging from consumers?							
Materials Could we invent a magical new material?	4	5	3	1	5	1	19

Figure 17. Concept Evaluation Matrix

Customer Information, Design, Reusable Packaging, and Packaging Take Back were the highest rated opportunities. Each opportunity, while in line with circular economy principles, is considerably broad and nebulous. The design process nudges towards synthesis and structure while allowing for future exploration and convergence in the opportunities selected to move forward. Although each opportunity area holds potential for impact, focusing attention on a select few is critical to allocating resources effectively. As the research and design process continues, validating the ratings while gathering more data would inform pathways to action for the company.

The define phase of the design process helped the research team uncover these insights, some of which were surprising. For example, the technical requirements for packaging require perfection not only to provide a beautiful unboxing experience, but to also to protect the product and signal other things to the customer including originality and authenticity. This phase of the design process also helped the research team understand nuances of the customer experience. Customers are not aware what the company's packaging is made of and that it is designed to be recycled. The entire unboxing experience is intuitive, but not what to do with the packaging after unboxing. It was not surprising that the company has explored options in all of the concept categories previously, some more than others, and the company is open to exploring new ideas or approaches. There is an authentic commitment to explore ideas beyond low hanging fruit which will be explored in the next chapter.

Chapter 5 | Develop

After review of these opportunity areas and the associated potential impact of each, the company and the MIT D-Lab research team focused on to two to explore further: Customer Information and Reusable Packaging. The selection was driven by various evaluation criteria including the following:

1. Relevance: projects that align with the company's mission and vision
2. Resources: availability of resources and team members within the company
3. Horizon: projects that would have impact over differing time horizons (impacting the current status quo vs. a new future)
4. Targeting different loops in the circular economy model (recycle vs. reuse)
5. Expertise and skills of the MIT D-Lab research team
6. Timing: projects that could see movement in a short time span
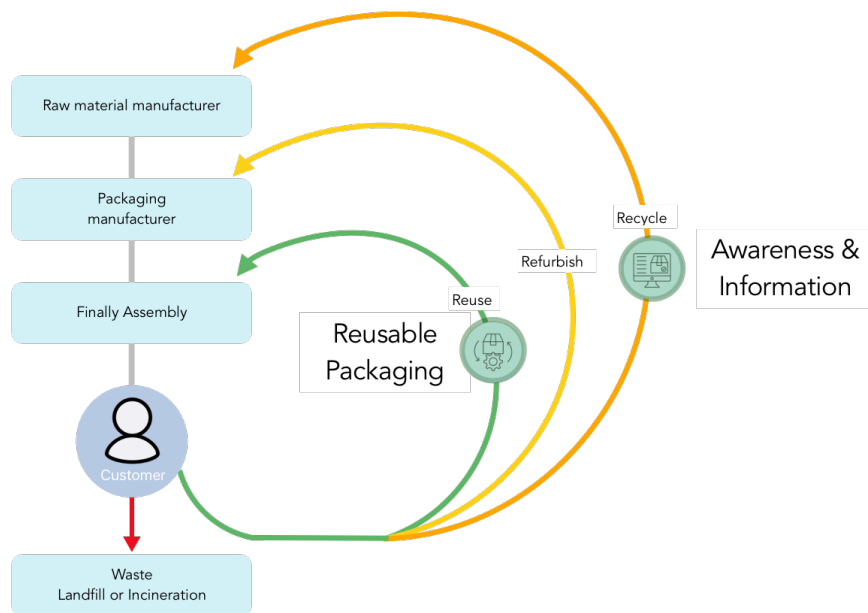
While these two areas of exploration were the focus of the research, throughout this phase of the design process, some other opportunity areas proved to be tangential and sometimes even integrated in the concepts generated.
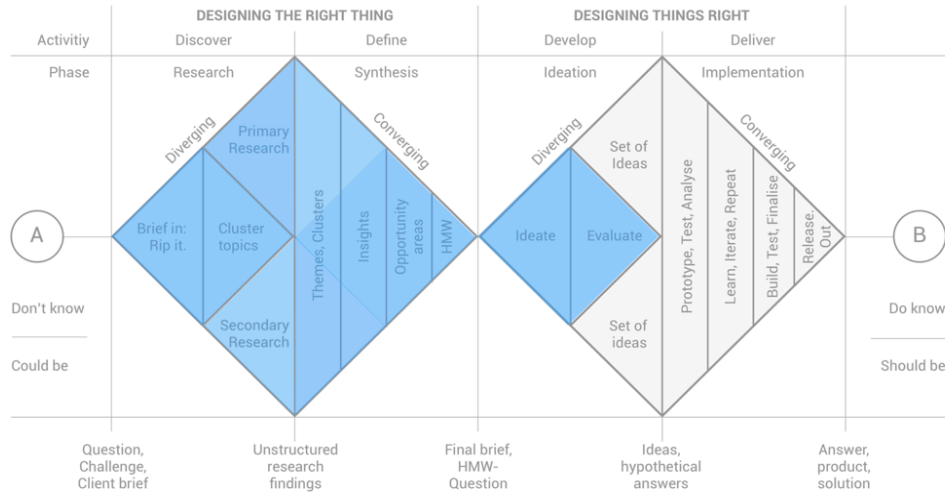
Figure 19. Updated British Design Council's Double Diamond[30]

How Might We

The "How might we" question in the design process is an informed and synthesized reframing of the original problem articulated. For the two opportunity areas selected, the team arrived at these "How might we" questions:

Reusable Packaging

How might we engage with consumers to increase the likelihood that reusable packaging gets returned to the company?

Customer Information

How might we engage with consumers to increase the likelihood that packaging gets recycled?

	Initial Problem Statement	Opportunity Area	HMW
Reusable Packaging	How can we minimize the environmental impact of consumer electronic packaging?	What would a reusable packaging design and system look like?	How might we engage with consumers to increase the likelihood that reusable packaging gets returned to the company?
Customer Information		At what point or points in the customer journey is it most impactful to share information that customers will act upon to increase recycling?	How might we engage with consumers to increase the likelihood that packaging gets recycled?

Figure 20. Evolution from problem statement HMW

Figure 17 demonstrates how the problem being addressed evolves as the design process progresses from a broad, vague and uninformed idea to a relevant, focused question. This points to the efficacy of the design process, leading the research team to converge on to a concept to "design the right thing" before "designing things right."

The link between these two HMWs stems from a challenge that most companies face in Design for Environment. Although the company may have designed for sustainability, the control of what occurs in the use phase of the product or packaging remains with the customer and the inconsistent end of life systems that exist. In the Customer Information opportunity, the company already designed packaging for recyclability, after understanding how waste collection, sorting, and processing works in the United States. However, it depends on the customer to recycle the box, in order to align with the Design for Environment intention that lives within the box. In the hypothetical Reusable Packaging opportunity, the company would

heavily rely on the customer to return packaging to the company to reuse, which would lead to environmentally preferable outcomes.

Sustainable Behavior Literature Review

Before moving into ideation in response to the HMW question, the MIT D-Lab team reviewed the existing literature at the intersection of human behavior and sustainability. The purpose of this review was to investigate methods and approaches to change human behavior to be more environmentally preferable and to understand how effective they are in terms of lasting outcomes. Is one piece of information enough or are repeated points of information and intervention required to get someone to change their behavior? Would that change be sustained over time or fizzle out? In the case of packaging, the company would look for an immediate action of either recycling or returning packaging, so the question was: what would be effective?

The literature suggests that providing customers with relevant information or a particular framing of the context could influence behavior. Providing consumers with action-oriented information (telling them exactly what to do), with clear labeling, that makes them feel good about their actions, through text and or pictures, would be effective. In fact, the results of a survey conducted on environmental behaviors showed an interesting result that ''lack of information'' is cited as the second or third most important barrier in achieving behavior change.

Table 7
Barriers to action as a percentage of number of respondents who said they would like to do more, in each section (most common responses in bold).

	Raise awareness/lobby	Home energy use	Travel	Food
% Respondents who would like to do more	71.6	90.7	76.5	77.2
Barriers				
Cost	12.9	**51.0**	37.1	33.6
Lack of options	12.1	31.3	**46.8**	**42.4**
Lack of information	19.8	23.1	11.3	29.6
Inconvenience/discomfort	19.8	15.0	37.1	22.4
Lack of time	**70.7**	19.7	21.0	17.6
No point at the moment	4.3	2.0	0.8	1.6
Other	13.8	21.8	13.7	12.8

Figure 21. Barriers to environmental action. Howell, Rachel A. "Lights, Camera … Action?"

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Every touchpoint on the customer journey is an opportunity to educate, inform, or nudge the consumer to behave in an environmentally preferable manner, and selecting the right time and experience could drive or kill the success of the intervention.

When customers consider purchasing a product or engaging with a brand, they already have existing "underlying knowledge, values, experiences and lifestyles; and these in turn are affected by the wider social landscape" which drives their engagement with the product and impacts their engagement on the issue of climate change. A study conducted in the UK investigated the effects of a film on climate change on viewers' attitudes and behaviors and found that immediately after watching the film, viewers levels of concern were raised and motivation to act increased. However, 10-14 weeks after watching the film, concern and motivation to act had "dropped back to initial levels."[31] The paper furthers cites research about advertising suggesting that people need to see messages more than once in order to remember and respond to them. This study, in common with others, also found that where there is some evidence of a link between attitudes and pro-environmental behavior, it tends to be less costly behavior "in terms of time, money, or effort" like installing energy saving lightbulbs or changing the temperature at which the washing machine runs. This means that it is possible to present the customer with information that they may act upon but reducing the friction and barriers to act is paramount.

Another study used "discrete choice experiments to assess consumer willingness to pay for packaging materials and recyclability of a beverage product."[32] The results showed that the customers' willingness to pay is highest for plastic, followed by aluminum, glass, and then cardboard. This is because customers believed there is higher impact achieved through recycling plastic. Further, after showing customers a video on recycling, the study found that there was a positive effect on willingness to pay for packaging recyclability. This extends the findings from the previous study on change in behavior and action to a delta in dollars spent

on a product during a transaction, because of the perceived environmental preferability of the option available to them.

Before and during the purchase, the customer can be influenced to shape attitudes toward the environment. After the purchase of product, that comes along with packaging, the control of what to do with the packaging remains firmly in the hands of the customer. Therefore, providing information or influencing environmentally preferable behavior at this point in the customer journey is imperative. In a study investigating links "between emotions and users' resource conservation behaviors, thirty participants were shown sketches of four conceptual eco-feedback product designs." [33] Two eco-feedback design styles, quantitative and figurative, were compared and the study counterintuitively found that quantitative designs evoke stronger emotions than figurative designs and quantitative designs made participants realize the amount of resources being wasted. Quantitative designs often made the participants feel strongly because the numbers of energy/water consumption made them realize that a lot of energy or water would be wasted, or that they could easily save a lot of resources with some simple actions. Another study conducting behavioral experiments examined the changes in individual's shipment packaging recycling behaviors after observing written and pictorial information. Results showed that both written and pictorial information can positively change an individual's recycling behavior. Pictorial information has a stronger impact on purchasing behavior than written information, but their effectiveness is not significantly different. These findings show that if the company relies on the customer to behave in an intended way, information can be presented to the customer in an effective way that is more likely to evoke the intended response.

Most often, consumers are aware that the choices that they are making are not environmentally friendly, but despite this awareness, they still may not change their behavior. This gap is called the intention-action gap, and is relevant beyond climate-based decisions, like saving money or eating healthy. Nudging, or purposefully adjusting choice architecture for consumers to make

choices almost automatically, can be created by simplifying information provided, offering default choices, or setting up a system to easily enable a specific choice. Nudges do not try to necessarily change a customer's values or beliefs, but to thoughtfully focus on enabling behaviors and decisions that are beneficial to society or the individual.[34]

Another helpful definition of nudges is "any attempt at influencing people's judgment, choice or behavior in a predictable way (1) made possible because of cognitive biases in individual and social decision-making posing barriers for people to perform rationally in their own interest, and (2) working by making use of those biases as an integral part of such attempts."[35] Nudges can be designed from behavioral insights, but rarely can the results from one experiment be applied in a different context or in different populations, because human behavior is inherently complex. The list of drivers of influence below offer examples of tools that can potentially be leveraged as nudges.

Drivers of Influence

Transmitter	Choose the right messenger to enforce message	
Habits	Promote habits with new triggers and appropriate rewards	
Ego	Value action through reward and recognition	
Default	Create a default choice sequence	
Reciprocity	Create a social debt	
Incentives	Encourage through rewards	
Value	Justify through scope of work	
Emotion	Create response through imagery, visuals, stories	
Rewards	Positive Feedback	
Salience	Attract attention	

One Step	Simplify task
Framing	Create context
Immediacy	Postpone effort and provide immediate advantages
Nostalgia	Create emotions of the past or familiar
Fairness	Show how target behavior is just
Loss Aversion	Mention loss provoked by not adopting behavior
Upper Anchoring	Generate favorable associations and reference points
Easiness	Simplify
Norms	Encourage need for conformity
Compartmentalize	Create emotions of the past or familiar
Engagement	Generate commitments to promote consistency

Figure 22. Nudges as drivers of influence[36]

Applying drivers to the problem of climate change has proven to be successful for private companies. Opower is a classic example used to show the measured effectiveness of nudges.

The software as a service company provided a customer engagement tool for utility companies to help their customers (households) with programs save energy. Opower provided households with Home Energy Reports which contained customized suggestions on how to save energy (information) based on household energy consumption patterns, as well as comparative information on the relative energy use of the 100 nearest households of a similar size. The powerful driver of influence in this case is norms. By presenting information that made customers compare themselves to their neighbors, Opower made conformity the norm. When run as an experiment in a randomized field experiment, researchers found that households presented with Opower reports reduced their energy consumption by about 2%. At scale, this small change has significant climate impact.

Figure 23. Opower's social comparison nudge

Ideation

Although the design process was implemented for both the Reusable Packaging and the Customer Information opportunities, the remainder of this thesis will explore Reusable Packaging.

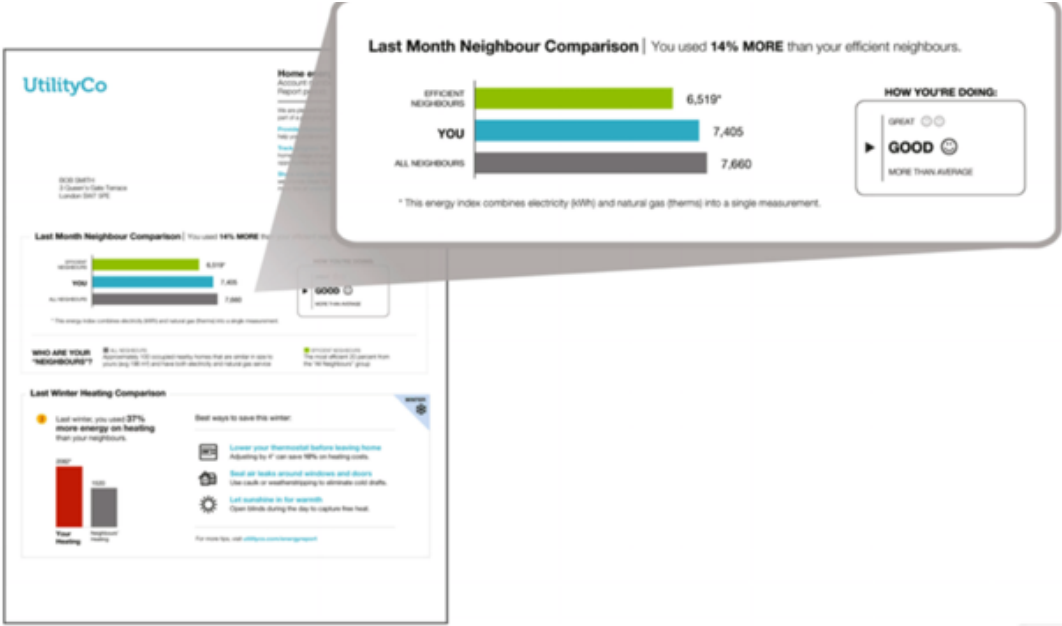Much work has been completed on human behavior and recycling but reusable packaging as a sustainable option for large scale consumer goods companies is still in a nascent stage. This opportunity has become a point of conversation for many consumer goods companies as they begin to move towards the "inner loops" of the circular economy and therefore reusable packaging will be the focus of the remainder of the thesis.

The MIT D-Lab team referenced an Ellen MacArthur report on reusable packaging to understand what consumer product goods companies were implementing. The companies that are attempting this are targeting low value consumables in a variety of industries and are pairing reusable packaging with deposit-refund systems, meaning customers deposit an amount for the packaging and are refunded when they return it to the producing company. Deposit amounts for the packaging ranged from $1-17 and the many companies that attempted to make collection of the packaging easy, did so through a network of collection points or easy pick up through a logistics company.

Company	Return or Refill	Type of Product	Product Value	Deposit $	Packaging Type	# of refills	Who cleans	Network of collection points
Replenish	Refill	Home Care	$5	$7	Plastic	Monthly	Customer	No
SodaStream	Refill	Food	$15	$15	Gas cylinders	Monthly	Company	No - UPS drop off
Dasani PureFill	Refill	Food	$1	0	BYOB	Daily	Customer	No
DabbaDrop	Return	Food Service	$33	$17	Steel	Weekly	Company	No - Collection service
Loop	Return	Packaging service	$10	$5	Glass, aluminum	Monthly	Company	No - UPS pick up

Coca Cola Brazil	Return	Food container	$1	<$1	Reusable PET	Weekly	Company	Yes - grocery stores
CoZie	Return	Personal Care	$19	$2	Glass	Monthly	Company	Yes - CoZie Stores (335 points of sales)
Revolv	Return	Food container	NA	$6	Glass	Daily	Customer	Yes - city wide cafes and chains
Swedish Return System	Return	Logistics	NA		Plastic	Daily	Company	Yes - 1500 participating businesses
Hepi Circle	Refill	Personal Care	<$1	<$1	Plastic	Weekly	Company	Yes - local shops
by Humankind	Refills	Personal Care	$15	Included in first purchase	Plastic	Monthly	Customer	No - refills delivered in compostable packaging

Figure 24. Examples of reusable packaging available on the market – Ellen MacArthur Report[38]

In order to execute a reusable packaging system, cross-functional teams must collaborate. Thorough investigation must be involved with design, engineering, materials, marketing, systems, and customer participation. Without the right customer participation all efforts to move to a reusable system could be wasted. A reusable packaging system would likely be more resource and CO_2 intensive upfront as compared to single use packaging but would be a net positive if the packaging were reused multiple times. The research team concluded that for this company, more customers would have to return the packaging than those who keep in order achieve a net positive outcome.
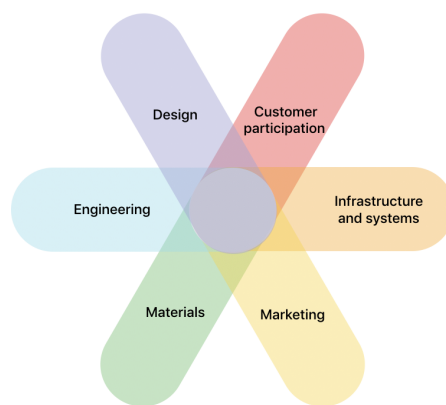

Figure 25. Levers for designing circular packaging

Workshops

To generate ideas in response to "How might we engage with consumers to increase the likelihood that reusable packaging gets returned to the company?" the MIT D-Lab team hosted a workshop with employees from across the sponsor company to tap into the diverse expertise available. Designers, engineers, and managers from packaging, environment, facilities, government affairs and policy, innovation, and materials, were invited to participate. The one-hour session, complete with activities, post-it notes, whiteboards, and chocolate, was designed to create connection and unlock creativity.

Participants were led through a series of introductions and activities including an icebreaker, introduction to the context, findings from the sustainable behavior literature review, the How Might We question, brainstorming rules, and a brainstorming warm up, before being split into smaller groups to answer the HMW in groups of four to five participants. Small modifications to the brainstorm were made to encourage creativity such as adding and removing constraints or asking how another brand or company might answer this question. For the purpose of this brainstorm, reusable packaging was defined as large packaging that could collapse to a smaller more manageable size, and would be durable for multiple uses, if returned to the company.
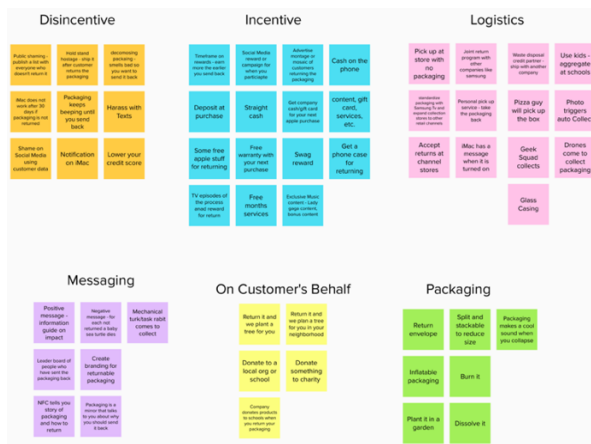
Figure 26. Ideas generated at the workshop.
Intentionally blurred for confidentiality
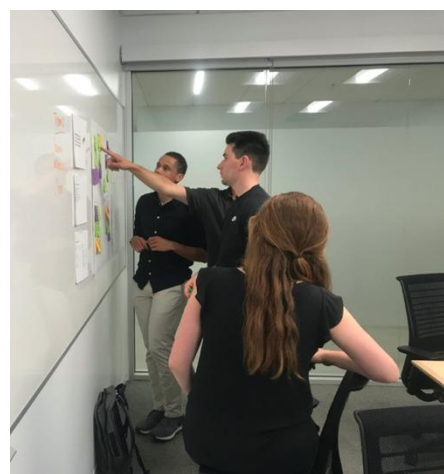
Figure 27. Ideation workshop conducted in July 2019

Concepts

Fifty-six ideas were brainstormed in the workshop, a majority of which included elements from the drivers of influence including transmitter, ego, incentives, rewards, one step, immediacy, easiness and loss aversion. When synthesizing all of the ideas, six themes emerged: disincentives, incentives, ease of logistics, messaging, acting on the customer's behalf and packaging design. The team eliminated disincentives to remain within the parameters of a positive customer experience and then integrated the other themes to arrive at three concepts.

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1. **Easy Returns**: Make it simple for customers to participate. This concept was rooted in the idea that by reducing the friction in returning the reusable packaging, the company would increase the likelihood that the customer would participate. Ideas ranged from having drones collect the packaging directly from the customer to allowing in store drop offs. Participants said, "If it were me, and I had to do even a little bit of work, I would not send it back."

2. **Incentives:** Motivate customers to participate. Because reducing return friction might not be enough motivation for a customer to return their reusable packaging to the company, this concept attempted to suggest various motivators that might lead to some action from the customer through opt-in options. Ideas ranged from featuring customers in a social media thank you message to rewarding them with cash. Participants said, "Maybe if we offer something that is exciting to the customer, has value to them, they might return the packaging."

3. **Deposit-Refund:** Create an accountability system. This concept grew from the idea that customers would not return the packaging to the company easily unless they were automatically enrolled in a system that would capture value from them at the time of purchase and return that value to the customer if the packaging was returned. This accountability system, known as deposit refund, has been used across many industries. The ideas included a variety of dollar amounts and other deposit mechanisms.

After synthesizing the ideas from the brainstorming workshop, the concepts needed evaluation from potential users to understand their desirability. Although there are many potential approaches on generating user feedback, the company and the MIT D-Lab team chose to use an internal survey to gather a larger sample of data.

The intention of the survey was to understand potential customers' understanding of reusable packaging and to gauge responses to the concepts synthesized above. Additionally, the team

wanted to record what customers say they do with their packaging in the current scenario, as well as their attitudes towards society and the environment in order to help segment types of respondents and their responses. Developing the survey itself involved a team that reviewed the vocabulary, positioning, and bias in the questions to ensure that respondents would have a clear understanding of the content, be thorough, and be as honest as possible.

User Feedback: Survey

The final survey, attached below, was sent out to 3,000 employees and 356 responses were recorded using Qualtrics, a survey design and execution tool. The time required to complete the survey was between 12-15 minutes. The survey was conducted in two cities in which the company operates. The complete survey is attached as Appendix C. A summary of the survey questions follows:

Imagine that you are standing in a grocery store and are ready to purchase your favorite ice cream. You see that Haagen Dazs offers two types of packaging. The one on the left is single use (product packaging is designed to be disposed to landfill or recycled through municipal handling) and the one on the right is reusable (product packaging is designed to be collected, cleaned, used again by Haagen Dazs for packaging another batch of ice cream).
Which product would you purchase?
If both the single use and reusable packaging are exactly equal in terms of their overall price, environmental impact, and convenience which packaging type would you prefer?
Please rank in order of preference why you would purchase this type of packaging type for Haagen Dazs ice cream. (1 = your top ranking)

Concept 1
The next few questions are about different scenarios and what you may do with the packaging box (finished goods) after you purchased an xxx. In these

scenarios, the xxx packaging box (finished goods/white pretty box) is reusable, meaning yyy would collect, clean and use the box again for another new xxx, after you return it to the company. This reusable packaging would collapse to the size of a zzz box. This reusable packaging is not recyclable, meaning your local municipality would not process it into a new material.

Inside the box is a set of instructions on how to send the packaging back and how sending it back would benefit the environment. There is also a shipping label included for easy returns.

How likely would you be to return xxx packaging to yyy through mail drop off?
How likely would you be to return xxx packaging to yyy through mail pickup?
How likely would you be to return it to yyy if you had to drop it off at a retail location (yyy store or yyy certified distributor)?
How effective is shipping/returning the reusable packaging a way to reduce packaging waste?

Concept 2

When you purchase the xxx, inside the box is information that there are incentives for returning the packaging back to yyy. You could return the packaging using the most preferred method (mail drop off, mail pickup, or store drop off).

Please indicate how each incentive may influence the likelihood of returning the packaging.
Are there other incentives that would motivate you to return the packaging?
How effective is rewarding you to return reusable packaging (finished goods/white pretty box) a way to reduce packaging waste?

Concept 3

When you purchase the xxx, inside the box you are told that you will be credited for returning the packaging. You could return the packaging using the most preferred method (mail drop off, mail pickup, or store drop off).
  o   I would return yyy packaging if I was credited with $_____.

  o I would return it for ($)

  o Not Applicable. I would return it for free.

Please rank the following ways yyy could implement a deposit - refund system, based on your preference (1= your favorite)

  o Added to bill

  o Included in product price

  o Charged later

How effective is the deposit refund system for packaging (finished goods) a way to reduce packaging waste?

Below is a summary of the concepts that have been presented to you on reusable xxx packaging (meaning yyy will collect, clean and use the box again for another new yyy). You will be asked to rank them.

What is the likelihood that you would return the following product's reusable packaging back to yyy?

The following section will ask you questions about your experience with packaging. Please rank the characteristics of packaging (including shipper/brown cardboard, finished goods box, wrapping, inserts) that are important to you. (1 = your top ranking)

What do you normally do with yyy packaging (including finished goods box/, wrapping, inserts) right after unboxing your product?

Chapter 6 | Results

The data from the survey was aggregated in Qualtrics and analyzed by the MIT D-Lab team. The demographics showed that fifty-two percent of respondents were between the ages of 25-34 and based on the normalization of the responses to the NEP questions, 90% of the respondents shared that they were inclined to be pro-environmental (instead of pro-socio).
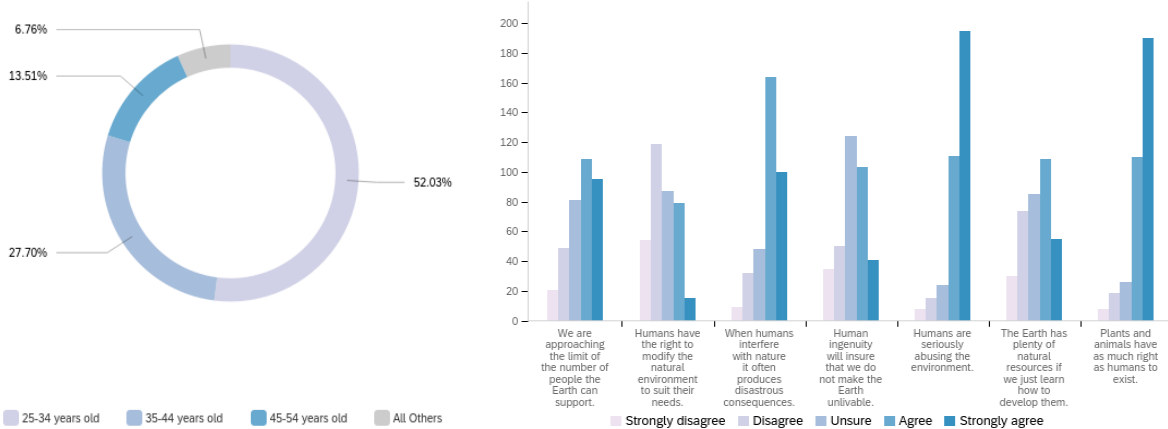
Figure 28. Demographics of the survey respondents

Results: Packaging

Sixty percent of respondents said that they keep their packaging immediately after unboxing the product.
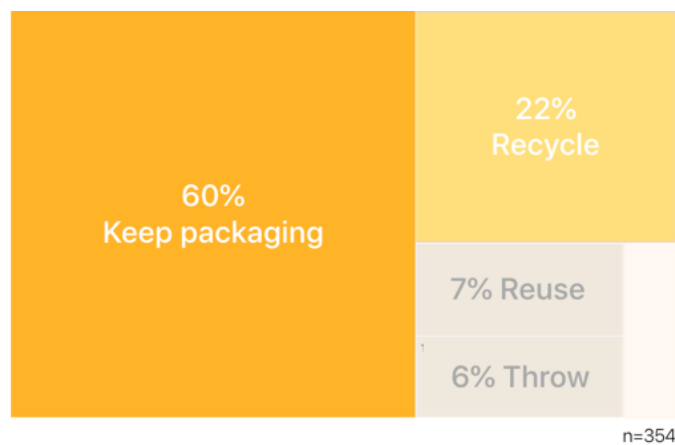
Figure 29. Survey response to What do you do with consumer electronic packaging

Respondents said that the packaging was "too pretty to throw away," "thought about if I would need to use it in the future – either while moving or selling the product," or "kept it just in case I need to return the device." If reusable packaging were to be designed, the team would have to target a majority of customers to overcome the barrier of them keeping the packaging. Influencing customers who don't know what to do with their packaging would be easier than those who purposefully keep it.

To introduce the concept of reusable packaging to the respondents and to get a baseline of how customers perceive reusable packaging options, the Haagen Dazs example of reusable vs. single use packaging was presented. Sixty-four percent of respondents said that they would

purchase product in reusable packaging. Thirty-nine percent of respondents said that they chose that option because it is "Good for the environment." This is promising because more respondents said that they would purchase reusable packaging than respondents who said that they keep their product packaging today and shows receptiveness to the concept of reusable packaging. However, it is difficult to validate if customers would make the reusable purchase if presented these options in a real store.
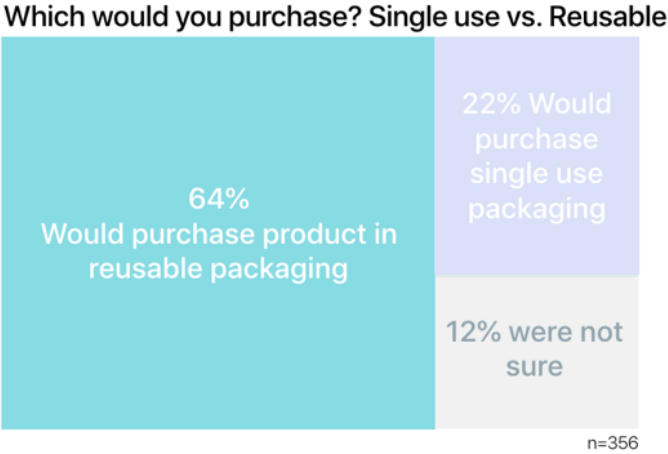
Figure 30. Survey response to "Which would you purchase? Single use vs. Reusable"

Results: Easy Returns

In response to the variations of the Easy Returns concepts, all of which included instructions on how to send packaging back to the company with a shipping label, Eighty-four percent of respondents would be likely to return packaging if they could mail it into the company from home. Eighty-four percent of customers would also be likely to return the packaging by dropping it off in store. However, fifty-three percent of respondents said that they would be extremely likely to mail packaging in from home versus the 40% that they would be extremely likely to return in store. Customers would be least likely to drop reusable packaging off at the post office. One respondent said "I would return because it would be better than disposing it as municipal waste" and another said "Would pay more for reusable, but do not have faith that I would take the necessary steps to return the package," showing both a distrust of the existing waste management infrastructure and human behavior.

These results show that there is a high willingness to return reusable packaging overall and that simplifying returns would enable the highest number of returns.

	Extremely Likely						Extremely Unlikely
Mail in from Home	53%	21%	10%	4%	4%	5%	
Drop at Post Office	17%	17%	21%	5%	13%	11%	17%
Return at Store	40%	30%	14%	5%	4%	7%	

n=354
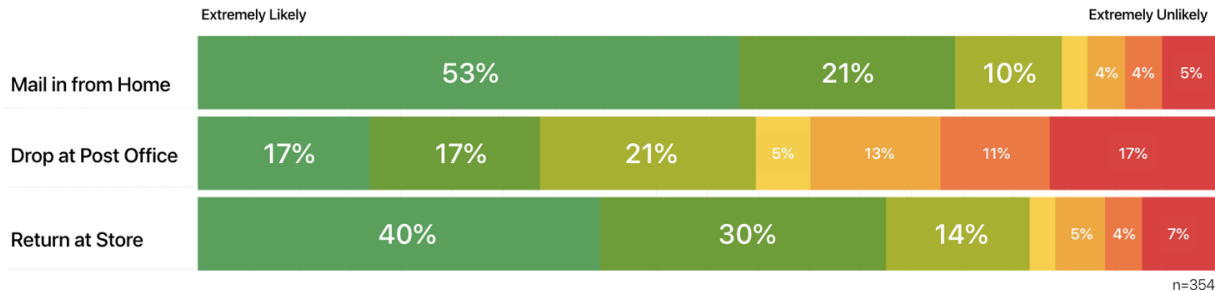
Figure 31: Survey response to Easy Returns concepts

Results: Incentives

Respondents were receptive to the concept of incentives to motivate them, with seventy-two percent of respondents saying that they would be extremely likely to return the reusable packaging in exchange for cash or a gift card. On the other extreme, the opportunity to be featured in a social media campaign was not appealing to respondents. Respondents also suggested alternative incentives, including wanting to receive a thank you email for returning their packaging or even other company branded products. These results show that incentives had a more positive response than the easy returns and could lead to a higher return rate.

Cash or Gift Card	72%	15%	9%	1%	1%	1%	1%
1 Month Music or TV free	57%	21%	10%	5%	1%	2%	4%
Exclusive memorabilia	45%	20%	14%	8%	3%	4%	6%
makes a donation to an environmental charity	33%	25%	22%	9%	3%	4%	5%
Your local school is entered to win new devices	28%	18%	17%	17%	6%	6%	8%
You may be featured in a social media campaign	4%	8%	12%	20%	5%	8%	41%

n=355

Figure 32. Survey response to Incentives concepts

Results: Deposit Refund

The last concept, deposit refund system, attempted to uncover a) if customers wanted compensation for returning reusable packaging, b) if they expected compensation, what amount would be sufficient, and c) how they would like the system to be presented to them. Fifty-sex percent of respondents said that they would return the packaging for a specific dollar amount.
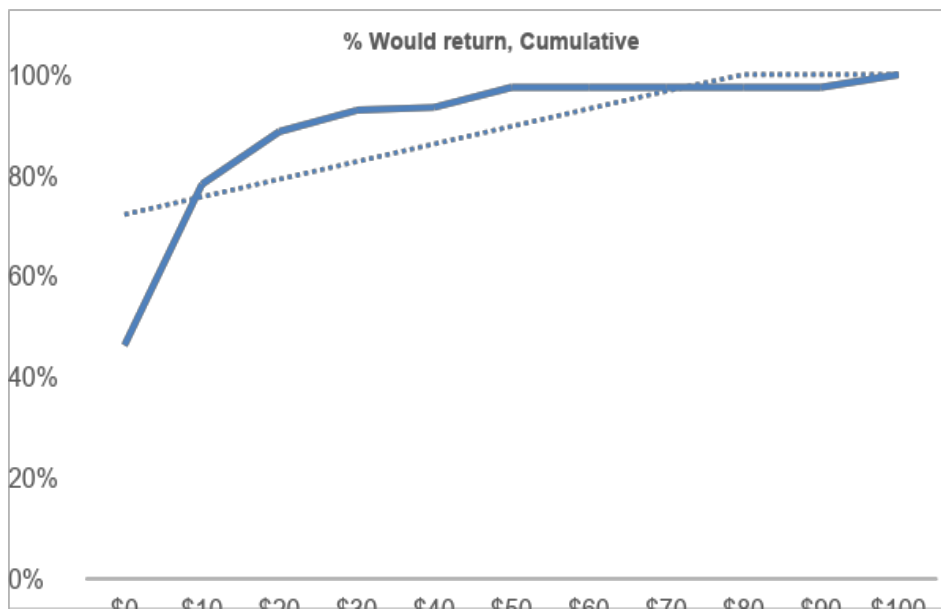
Figure 33. Survey response to Deposit Refund concepts

Thirty-one percent of respondents said that they would return the packaging in exchange for $10 and cumulatively ninety-seven percent of respondents would return the packaging if they received a refund between $0-50.

However, customers were not eager to be made aware that they were participating in a deposit refund system. Sixty-two percent said that they would prefer for the deposit to be included in the product price and be refunded on return of the reusable packaging.

These results show that a majority of customers expect some compensation or incentive for returning their packaging. It is likely that because consumer electronics are high value durable goods, customers expected a higher refund range for returning packaging.

1	Included in product price - refunded on return
2	Added to bill - refunded on return
3	Charged later if not returned

44% Would return it for free

56% would return for $

n=355
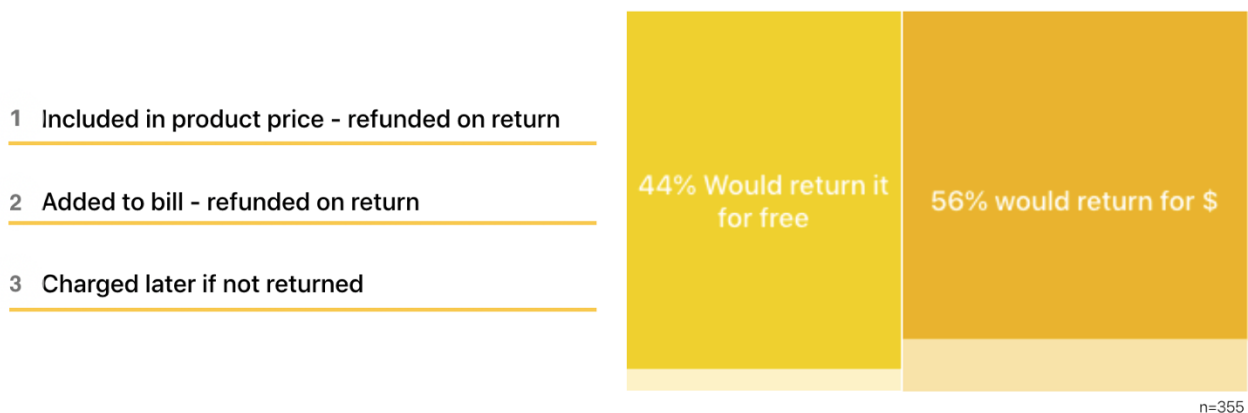
Figure 34. Survey response to Deposit Refund concepts

Participants were asked to assess the effectiveness of each concept after it was presented to them, as well as rank them overall after having been presented all of them. Forty-five percent of participants said that Incentives would be extremely effective. Easy Returns and Deposit Refund were also rated as effective concepts, but not as positively. In the overall rankings, fifty-eight percent of respondents ranked Incentives as the top concept.

	Extremely Effective						Extremely Ineffective
Incentives	45%	31%	15%	5%	2%	1%	1%
Easy Returns	24%	31%	27%	6%	5%	5%	3%
Deposit Refund	22%	31%	26%	6%	6%	4%	6%

Figure 35. Survey response to effectiveness of each concept

Chapter 7 | Discussion and conclusion

The data resulting from the survey suggests that overall, respondents (which were company employees) were receptive and welcoming to the concept of reusable packaging and demonstrated a willingness to engage in a system where customers would return reusable consumer electronics packaging to the producer. Respondents had positive reactions to the potential environmental and perceived economic benefits of reusable packaging, while also highlighting that this sort of system would solve a "personal landfill" problem. Consumer electronics are purchased frequently, and large packaging stored at home is either a nuisance or forgotten in a closet or drawer and respondents were keen to have the company be responsible for managing the waste.

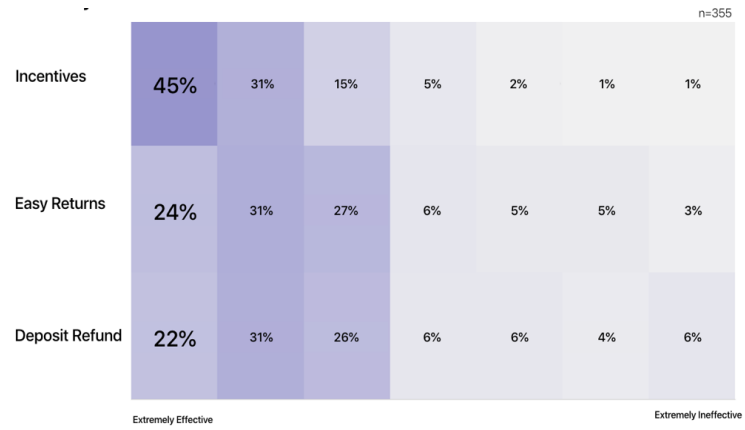When there was hesitation to engage in the system, the response was rooted in a user need to consider a potential future use of the packaging, such as a future resale of the product, moving homes, future servicing, or future sale of the product in which case the packaging would be necessary to protect the product.

In designing and testing a reusable packaging, the company should make the system logistically easy, provide a direct benefit to the customer, and clearly communicate the role of the customer and their actions in the system.

Further, in each concept that is considered, there is a tradeoff between the effectiveness of customers returning the packaging to the company, and the customer sentiment about the concept. While a concept might be very effective, the company has to deeply consider the emotional reaction the customer will potentially have.

There are other factors that the company should be cognizant of as it considers the results of this survey. A survey, although helpful in gauging high level customer sentiment, is a form of gathering user feedback that is removed from the reality of a transaction with the customer. Understanding customer response and human behavior through other feedback mechanisms would be critical before moving ahead with any of the presented concepts. Additionally, as the survey was conducted internally with employees, the data is not representative of the types of responses that real customers might have. Running the same survey externally would be necessary to validate or contradict these initial findings. Further, each concept would lead to varied actual outcomes in terms of customer participation and it is important to consider the environmental preferability of the options as well as customer perception of the environmental impact of the concept.

What we did

This thesis leveraged the human centered design process to tackle the broad and vague question of "How can we minimize the environmental impact of consumer electronic packaging?" By partnering with team members from the sponsor company, the research team conducted primary research and synthesis to diverge and converge on opportunity areas and more specific "How might we" questions. This was followed by ideation and evaluation through a large internal survey with company employees. The company is planning on moving ahead with external surveys to validate the initial findings and is keen to design, prototype, and iterate on reusable packaging concepts with environmental preferability compared to single use packaging as the primary goal.

Design for sustainability

This process has highlighted that design for environment is a plausible methodology that large companies can use to tap into their own employees to solve complex problems that businesses will face in the age of climate change. Bringing together teams from diverse disciplines is key,

because a variety of perspectives, expertise, and experience is a healthy pressure cooker environment for collaboration and creativity. The MIT D-Lab team received feedback that integrating the design process in this company was a unique and welcomed approach. Particularly, aggregating multi-disciplinary teams to conduct active ideation sessions was professionally invigorating and inspiring to the workshop participants. In the routine of meetings in the workplace, carving out time for creative problem solving is important and is much more successful when a leader insists that the problem be tackled with a design approach. Enabling design from the top combined with holistic and invested participation from the bottom of the organization is the key to success in design.

Sustainable behavior is complex

In order to understand opportunities to intervene and nudge customers towards more environmentally preferable behaviors, the research team created a journey for packaging. The literature review highlighted that education, information, and easy decision making made action more accessible to the customer and should be integrated into designs intended on being sustainable.

When designing for the environment, if the intention is to be environmentally preferable, defining what that means internally is a fundamental part of the design process. For some that may mean reducing CO_2, for others it might mean reducing resource consumption. Measuring a baseline of the status quo and identifying clear goals will provide the team with a compass to work towards. The product and/or system designed should also be tested against the baseline before rolling out because although a concept may seem environmentally preferable, it could have unintended or hidden impacts. Reusable packaging is likely resource intensive to design and manufacture and it may only be beneficial to move forward with such a concept if customers cross a specific hurdle rate on returns of the packaging. Innovations in technology

and the packaging industry should also be considered in designing for environment as new age methods of tracking, customer interface, and materials could enable environmental goals.

Data for evaluation: human and environmental

To further explore the validity of the data generated in this survey, executing the same survey externally with potential customers is important to measure a sentiment more representative of the average customer. Increasing the sample size to ensure that there is diversity across multiple demographics, especially in the NEP could help inform internal teams on real customer sentiments.

Additionally, because it is difficult to capture customer behavior patterns through surveys, running experiments with prototypes of the reusable experience would be imperative to understand the return rate and if, as a system, more customers would return reusable packaging vs. keep it. By following the design process, the company can continue to explore reusable packaging concepts, not only evaluating human behavior elements, but also packaging design and system design. This holistic approach would increase the likelihood of success of the program and benefit the environment as the major outcome of the process.

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Appendix A

	Current - single use recyclable	Would like to design - reusable returnable
OVERALL		
1. Is the individual aware of what he or she needs to do, but unable to accomplish it — or does a desired behaviour or action need to be activated?	Activated	Activated
2. Is the individual motivated enough to impose a nudge on his or herself?	Not motivated	Not motivated
3. Is the action more likely to be taken with increased cognition, or is the individual already hampered by cognitive overload?	Increased cognition	Increased cognition
4. Is the desired action not being accomplished because of a competing action, or due to inertia? Consequently, should you aim to discourage the competing action or encourage the target action?		
PROPERTIES OF THE DECISION		
1. Is the decision important to the individual or does it receive little attention?	Little attention	Little attention
2. What moments or events motivate an individual to act on the decision?	Purchasing, unbox, set up	Purchasing, unbox, set up
3. Is this an active choice or an automatic, passive choice?	Active	Active
4. How many options are available? What is the default option if an individual decides to do nothing?	Default option: trash Alternatives - keep, recycle	Default option: trash Alternatives - keep, recycle, return in store, return in mail, return in channel store
4. Is feedback available and is it received immediately?	None	Thank you, reminder to participate
5. What are the incentives? Which ones are most prominent, which ones are not?	None	$0-50
6. What are the associated costs (financial, social, psychological)?	Decision time to send back, perceived foregone resale value, perceived foregone sentimental value,	Decision time to send back, perceived foregone resale value, perceived foregone sentimental value, time to mail or bring back, more steps in set up, more cumbersome customer experience
INFORMATION SOURCES		
1. What knowledge or expertise is needed to make this decision?	Knowing which recycle bin to put it in, if you will need the box later	How to collapse, how to send back, where to bring it, which recycle bin to put it in, if you will need the box later

2. How is information or knowledge communicated to the individual (visually, verbally, in text)?	Recycle mobius on packaging	Visually, verbally, and text
3. Does the information flow sequentially? What information is presented first? What is presented last?	NA	1. Packaging is returnable 2. Here is why you should return it 3. Here is what you get 4. Here is how to participate (collapse and send back)
FEATURES OF THE INDIVIDUAL MINDSET		
1. Are the benefits of making a good decision delayed, or are they experienced immediately?	Delayed	Delayed (environmentally) Immediate (financial) Immediate (emotional)
2. Is the decision usually made when the individual is in an emotional state?	Yes	Yes - excited to use product!
3. Does the decision require the exertion of willpower or self-control (such as in the domains of smoking, dieting, exercising)?	No	No
ENVIRONMENTAL FACTORS		
1. Is the decision made in isolation or in a social environment?	Home or Office	Home or Office
2. Is the decision influenced by what is presented in the media or by expert opinions?	Yes	Yes
3. Are peers a major source of information?	Yes	Yes
4. Is there an application process and is it difficult to navigate?	No	No

Appendix B

Idea	Category	Desirability - solving customer/company problem?	Feasibility - core operational strength	Impact	Sum
Public shaming - publish a list with everyone who doesn't return it	Disincentive	3	5	4	12
Hold stand hostage - ship it after customer returns the packaging	Disincentive	2	5	3	10
decomposing packaging - smells bad so you want to send it back	Disincentive	2	3	3	8
xxx does not work after 30 days if packaging is not returned	Disincentive	1	4	5	10
Packaging keeps beeping until you send back	Disincentive	2	5	4	11
Harass with Texts	Disincentive	2	5	1	8
Shame on Social Media using customer data	Disincentive	2	5	1	8
Notification on xxx	Disincentive	4	5	4	13
Lower your credit score	Disincentive	1	1	1	3
Timeframe on rewards - earn more the earlier you send back	Incentive	5	5	5	15
Social Media reward or campaign for when you participate	Incentive	5	5	4	14
Advertise montage or mosaic of customers returning the packaging	Incentive	5	5	4	14
Cash	Incentive	5	5	4	14
Deposit at purchase	Incentive	4	5	4	13
Straight cash	Incentive	4	5	4	13
Get company cash/gift card for your next purchase	Incentive	4	5	4	13
Yyy content, gift card, services, etc.	Incentive	4	5	4	13
Some free yyy stuff for returning	Incentive	4	5	4	13
Free warranty with your next purchase	Incentive	4	5	4	13
Swag reward	Incentive	4	5	4	13
Get a phone case for returning	Incentive	4	5	4	13
reward for return	Incentive	4	5	4	13
Free months of other services	Incentive	4	5	4	13
Exclusive Music content - Lady gaga content, bonus content	Incentive	4	5	4	13

Pick up at store with no packaging	Logistics	2	3	4	9
Joint return program with other companies	Logistics	4	4	5	13
standardize packaging with Samsung Tv and expand collection stores to other retail channels	Logistics	4	4	5	13
Personal pick up service - take the packaging back	Logistics	5	5	3	13
Accept returns at channel stores	Logistics	5	5	5	15
xxx has a message when it is turned on	Logistics	4	5	4	13
Positive message - information guide on impact	Messaging	4	5	4	13
Negative message - for each not returned a baby sea turtle dies	Messaging	3	5	4	12
Leader board of people who have sent the packaging back	Messaging	4	5	4	13
Create branding for returnable packaging	Messaging	4	5	3	12
NFC tells you story of packaging and how to return	Messaging	4	5	4	13
Packaging is a mirror that talks to you about why you should send it back	Messaging	3	3	4	10
Mechanical turk/task rabbit comes to collect	Messaging	5	4	3	12
Waste disposal credit partner - ship with another company	Methodology	4	5	5	14
Use kids - aggregate at schools	Methodology	4	5	5	14
Pizza guy will pick up the box	Methodology	4	5	5	14
Photo triggers auto Collect	Methodology	4	4	5	13
Geek Squad collects	Methodology	4	5	5	14
Drones come to collect packaging	Methodology	4	3	5	12
Glass Casing	Methodology	2	3	2	7
Return it and we plant a tree for you	On your behalf	4	4	5	13
Return it and we plan a tree for you in your neighborhood	On your behalf	4	3	5	12
Donate to a local org or school	On your behalf	4	4	4	12
Donate something to charity	On your behalf	4	4	4	12
Yyy donates products to schools when you return your packaging	On your behalf	4	4	4	12
Return envelope	Packaging	3	5	5	13
Split and stackable to reduce size	Packaging	4	4	5	13
Inflatable packaging	Packaging	4	4	5	13
Burn it	Packaging	2	3	1	6
Plant it in a garden	Packaging	2	5	2	9

Dissolve it	Packaging	2	2	2	6
Packaging makes a cool sound when you collapse	Packaging	4	5	4	13
Deposit on Packaging	Rewards	4	5	5	14
Give a special yyy product promotion if packaging is returned	Rewards	5	5	5	15
extended warranty	Rewards	5	5	5	15
Messages stickers or special emojis	Rewards	3	5	5	13

Appendix C

Hello!

Thank you for participating in this survey on packaging. Your participation in this survey is voluntary. You may choose not to participate. This survey will take approximately 5-10 minutes to complete.

As you complete the survey, responses are automatically saved and submitted anonymously.

If you find that you want to step away from the survey at any time, you will be able to return to your web browser or click on the link and continue where you left off. If you decide you no longer want to complete the survey you may stop at any time by closing your web browser.

As mentioned, responses to this survey are anonymous and not associated with you. If you are interested in providing additional information or participating in a follow up study, you may provide your email address at the end of the survey. By doing this you are consenting to your data no longer being anonymous. If you would like your data to remain anonymous, please do not provide your contact information.

Your responses will only be shared with select members of the Packaging Team and database administrators.

Listed below are statements about the relationship between humans and the environment. For each one, please indicate whether you Strongly disagree, disagree, unsure, agree, or strongly agree.
- We are approaching the limit of the number of people the Earth can support.

- Humans have the right to modify the natural environment to suit their needs.
- When humans interfere with nature it often produces disastrous consequences.
- Human ingenuity will ensure that we do not make the Earth unlivable.
- Humans are seriously abusing the environment.
- The Earth has plenty of natural resources if we just learn how to develop them.
- Plants and animals have as much right as humans to exist.
- The balance of nature is strong enough to cope with the impacts of modern industrial nations.
- Despite our special abilities, humans are still subject to the laws of nature.
- The so-called "ecological crisis" facing humankind has been greatly exaggerated.
- The Earth is like a spaceship with very limited room and resources.
- Humans were meant to rule over the rest of nature.
- The balance of nature is very delicate and easily upset.
- Humans will eventually learn enough about how nature works to be able to control it.
- If things continue on their present course, we will soon experience a major ecological catastrophe.

Below is a scenario and questions about packaging choices.

Imagine that you are standing in a grocery store and are ready to purchase your favorite ice cream. You see that Haagen Dazs offers two types of packaging. The one on the left is single use (product packaging is designed to be disposed to landfill or recycled through municipal handling) and the one on the right is reusable (product packaging is designed to be collected, cleaned, used again by Haagen Dazs for packaging another batch of ice cream).

HÄAGEN-DAZS ICE CREAM

Which product would you purchase?
- Single Use
- Reusable
- I don't know

If both the single use and reusable packaging are exactly equal in terms of their overall price, environmental impact, and convenience which packaging type would you prefer?
- Single Use
- Reusable
- I don't know

Please rank in order of preference why you would purchase this type of packaging type for Haagen Dazs ice cream. (1 = your top ranking)
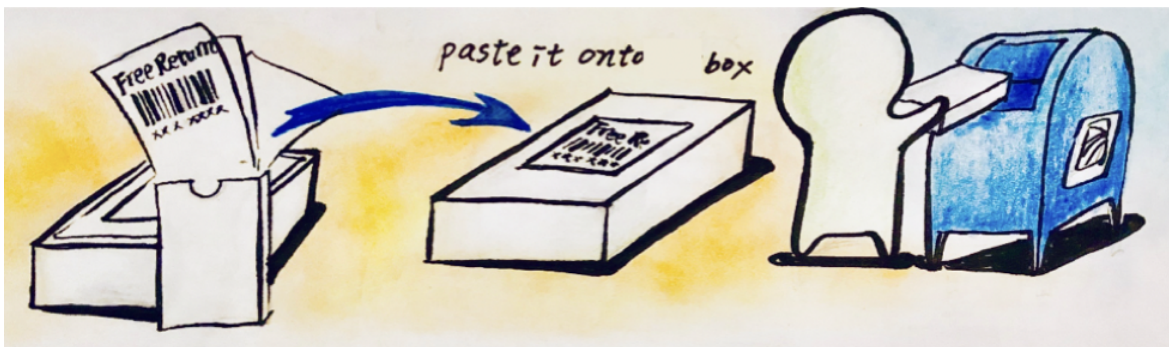- Brand recognition
- Convenience
- Design aesthetic
- Easy to use
- Good for the environment
- Price
- Product information
- Protecting the product

- Other (please specify)
- Please tell us more about your responses above.

Concept 1

The next few questions are about different scenarios and what you may do with the packaging box (finished goods) after you purchased an xxx. In these scenarios, the xxx packaging box (finished goods/white pretty box) is reusable, meaning yyy would collect, clean and use the box again for another new xxx, after you return it to the company. This reusable packaging would collapse to the size of a zzz box. This reusable packaging is not recyclable, meaning your local municipality would not process it into a new material.

Inside the box is a set of instructions on how to send the packaging back and how sending it back would benefit the environment. There is also a shipping label included for easy returns.

How likely would you be to return xxx packaging to yyy through mail drop off?
- Extremely unlikely <> Extremely likely

How likely would you be to return xxx packaging to yyy through mail pickup?
- Extremely unlikely <> Extremely likely

How likely would you be to return it to yyy if you had to drop it off at a retail location (yyy store or yyy certified distributor)?
- Extremely unlikely <> Extremely likely

How effective is shipping/returning the reusable packaging a way to reduce packaging waste?
- Extremely Ineffective <> Extremely effective

Concept 2

When you purchase the xxx, inside the box is information that there are incentives for returning the packaging back to yyy. You could return the packaging using the most preferred method (mail drop off, mail pickup, or store drop off).

Please indicate how each incentive may influence the likelihood of returning the packaging.

–   You may be featured in an yyy social media campaign
–   Exclusive memorabilia from yyy
–   Cash/Gift Card
–   Yyy makes a donation to an environmental charity
–   Your local school is entered to win new yyy devices
–   Are there other incentives that would motivate you to return the packaging?

How effective is rewarding you to return reusable packaging (finished goods/white pretty box) a way to reduce packaging waste?

–   Extremely Ineffective <> Extremely effective

Concept 3

When you purchase the xxx, inside the box you are told that you will be credited for returning the packaging. You could return the packaging using the most preferred method (mail drop off, mail pickup, or store drop off).

–   I would return yyy packaging if I was credited with $_____.
–   I would return it for ($)
–   Not Applicable. I would return it for free.

Please rank the following ways yyy could implement a deposit - refund system, based on your preference (1= your favorite)

– Added to bill: An additional deposit amount is explicitly added to your bill when checking out, and you get the amount back if re- turned within 14 days.
– Included in product price: The product's list price already includes the packaging deposit amount, and you get an amount back if returned within 14 days.
– Charged later: You don't pay any additional amount when checking out, and are charged an amount later if you keep the packaging for more than 14 days.

How effective is the deposit refund system for packaging (finished goods) a way to reduce packaging waste?
– Extremely Ineffective <> Extremely effective

Rankings
Below is a summary of the concepts that have been presented to you on reusable xxx packaging (meaning yyy will collect, clean and use the box again for another new yyy). You will be asked to rank them.

Concept 1 - Easy returns of xxx packaging (finished goods/white pretty box) with instructions on how to send packaging back to yyy with a shipping label.
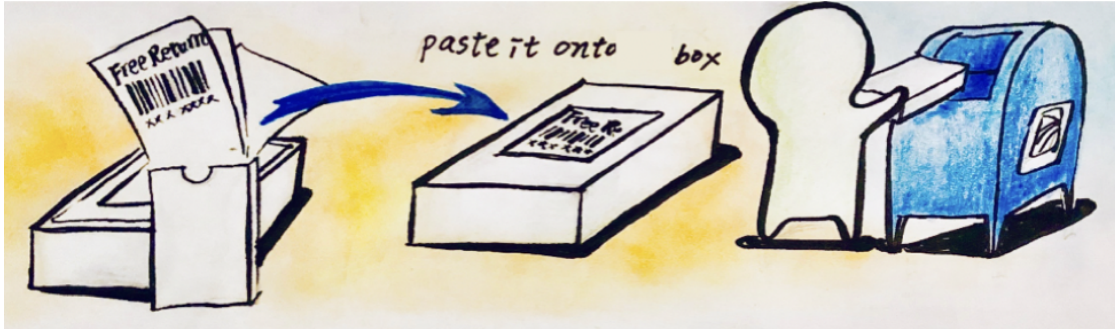
Concept 2 - yyy gives you an incentive for returning reusable xxx packaging.

Concept 3 - Deposit refund system for returning reusable xxx packaging.

Please rank the concepts above overall (1 = your top ranking)

– Concept 1 - Easy Returns

– Concept 2 - Incentives

– Concept 3 - Deposit Refund

What is the likelihood that you would return the following product's reusable packaging back to yyy?

– Extremely unlikely <> Extremely likely

o Product 1

o   Product 2

o   Product 3

o   Product 4

o   Product 5

Packaging

The following section will ask you questions about your experience with packaging.

Please rank the characteristics of packaging (including shipper/brown cardboard, finished goods box, wrapping, inserts) that are important to you. (1 = your top ranking)

All responses are anonymous.

–   Brand recognition

–   Design aesthetic

–   Easy to use

Good for the environment

–   Product information

–   Protecting the product

–   Other (please specify)

What do you normally do with yyy packaging (including finished goods box/, wrapping, inserts) right after unboxing your product?

–   Keep it

–   Recycle it - put it in the single stream blue bin

–   Reuse it - use for another purpose

–   Throw it away - put it in the trash

–   Other (please specify)

Demographics

These are the final set of questions and will be about demographics. Thanks for your time!

What is your age?

–   18-24 years old

–   25-34 years old

–   35-44 years old

–   45-54 years old

- 55-64 years old
- 65-74 years old
- 75 years or older

What is your gender?
- Male
- Female
- Non-binary
- I prefer not to respond
- Self-identify as

What is the highest degree or level of school you have completed?
- Less than high school
- High school graduate
- Some college
- 2 year degree
- 4 year degree
- Professional degree
- Doctorate
- I prefer not to respond