BEYOND BIG BEEF: TRANSITIONS TO FOOD CITIZENSHIP THROUGH COMMUNITY

EMA KARAVDIC

cost inputs

Use of cheap grain to feed cattle

Country specialization

Specialization of farmers

Mono-cultures on farms

Dependence on foriegn markets

Beef oligopoly-/centralization

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...reased ...ceptance ...CAFOS

Industrialized food chain

Main... ...e of cheap inputs

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Codi... syste... USDA... grad...

Increased beef consumption

Social stru... shifts

Changing family structures

Demand for convenience

Increasing women in the workforce

Demand for convenience

Beef culture

Rise in super-markets

Demand for convenience

Highway culture

Rise in fast food

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ABSTRACT

In the midst of a climate crisis, recent studies have proven that a shift towards a sustainable diet can have a disproportionately large impact on reducing emissions. These studies specifically indicate that the amount, type, and source of meat we choose to consume have large climate implications when aggregated. This presents an important opportunity to have a tangible contribution to the climate crisis as individuals, and together as a community.

However, dietary change is not a simple feat, especially when it comes to meat. While many of us are supportive of reduced emissions, there is often a large gap between our attitudes and our actual behaviors. Within this gap lie deep cultural and personal implications that meat has fostered over time, which are also reinforced through everyday habits. The Big Beef industry has also transformed the meat system into a black box, disconnecting us from the broader implications of its consumption. This disconnect makes it incredibly hard to move past the cultural and personal connection we have to meat.

It becomes increasingly clear that in order to make a tangible contribution to sustainable dietary change, collective action is required. The power of a united, collective response to a crisis has never been made more evident than through the responses to the global pandemic of COVID-19. As a result, my study focuses on and leverages a group that has strong, existing community influence—first-time expecting and new parents—as a means of exploring the potential for people to shift large systems. This community shares a common, life-changing experience that often prompts reflection on existing habits, especially when it comes to food, and has the potential to influence the habits of those around them. Therefore, my study asks: how we can empower first-time expecting and new parents to become engaged food citizens and consequently, ambassadors for change in their communities, thereby shifting the food system from the bottom up?

My research, which is rooted in transition design, social practice theory and learning theory, situates problems related to dietary change within a systems lens. By identifying logical and appropriate intervention points in the system, this thesis investigates opportunities where design can be used to leverage existing personal and community values, integrating sustainability lessons into interventions to create positive change. Two potential interventions—Munch and Family Fuel—were explored and proposed in the study to address individual everyday eating habits.

Finally, this thesis defines a preferable future that the two interventions are working towards, highlighting important systemic milestones and backcasting a possible pathway forward. Given that Munch and FamilyFuel exist in a system, this thesis depicts how they could integrate with other existing and future interventions on a pathway to successfully drive momentum towards the preferable future and reduce the human impact on our planet.

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INTRODUCTION

According to the latest report from the UN Intergovernmental Panel on Climate Change (IPCC), Global Warming of 1.5C (2018), the world has 12 years to make large scale changes to the way that we are interacting with the earth in order to keep the temperature rise at a maximum of 1.5C. Globally, the food system is responsible for more than 25 percent of greenhouse emissions, with livestock production contributing upwards of 80 percent (Springmann *et al.,* 2016). Red meat and dairy production account for a large proportion of this amount (Engelhaupt, 2008). As a result, it is evident that our individual food decisions have a large impact on climate change globally.

As much as food systems and our consumption of meat are a large part of the problem, they can also be part of the solution. Drawdown, a research organization that maps, measures, and models substantive solutions to global warming, ranked transitioning to a plant-based diet as the fourth most effective solutions to lowering CO_2 emissions. As a result, adopting a plant-based diet serves as a tangible contribution that we can make towards limiting our personal impact on climate change.

The acceptance and growing popularity of plant-based diets are evident in the growth of trends such as Meatless Mondays at the household level. At the neighborhood and city level, there is an increasing amount of vegetarian and vegan options that are available, catering to increasing demand. At scale, reductions in meat consumption at an individual level can lead to large positive impacts on the planet. A 2016 study on the impact of plant-based diets shows that a transition to a vegan diet can reduce emissions by 70 percent, while a vegetarian diet (including eggs, cheese and milk) can reduce it by 63 percent (Springmann *et al.,* 2016). Of course, while this only represents the impact of diet based on CO_2 emissions, it still serves as a significant opportunity to contribute to the reduction of global warming.

However, bringing about dietary change is not a simple feat given the deep cultural and personal implications that meat has fostered over time, especially in the United States (US). We have a cognitive understanding of the impact of food systems on the environment. However, many of us do not use this knowledge to inform our food choices, resulting in a behavior gap. As a result, we are not taking advantage of a critical opportunity to influence systemic change as a community through citizen-driven action.

RESEARCH QUESTIONS

On this basis, my thesis initially investigates the question "How might interventions be designed to empower people to make sustainable food decisions and move away from industrialized meat?"

To further guide my research, there are a number of supporting questions that I studied:

- What are the contexts and motivations in which people are making/will make food decisions? This includes the environmental setting, timing and social norms.

- Which part(s) of the multi-level system will serve as effective points to intervene? This refers to Geels' framework that is utilized to explain socio-technical transitions and the different levels of scale that innovations go through before becoming commonplace. They are niche, regime and landscape levels (Geels, 2018).

- What are current interventions and food trends in meat consumption and production that are catalyzing sustainable behavior change?

- What does a preferable, sustainable food future look like?

After extensive research, I identified first-time expecting and new parents as people who have a strong potential to shift the system, resulting in greater specificity of my core question: "How might interventions be designed to empower first-time parents to become conscious of sustainability and successfully integrate sustainable eating practices into their lives?"

ASSUMPTIONS

From the beginning of my research, I felt that it was important to be clear on the assumptions that guided the direction of my inquiry. Fundamentally, the assumptions are based on the possibility of behavior change towards sustainability motivated and led by people. They include:

- People care about the environment.

- People want to make sustainable decisions.

- Climate change is an accepted phenomenon that is understood to be the result of human activity on earth.

- Changes towards sustainable behavior in the human population can significantly curb the impacts of climate change.

- People understand that their food decisions have an important environmental impact.

PROJECT GOALS

My overarching goal throughout this project has been to leverage the unique, tangible nature of design to research and prototype opportunities for systemic change in the US food system.

While the thesis itself pursues one leverage point in the system, it also aims to provide commentary on other potential, unexplored options through the insights gleaned from research. This work may also function as an initial foundation for future design research that focuses on fostering bottom-up systemic change.

Finally, this study aims to contribute to the continual development of Transition Design frameworks. The insights developed throughout the research process serve as a case study for future designers also interested in design-led systems thinking.

SCOPE AND LIMITS

In order to focus my study, I decided to narrow my initial research to beef in the US. I chose to focus on beef as it is the most resource intensive type of meat production and has the largest effect on the environment in comparison to other forms of meat commonly consumed such as chicken and pork (Ranganathan *et al.,* 2016). Beef is also the second most consumed type of meat in the US (Meat Institute, 2017). I chose to focus on the US as its population consumes the second largest amount of meat per capita in the world (OECD, 2020) and it is my place of residence, giving me access to crucial resources needed to conduct research.

In my concepts, I decided to target first-time expecting and new parents because:

- They are already going through natural life transitions

- Mothers are already making dietary changes

- Parents have a strong, influential community that they build around them

- They have a strong motivation to build good food habits with their children

- There exists an opportunity to influence the food habits of future generations

Within this group, my study includes those who make food decisions predominantly based on context, without any strict dietary restrictions. As a result, this study does not include parents on the extreme ends of the eater spectrum: those who are already vegan or those who will always eat meat no matter the circumstances.

It is important to note that there are some limitations to the findings of the study. Firstly, while the participants in the study had a diverse range of experiences and backgrounds, most of the research was conducted using qualitative methods in Pittsburgh. Furthermore, research would need to be conducted to apply the proposed interventions to other cities. Secondly, although the possible leverage points for systems change are endless, this study focuses on one possible community as an entry point to food systems change and proposes two interventions to illustrate their potential for impact. Finally, the proposed interventions have not been piloted in context so the possible long-term implications described in this thesis are hypotheses.

EXPLORATORY RESEARCH

**Understanding meat systems in the US
using systems thinking**

INTRODUCTION

Exploratory research was conducted to understand the existing food system in the US through the lens of beef. I used Transition Design methods to analyze the system as a whole, identifying the core elements that inhibit change towards sustainability. This research has proven critical to creating a foundation for my understanding of the food system and highlighting the systemic barriers that need to be overcome by interventions. The following section summarizes my analysis of the literature and interventions, including the artifacts I created as a result of my learnings.

LITERATURE REVIEW

The literature review I conducted focused on establishing the context for the meat system and the theoretical foundations necessary to conduct a design-led analysis regarding how consumers can be empowered to undertake sustainable dietary shifts. The underlying themes of my topic informed the literature I studied, which initially consisted of seminal works as starting points. The literature selection was then extended and prioritized based on my growing knowledge of each area of work as well as the developing direction of my thesis. The insights gained from my literature review were crucial to shaping the direction for my generative phase of work.

UNDERSTANDING THE UNDERLYING ISSUES THAT HAVE LED TO AN UNSUSTAINABLE FOOD SYSTEM

To begin my research, I sought to thoroughly understand the underlying problems that have driven us to an unsustainable food system, particularly in the context of the U.S. I investigated texts that delved into our historical connections with food, particularly meat, and the way our interactions with it have changed over time.

Omnivore's Dilemma by Michael Pollan (2006) focuses on all the food chains that sustain us, not just meat. In doing so, he displays the interconnections of nature and highlights the importance of symbiosis that we, as humankind, have broken. There are two crucial points that have contributed to my thinking. First, Pollan's insight into our reductionist

view of nature and its application to our use of technology in agriculture as well as the way we seek convenience, interact with nature through labels and apply ethics. Second, there are serious problems associated with the length of the food chain for both farmers and consumers. Consumers are often removed from nature and also, as Pollan suggests, the guilt of eating the flesh of another animal. He questions whether we would eat quite as much meat if we knew what the process entailed. However, Pollan doesn't address: how did we get to this reductionist mindset?

Jeremy Rifkin tackles this question in *Beyond Beef* (1993). Rifkin, another great historical analyzer, focuses solely on America's relationship with beef over time. He deduces two major sources for our reductionist and mechanistic view of nature. First, the growth of judeo-christianity that proliferated the notion that man is in God's image and was therefore entitled to take whatever God provided on earth. Secondly, this belief coincided with the rise of the enlightened mechanistic utilitarian who believed that science could be used to objectively understand God's order in nature and thereby control it. Thinkers such as Rene Descartes and Francis Bacon popularized the metaphor of nature as a machine, reinforcing the psychological distance between Man and Nature that religion had already started to create. These sources of reductionism are prevalent in the infrastructure of today's food system, meaning that solutions that target solely individual dietary change rather than including broader systems will not be effective in tackling the sustainability of food consumption.

Roger Horowitz's *Putting meat on the American table* (2005) analyzes the socio-technical shifts that made the price of meat low and its supply widespread. Horowitz views meat as material culture in his analysis, which is particularly relevant given the symbolic depiction of beef as success and masculinity, thereby highlighting the social implications of its consumption. He outlines three major technological developments. First, refrigeration helped both the preservation and transportation of meat. Secondly, the railway connected the East and West sides of America, which caused the cattle industry to begin severing ties with local markets and become a nationwide business. Finally, breakthroughs in packaging made meat more mobile, which promoted branding, paved the way for standardized, self-serve meat in supermarkets, and reduced the cost of meat further than the previous two technological changes.

The insights gleaned from these three texts enabled me to identify the main roots of the system that support the current unsustainable practices, using the Wicked Problem Map framework to visualize them (Figure 1). The map is a sensemaking tool that builds a shared understanding of a wicked problem while also providing a framework to guide analysis of the root causes that keep the system in place

(Irwin, 2018). After analyzing the commonalities between Pollan, Rifkin and Horowitz, I deduced five major areas that I believe have the greatest impact on the current state of the industrialized meat system.

1. Reductionism, which Rifkin (1993) identified as our perceived right to control and exploit nature. This ideology underpins all of the five major areas identified in the current state of maintenance of the system.

2. Industrial revolution(s), which Horowitz (2005) found to be particularly important in terms of technological development. As we have begun to increasingly rely on technology for the creation of food, we have also moved towards a more industrialized food chain, which perpetuates cheap inputs and the detachment of meat from place.

3. Globalization has meant the proliferation of a meat-heavy Western diet that has spread beef culture worldwide and increased the agro-industrial complex. Pollan (2006) emphasizes how detached we have become from our food sources as a result of our drive for convenience, which impacts local food economies.

These texts shaped my understanding of the context of food systems and beef history in America. They exposed the origins of deeply rooted perspectives and practices that needed to be considered in my thesis so that any proposed interventions tackled the core of the issue rather than the symptoms.
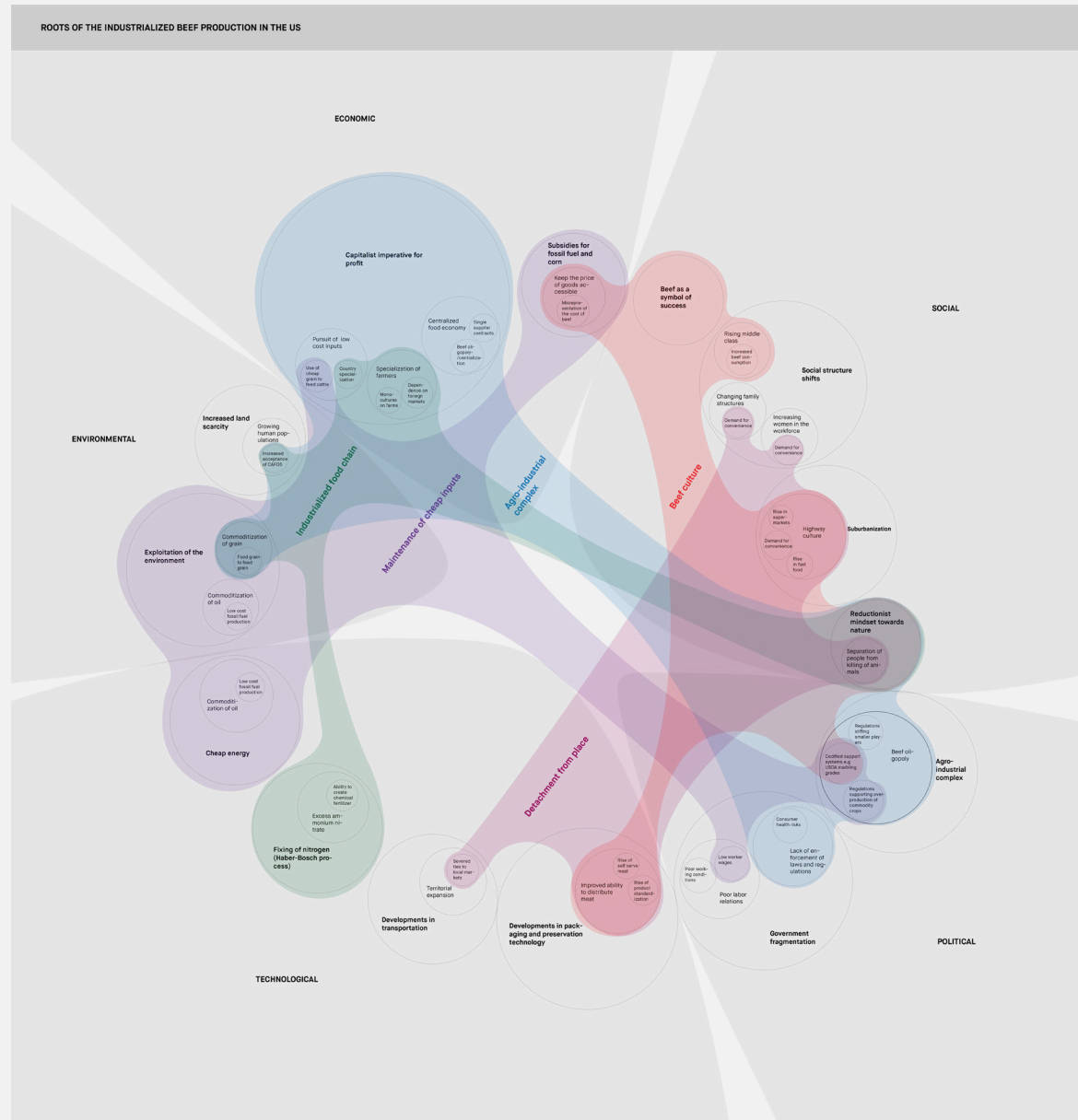
Figure 1: Wicked Problem Map

EXPLORING TRANSITIONS IN FOOD SYSTEMS TO IDENTIFY ENTRY POINTS FOR CHANGE

While it is important to understand the broad context of a wicked problem, a system is ultimately made up of people and reinforced through our everyday practices. As a result, I leveraged Social Practice Theory (SPT) in combination with Transition Design methodologies, which enabled me to take a design-led approach to my work. SPT focuses on the way that design, production and consumption are embedded into everyday habits, investigating how these habits are created and changed (Scott *et a.,* 2012). Transition design proposes an approach that is based on longer-term visioning towards sustainable futures, advocating for collaborative, systems level of wicked problems (Irwin, 2015).

Recognizing that transition theory and SPT approach systems change at very different levels, *Understanding sustainability innovations: points of intersection between multi-level perspective and social practice theory* by Tom Hargreaves, Noel Longhurst, and Gill Seyfang (2012) examines the similarities and differences between the two approaches. They conclude that by connecting the two approaches when analyzing sustainable innovations, a holistic picture can be derived as to why an innovation succeeded or failed. To illustrate this point, the authors highlight the different focus areas of the approaches. The MLP focuses on different levels of scale and novelty. In contrast, SPT focuses on horizontal integration of practices and normality. The authors suggest that analysis must cover transitions in regime, transitions in practice, and most importantly, where these two transitions intersect, revealing crucial points that enable or prevent systemic change. Through this suggestion, the authors highlight how regimes and practices are codependent on each other and should not be analyzed individually. Crucially, this highlights that our day-to-day habits are both influenced by existing systems and reinforce them. It points to the notion that intentional behavior change can indeed catalyze shifts in existing regimes, especially if a greater number of people buy into these changes. As a result, the conclusions led me to investigate the role of community as a mechanism for increasing the impact of individual behavior changes, thereby shifting the regime through a collective, bottom-up approach.

Fractures in food practices: exploring transitions towards sustainable food by Kristie O'Neil, Adrian Clear, Adrian Friday and Mike Hazas (2019) also recognizes that our everyday practices can result in either stabilization or transformation of the system, arguing that if enough people adopt small-scale practice change, there is the possibility to create momentum towards large-scale systems change. They propose the concept of natural fractures that people experience in life as a potential point of transition in practices where changes might be more naturally integrated. They define two different types of fractures. The first is social fractures, such as having children, losing a partner or retirement. These fractures are typically associated with changes in lifestyle habits, shifting the role of food in our lives as the definition of 'normal' also changes. The authors highlight that these types of fractures often prompt reflection and experimentation, which SPT argues are critical to create proto-practices and consequently, change in habits. The second type is spatial factures, such as moving, traveling or meeting new people. In this type of fracture, exposure to new perspectives or the influence of local infrastructure has a large impact on food practices and the capability for change towards sustainable food habits. The authors highlight that if the cultural context of a place is not favorable for sustainable habits, then it makes that much harder to practice sustainable food habits. They suggest that potential collaborations with organizations can help to facilitate the possibility of change among residents. The notion of fractures proposed by the authors suggests a potential placement point for triggers that can effectively leverage the natural changes occurring. This conclusion led me to investigate different groups of people that are experiencing life transitions as a potential entry point for food systems change.

Social practice theory introduces an important reframing of individual behavior as socially influenced practice. As the consumption of beef has important symbolic social value, the application of social practice theory to the challenge at hand becomes evident. *Designing change by living change* by Scott, Bakker, and Quist (2012) introduces a methodology for practice-oriented design that integrates concepts of social practice theory into design work. There are three key points that Scott et al make to highlight the importance of focusing on practices rather than individual behaviors to make lasting change on consumption habits. First, it is critical to challenge what is considered 'normal' as they subconsciously maintain the existing regimes of meat consumption. Here, the authors introduce Giddens' concept of practical and discursive consciousness. Practical consciousness is the automatic behaviors we execute while discursive is the reflective capacity that enables us to change behavior. To move behaviors from the practical to the discursive, reflection is integral and therefore will be an important factor to any intervention. Second, changing practices is an inherently social process that should be leveraged. Individual actions and social norms are constantly influencing each other, creating important implications for designers. Scott *et al* highlight the importance of collaborative methodologies in understanding the networks of practices that individuals undertake and co-creating new ones. Finally, practices are emergent and will continuously change, which presents unique challenges for design and the

implementation of social practice theory. As a result, design interventions must be flexible enough to accept that there is no end but must actively play a part in the mutual cycle of influence between agency and social norms. The approach Scott *et al* take serves as an important model for design-driven inquiry into consumption practices of industrialized beef and inspired the use of a diary study as a primary research methodology to understand participants' day-to-day encounters with food and meat.

OVERCOMING THE ATTITUDE-BEHAVIOR INTENTION GAP IN EVERYDAY PRACTICES TO MOTIVATE INDIVIDUAL CHANGE

Although research has shown that there has been increasingly positive sentiment towards reduced emissions and sustainability, there is often a large gap between our attitudes and our actual behaviors, especially when it comes to meat. This divide is known as the attitude-behavior intention gap (Vermeir and Verbeke, 2006). Within this gap lie deep cultural and personal implications that meat has fostered over time, which are also reinforced through everyday habits.

Paul C. Stern's Attitudinal-Behavioral-Contextual (ABC) theory (2000) was very influential in uncovering the way in which personal attitudes and external context impact behavior, setting an important baseline for understanding the attitude-behavior intention gap. Ultimately, Stern posits that strong contextual factors override any attitude-behavior association, effectively forcing behavior in specific directions. Further, he hypothesizes that the more important a behavior is to environmental impact, the less it has to do with attitudes. Stern identifies four types of causal variables: attitudinal factors, contextual factors, personal factors (such as knowledge or skill), and habit or routine. He argues that these factors will have different impacts depending on the behavior that is being examined or elicited. To change behavior, the right set of interventions need to be applied to help individuals overcome the main barriers that stop them from engaging in pro-social behaviors.

Sustainable food consumption: exploring the 'attitude-behavior intention' gap by Iris Vermeir and Wim Verbeke (2006) identifies a set of factors that are similar to Stern's ABC theory. However, they define attitude and context in greater detail than is evident in Stern's piece. In their work, the attitude variable is divided into values, involvement, and social norms. Values are a relatively stable personal expression of needs that motivate us. Involvement is triggered when a product or service is seen to be an

important vehicle to achieving these values, influencing the amount of cognitive effort we are willing to invest. Given that humans are highly relational, values and involvement are influenced by social norms, which makes external cultural factors important to consider. The context variable is defined as availability and perceived consumer effectiveness (PCE). Availability addresses the challenges of infrastructure that allow us to access sustainable products. The authors argue that while high motivation is an important prerequisite to purchasing sustainable products, low availability can make it impossible to achieve. PCE refers to the extent to which a consumer believes that their purchasing decisions are impacting the environment, making transparent feedback loops for sustainable behavior an important factor for motivating behavioral change.

The variables in this work are also supported by Susanne Stoll-Kleemann and Uta Johanna Schmidt's meta-analysis of research studies conducted on the topic (2017), that focuses specifically on reducing meat consumption. Both Vermeir and Verbeke as well as Stoll-Kleemann and Schmidt highlight the current lack of transparent information that makes it difficult for those with positive attitudes towards sustainability to make informed purchasing decisions and see the impact that their decisions make on the food chain. As most of us cannot personally evaluate the sustainability of a product based on their own experiences, there is a strong reliance on external sources of information that are perceived as trustworthy. The lack of transparency in information has large implications on the influence of existing social structures. Pollan (2006) highlights the origins of the problem by explaining that this lack of transparency in the food system is a result of the system being incredibly long and convoluted. Extensive research by the FrameWorks Institute has found that a lack of transparent information also means that we do not have an existing model of the food system, making it difficult for them to retain any new information provided that would help to present the wider, systemic picture within which food is situated (Bales, 2006).

Although there are many overlaps in behavioral change theory, Fogg's Behavior Model (FBM) (2009) offers a different perspective to why attempts at behavior change succeed or fail. Fogg asserts that there are three main variables for behavior change to succeed. First, a person must be sufficiently motivated to enact a target behavior. Fogg highlights pleasure/pain, hope/fear and social acceptance/rejection as being some of the most important motivators he has seen in his research. Second, the behavior must feel more simple to enact. Fogg states that our perception of simplicity is linked to how much it requires of the scarcest resource in their lives. He identifies six key factors of simplicity: time, money, physical effort, mental effort, social deviance, and routine. Lastly, triggers must be leveraged. For a trigger to be effective, Fogg explains that not only does it need to be noticeable and clearly

associated with the target behavior, it is crucial that the trigger also be appropriately timed. Gleaned from the FBM, it is important to deeply understand the audience in order to determine what they define as easy or difficult as well as pin-point effective types and timing of triggers.

LEVERAGING LEARNING THEORIES TO DESIGN INTERVENTIONS FOR MEANINGFUL EXPERIENCES

Reflecting on my insights from behavioral change theories, it became clear that overcoming many of the identified barriers would require us to learn new ways of engaging with sustainability at an individual level. As a result, investigating how to facilitate effective learning experiences was crucial to understanding how to motivate target learners to engage with interventions and hold their attention to continue developing sustainability knowledge and skills over time.

In *About Learning* (1996), Bernice McCarthy introduces four core components of how people learn through the 4MAT system, which she argues constitutes the building blocks of any learning experience. The four components include meaning, conceptualization, problem solving and transforming. In each of these quadrants, McCarthy establishes the central questions, goals and methods that designers can use to effectively craft a learning experience and engage the target audience. Aside from constructing experiences, McCarthy highlights that the 4MAT can also be used to decode existing experiences and to understand the different learning styles that learners respond to depending on the way that they process information. The versatility of this framework provided a scaffold to reflect on the experiences I was proposing and aided prototyping through a variety of lenses, which provided important insight into the needs of the learner.

Julie Dirksen's *Design For How People Learn* (2012) builds on similar learning journeys to McCarthy but deepens the concepts by providing practical frameworks to implement valuable learning experiences, two of which had a particular contribution to my thinking. The first is the importance of identifying performance gaps in the existing experience to understand which interventions may be most effective. She identifies five types of gaps: knowledge, skills, motivation, environment and communication. Through this concept, Dirksen highlights the value of developing a deep understanding of the target learner, their experience and the largest barriers in comparison to the goals. The second concept is designing for

accomplishments by using a flow of goals. Dirksen posits that it is necessary to develop skills slowly by setting concrete goals over time that grow in difficulty. This is important from the perspective of the designer and the learner. For the designer, using the flow of goals ensures that there is logic and intention behind the goals and their arrangement. It also ensures that the appropriate feedback loops are considered to help learners move between goals. From the perspective of the learner, it establishes efficacy and helps the learner maintain confidence as they progress in difficulty through the learning experience. The exposure to Dirksen's concepts inspired my investigation into adult learning during ideation and my focus on hypotheses in user testing with first-time parents.

UNDERSTANDING THE ROLE OF SMALL COMMUNITIES IN FACILITATING SOCIAL TRANSFORMATIONS

Sustainable food systems change may begin with an individual, but will only occur when many people decide to adopt sustainable food practices. I investigated the role of community in facilitating change beyond the individual and for the greater good. I specifically delved into the components of small groups that prior research has identified as an important lever for large-scale transformations.

Community by Peter Block (2018) argues that community, especially in small groups, is the key to transformation. He explains that community is necessary to establish a sense of trust, belonging and relatedness, which all build our capability to solve problems effectively. There are three crucial points that have contributed to my thinking. First, Block emphasizes the power of citizens in creating sustainable transformations. However, he explains that citizens need to take back their power rather than waiting for organizations to solve the problems that are occurring around them. To do this, Block believes that citizens need to choose to come together as a community to imagine, and be held accountable for, a common alternative future that supports the well-being of the whole rather than the individual. Second, Block identifies small groups of up to 12 people as being an ideal unit to foster transformation. He argues that small groups allow for each voice to be heard, promoting intimate and authentic relatedness through the conversations that the groups have. By engaging in small groups, we build a bridge between ourselves and the larger community, finding commonalities in our hopes and concerns that unite us. Block explains that when enough small groups come together, the underlying fabric of community can help to facilitate large-scale transformations. Finally, Block identifies the importance of conversation as the mechanism for change. He highlights six types of conversations in particular that create a sense of belonging, accountability and care for the commons, moving

away from "just talk" (p. 115), to meaningful conversations. These include: the invitation, possibility, ownership, dissent, commitment and gifts. Block's text reinforced the potential for citizens to create sustainable change together through the mechanism of community, inspiring an exploration into community as an important entry point for my final concepts.

The Social Edge: The Power of Sympathy Groups for Our Health, Wealth and Sustainable Future by Anthony Costello (2018) also highlights the transformative powers of small groups, which he calls Sympathy Groups. He argues that small, local groups create an ecology of social trust and cooperation, finding creative solutions to complex problems. Sympathy Groups are defined by Costello as small groups of up to 15 people who leverage participatory action, sharing common interests through repeated facilitated conversations and meetings. They have eight essential components, which Costello shortens to BENEFITS. The Beneficiaries, or members, of the group have a direct interest in the group concerns, which is what inspires the bias for action. The Sympathy Groups work because they have Enablers who facilitate regular meetings to build trust in order to solve the group's problems, thereby learning how to collaborate together. The concept of Neighbors highlights the importance of relatedness and the intimacy of small groups, which Costello argues determines social cooperation. The groups require Focus and Iteration on specific challenges to build consensus through conversation, which Costello highlights is crucial to giving people a voice in discussions about a community's future. Finally, Trust and Strategies for change are critical for success as they continue to motivate members to agitate others to facilitate change and hold the group together in intimate relatedness over time. Crucially, Costello's text highlights the importance of the Enabler, who guides self-organized groups through important conversations and group skill-building. The concept of the enabler influenced the foundations of one of the final concepts, Munch, putting theory into practice.

ARTIFACT REVIEW

As part of my artifact review, I analyzed a variety of existing interventions in order to understand what already existed, draw insights from the unique elements and common patterns between the interventions and identify gaps that pointed to opportunities.

To combine research and entrepreneurial insight, I used the *Discovery Framework* (Myers *et al.,* 2013) to diagram my findings (Figure 2). The *Discovery Framework* considers the core components of a problem through the identification of related moveable barriers. The barriers featured in my work are derived from insights gleaned from the literature and artifact reviews I conducted. The framework also highlights practical discoveries from my analysis of existing interventions that can help shift the barriers. The interventions I analyzed were derived from the literature I read, venture capital funding analysis, market reports, ads, and recommendations. By displaying the *Discovery Framework* in the form of a matrix, I was able to visually express where clusters of interventions had formed and conversely, where clear gaps emerged. As a result of this multi-faceted analysis, I plotted opportunity areas using a practical lens towards systems change.
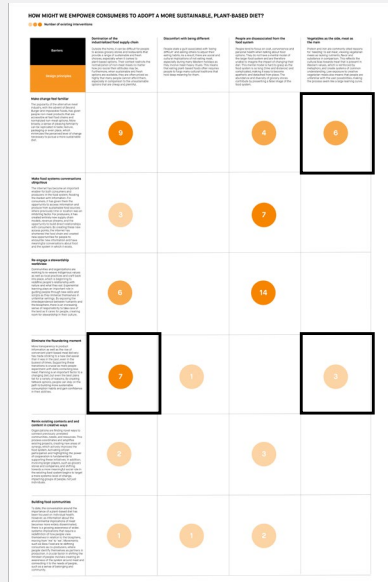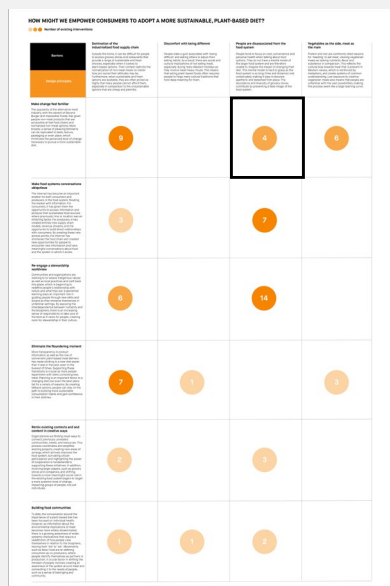
HOW MIGHT WE EMPOWER CONSUMERS TO ADOPT A MORE SUSTAINABLE, PLANT-BASED DIET?

●●● Number of existing interventions

Barriers / Design principles	Domination of the industrialized food supply chain	Discomfort with being different	People are dissociated from the food system	Vegetables as the side, meat as the main
(Barrier descriptions)	Outside the home, it can be difficult for people to access grocery stores and restaurants that provide a range of sustainable and fresh choices, especially when it comes to plant-based options. Their context restricts the normalization of non-meat meals no matter how pro-social their attitudes may be. Furthermore, when sustainable and fresh options are available, they are often priced so highly that many people cannot afford them, especially in comparison to the unsustainable options that are cheap and plentiful.	People state a guilt associated with 'being different' and asking others to adjust their eating habits. As a result, there are social and cultural implications of not eating meat, especially during many Western holidays as they involve meat-heavy rituals. This means that eating plant-based foods often requires people to forgo many cultural traditions that hold deep meaning for them.	People tend to focus on cost, convenience and personal health when talking about food options. They do not have a mental model of the larger food system and are therefore unable to imagine the impact of changing their diet. This mental model is so long (time and distance) and complicated, making it easy to become apathetic and detached from place. The abundance and diversity of grocery stores contribute by presenting a false image of the food system.	Protein and iron are commonly cited reasons for 'needing' to eat meat, viewing vegetarian meals as lacking nutrients, flavor and substance in comparison. This reflects the cultural bias towards meat that is present in Western values, which is reinforced by metaphors, and create systems of common understanding. Low exposure to creative vegetarian meals also means that people are unfamiliar with the vast possibilities, making the process seem like a large learning curve.
Make change feel familiar	9		4	6
Make food systems conversations ubiquitous	3		7	
Re-engage a stewardship worldview	6		14	
Eliminate the floundering moment	7	1		3
Remix existing contexts and content in creative ways	2		3	
Building food communities	1	1	2	

HOW MIGHT WE EMPOWER CONSUMERS TO ADOPT A MORE SUSTAINABLE, PLANT-BASED DIET?

Barriers / Design principles	Domination of the industrialized food supply chain	Discomfort with being different	People are dissociated from the food system	Vegetables as the side, meat as the main
Make change feel familiar	Beyond Meat; Impossible foods; Tofurkey; Tofu; Quorn; Seitan; Bitty foods; Farm to College; National farm to food network		Memphis meats; JUST; Future meat technologies; More-Than-Human lab	Blue apron; Every plate; SunBasket; Gobble; Green chef; HelloFresh
Make food systems conversations ubiquitous	Porter road; Butcher Box; Good Meat Project: Switchboard		Farm to People; Open Food Network; Local Food Connection; Pod foods; Beef tracking devices; Eat Wild; Buycott	
Re-engage a stewardship worldview	Farmer's market; Metropolitan buying clubs; Co-ops; CSAs; Belcampo; Mindful meats		CrowdCow; Ocooby; Portland Meat Collective; Atlas of butchery; Indigenous farming project; Square roots; Agri-hoods; INFARM; Edible Schoolyard; Big Green; Red Hook farm; The food project; Center for land-based learning; FFA	
Eliminate the floundering moment	Purple carrot; Sakara life; Epicured; Veestro; Urban remedy; Mosaic; Sprinly			Plantable; Forks over Knives; Equal parts
Remix existing contexts and content in creative ways	People's grocery; St Louis MetroMarket	Abillionveg	Shared earth; Smallhold; Babylon microfarms	
Building food communities	Simple feast	Veganuary	Indigenous food and agriculture initiative; Slow food movement	

Figure 2: Discovery Framework

Figure 3

Figure 4

CLUSTERS IN INTERVENTIONS

A few of the clusters that have appeared as a result of analysis:

There are a lot of boxes (A4, D1 and D4 in Figure 3)

These include meal kits, pre-made meals, online farmers' markets, CSA and meat boxes. One notable example is Plantable, which is a sugar-free, plant-based pre-made meal delivery service. Plantable's differentiating factor is the inclusion of personalized round-the-clock education and support from a coach as its customers make healthy, sustainable diet transitions. Many of the box delivery services exist online to improve access and are delivered directly to the home, increasing convenience. The messaging around most of the boxes is focused on health rather than any explicit environmental focus.

There are large investments into in-vitro meat (C1 in Figure 4)

The number of in-vitro or 'cultured' meat organizations such as Memphis Meats are growing at a rapid pace, responding to the demand for more sustainable meat using cells to cultivate meat in labs. Cultured meat has received large investments in the technology to get the costs down to produce at scale, triggering important conversations about the future of food. Due to the clear popularity of these organizations, big meat companies such as Tyson and Cargill are getting involved, either through investment or their own research endeavors, which has created a significant shift in the market.
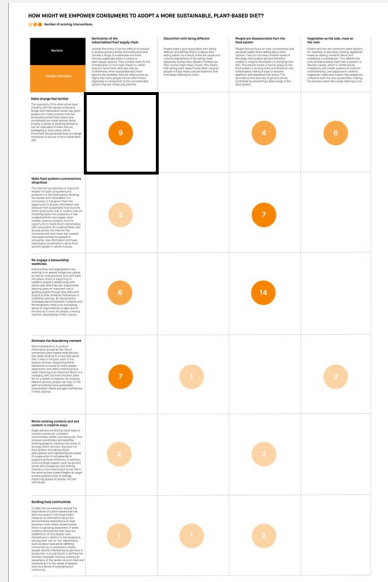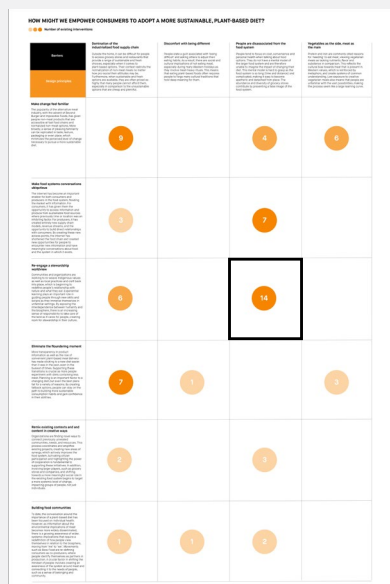
Figure 5

Figure 6

The meat alternatives market is growing (A1 in Figure 5)

Beyond Meat and Impossible Foods have instigated a revival of interest in meat alternatives by closely replicating the experience of eating meat in plant-based products. This endeavor has generated large amounts of exposure, establishing meat as an important contributor to the climate crisis. One of the biggest successes of meat alternatives has been improved accessibility to a large variety of meat alternatives in grocery stores. Meat alternatives have also extended to fast casual restaurants such as Burger King, which has caused a disruption in traditionally meat heavy market segments.

Experiential learning programs are predominantly targeted at youth (C3 in Figure 6)

There are a plethora of school programs that are teaching kids from elementary school to high school to become more connected to the environment. One such program is The Edible Schoolyard, which includes a garden, kitchen and cafeteria in schools that focus on teaching students the value of stewardship, nourishment and community through food. Programs such as this one are implemented at the class level and the school cafeteria level around the country, giving young students access to sustainable and nutritious meals, supporting local farmers and shaping their relationship with food.

Figure 7

Figure 8

Small scale, hyperlocal farms are growing in urban areas (C3 and C5 in Figure 7)

Vertical farms and home garden support products and services are growing. They use new technology to bring farming to the city, lower traditional farming costs and reduce waste. INFARM has taken urban farming one step further by partnering with grocery stores to include modular farming units to grow and sell plants, using cloud technology to control the environment. Although these hyperlocal farms currently only have small produce such as mushrooms, greens, and herbs, their presence has begun to take the image of farming out of the prairies and into a relatable space where people can fully participate.

The trend of interventions is to target wealthier communities, improve access to produce and sustainable meat and reconnect producers with consumers (A2 and C3 in Figure 8)

The internet has brought a new level of access and meaning to the concept of farm-to-table, improving convenience — for a price. Crowd Cow is a company that has leveraged this approach to conveniently provide sustainable, craft meats while also shining a light on the producers that service them, their stories, and farming methods. Not only can customers shop by type of meat, they can also purchase meat directly from the inventory available from a specific farm, which creates a unique marketing platform for farmers. These types of interventions recontextualize the procurement meat and increase transparency in the system.

GAPS IN INTERVENTIONS

As interventions began to cluster, gaps also appeared. These gaps were indicators of opportunity areas to me, highlighting important areas where there were limited interventions. These gaps include:

Many minorities are not present in messaging or targeting of current interventions

Indigenous voices in interventions have been very difficult to find despite the extensive knowledge they hold about local sustainability that has been passed down over many generations. Furthermore, while many interventions are dealing with the issue of access to sustainable meats, vegetables, or alternatives, they are often inaccessible to those who are less wealthy and may actually need it most. As a result, there is an opportunity to reap the benefits of local knowledge, focus interventions on minority access to real foods and give everyone the chance to make sustainable food decisions.

There is a lack of interventions that target groups of adults

Experiential learning about food and the food system is primarily directed at children or young adults without providing similar, guided opportunities for adults. The lessons children learn could be introduced to, and reinforced by, parents, which could strengthen everyone's understanding and value of their local food system. This approach could lead them to make better purchasing decisions together. Learning is a lifelong pursuit and every day offers a new opportunity to engage in more sustainable food habits, while also building community.

Not all important consumer touch points are represented in interventions

Many interventions take place in schools or the home. This approach is perhaps due to the fact that we don't consider organizations to be responsible for contributing to the food system, placing a large emphasis on the personal decisions of individuals. However, targeting companies, grocery stores, and even hospitals in aiding sustainable diet efforts serves as an important opportunity for positive impact because a large proportion of people already interact with the food system in these contexts.

A discomfort with being different is still a major issue

Although access to vegetarian food and meat alternatives has improved over the last few years, there are clearly still large cultural barriers to following a plant-based diet. Many of us who have tried vegetarian diets begin eating meat again as a result of our social circles and pressure from our eating contexts. Very few interventions have attempted to tackle this issue. There is potential to support those who are new to plant-based diets, leveraging community as well as promoting skill and knowledge creation and acquisition to sustain the transition.

Vegetables are still seen as the side, and meat as the main

Another area few interventions are tackling is the misconceptions that exist about the lower nutritional value that a plant-based diet provides, especially in relation to protein and iron. A few documentaries and movies such as Game Changers and Cowspiracy have made big impacts through streaming sites such as Netflix, but otherwise, only meal kits are actively trying to change the poor perception of vegetables. There exists a possibility to raise the social desirability of plants by redefining eating experiences to satisfy universal needs in new and creative ways.

Very few interventions build mental models of the food system

Most interventions tackle food from a consumer lens without taking a systemic approach. A lack of knowledge and transparency of the existing food system means that consumers are expected to make sustainable decisions based on partial information, making it difficult to understand the implications of their decisions. Currently, school garden programs provide the most extensive approach by involving students directly in the stewardship of land. Students thereby nurture the produce that they would typically find on the shelves in grocery stores, seeing the wider system. Due to the narrow view of interventions, there is an opportunity to expose and teach the community about the wider food system while highlighting the ways that we can opt out and participate in a clearer food system with shorter feedback loops.

OVERALL LEARNING

The insights from my research explorations created an important foundation that heavily influenced the rest of my design process. The research enabled me to investigate some of the initial theoretical questions I had, giving me space to unpack complex concepts.

Furthermore, it reinforced that I needed to complement the systems-level approach with an analysis of existing individual practices and further research on community, as there are clearly many opportunity areas for bottom-up, citizen-influenced change.

Finally, the frameworks developed in this phase later informed the underlying principles for ideation, creating a strong theoretical underpinning for the concepts developed.

GENERATIVE RESEARCH

**Understanding the individual challenges
of adopting a sustainable diet**

INTRODUCTION

Generative research was conducted to establish a deeper understanding of the individual challenges that we encounter in adopting sustainable diets. To do this, I conducted an online survey with 85 respondents and a five week diary study with 10 participants. The insights developed by studying and then aggregating individual behaviors was crucial to the determination of my target audience and the development of my final concepts. The following section summarizes the online survey and diary study, as well as the resulting insights gleaned from my research.

ONLINE SURVEY

I created an online survey with the intention of gaining a high level understanding of meat consumption and sustainability practices across a wide range of people. A total of 85 participants participated in the survey.

GOALS

There were two major goals for the survey. The first was to get statistically significant, quantitative data on factors that could impact food consumption and existing perceptions of meat consumption. The results provided initial insights that then played a role in guiding the framing of the diary study and the questions included.

The second goal of the survey was to serve as a recruitment mechanism for the diary study as it enabled extensive reach through online channels. Unfortunately, this did not work as intended as most of my network is outside of Pittsburgh, making it difficult to recruit for a place-specific study.

RECRUITMENT

To recruit participants for the survey, I created a post that I shared on a variety of social media platforms. I also asked friends and family to repost the request to ensure it received as much traction as possible.

SURVEY DESIGN

The survey had four main sections.

The first section aimed to capture general participant information to glean context for the demographic of the respondents.

The second section was focused on participant meat consumption. It calculated the frequency of meat preparation and consumption as well as the type of meat consumed and the factors that impacted consumption. The factors impacting meat consumption provided in the survey were based on secondary research. These questions aimed to capture existing attitudes towards meat consumption and understand the components that made meat was so attractive.

The third section recorded other common sustainable practices in which people participated. The intention was to see if any of the listed options were particularly popular. My intention was to investigate any popular practices as a case study to understand how they became so widely accepted.

The final section was a call to participate in the diary study.

DIARY STUDY

I conducted a diary study with 10 participants over five weeks to better understand the individual eating habits people practiced and why. This was inspired by my research of the collaborative, practice-oriented design approach that Scott *et al* (2012) took to researching consumption practices.

METHODOLOGY

A diary study is a guiding workbook that enables participants to record personal details about their everyday lives and events (Harrington and Martin, 2012). This gives the researcher insight into the participants' thoughts, feelings and behaviors at key moments in their own context without needing to be present.

I chose this method as it enabled me to track participants over time, which is necessary to better understand habit change. Furthermore, the intimate nature of a 'diary' often promotes reflection on existing habits.
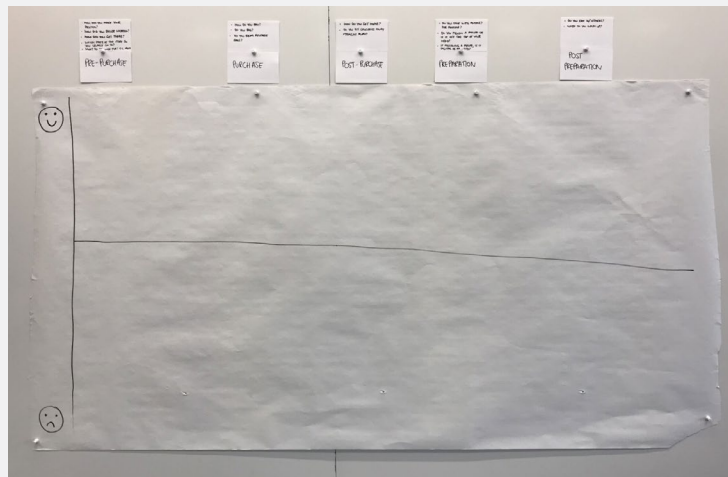
Figure 9: Recipe Card

Figure 10: Journey Map

GOALS

There were three major questions that the study aimed to answer:

1. Which factors most influence purchasing, preparation and consumption decisions when it comes to food?

2. What are the challenges faced by transitioning to a more sustainable, plant-based diet?

3. What, if any, is the role of reflection in behavior change?

RECRUITMENT

Recruitment was one of the largest challenges I encountered in the diary study. First, given that I needed in-person participation for the group meetings, I had to recruit within Pittsburgh where I have a small network. Second, a crucial factor was time. Five weeks is a long time for participants to be engaged in a recurring activity, even if it is 15 minutes a day. As a result of these factors, I relied on personal relationships that I had with people in the CMU community. While this approach resulted in a very specific demographic for my participant pool, there was still a large amount of diversity in their backgrounds, eating habits and experiences.

DIARY STUDY PLAN

The diary study consisted of individual activities as well as three in-person group workshops to guide participants through two phases of the study. The study design was as follows:

First group meeting at Carnegie Mellon University

The main aim of this first meeting was to set the context of the diary study, get to know the participants as well as introduce myself and the study to the participants. Aside from providing the basic instructions for participation, I conducted two smaller activities to frame participants' thinking.

First, I asked participants to write down their go-to recipe (Figure 9) and explain why they chose that meal. As they introduced themselves, they also introduced their go-to recipe, framing the conversation around food. The aim of this activity was to understand which factors were most important for participants when considering what to cook, giving me an understanding of their values relative to food.
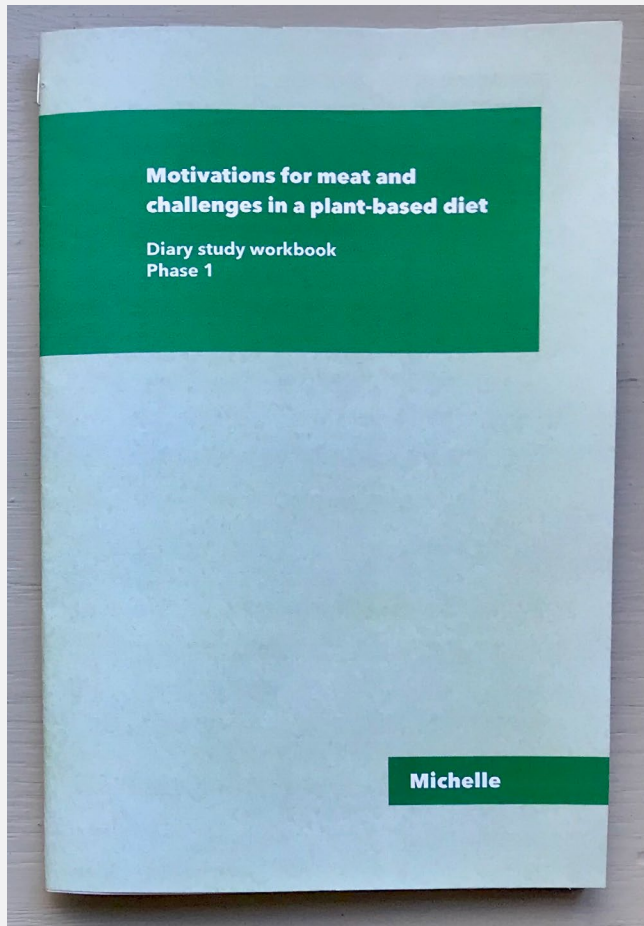
Figure 11: Diary study workbook

Second, the participants engaged in a journey mapping activity (Figure 10) of their typical eating habits. A journey map visualizes key actions and phases in an experience (Harrington and Martin, 2012). It often captures the end-to-end journey, including feelings, perceptions and mindsets of the users of an experience. The intention was to help participants become comfortable reflecting on their actions and set expectations for the level of detail that I aimed for them to include in the diaries. During this activity, I was also able to have conversations with the participants and understand their mental models as they relate to food.

Phase 1: Capturing existing consumption habits (2 weeks)

For the first two weeks I asked participants to document and reflect on their existing consumption habits in workbooks provided (Figure 11). This step aimed to activate the discursive thinking that social practice theory explains is essential to any change (Scott *et al.,* 2012)—shifting from automatic behaviors to considering *why* they engage in certain eating habits. By asking participants to begin noticing their actions, the aim was to create a baseline understanding of their existing habits, how they feel about these behaviors and prepare them for the next phase of the diary study.

Second group meeting at Carnegie Mellon University

There were two main goals for this meeting, which was the second gathering in the study. First, I asked participants to reflect on the initial two weeks of the diary study. I was curious to understand if anything stood out to them as they analyzed their habits and whether there was anything that we needed to change logistically.

The second aim was to prepare the participants' eating goals for the next three weeks as they were going to trial and document their own diet change towards more sustainable practices. I chose three weeks for this phase as it takes around 21 days to begin to form a habit. To do this, I created a consumption modification activity (Figure 12) using a framework developed by Niki Wallace (2019). The intention was for each participant to co-create an eating challenge that would include more sustainable practices that they would stick to over the next three weeks. I didn't want to stipulate that participants try a no meat diet as there are many ways to approach sustainability, mimicking the more gradual change that we make in our habits. Through discussion, I was able to understand some of the challenges, concerns and considerations that the participants noted as informing their decisions. Ultimately, each of the challenges reflected the individual and what they felt they were willing and able to sustain.

Figure 12: Diet modification activity

Figure 13: Magic device activity

Immediately after the meeting, I asked the participants to write a structured break up letter with their existing eating habits over the next three weeks. The break up letter method asks participants to reflect on prior relevant experiences, express their feelings to a personified product, service or practice and highlight why the relationship was no longer working (Harrington and Martin, 2012). This was designed to get participants to intentionally commit to the consumption change and articulate to themselves the rationale for their decisions. This activity also helped me gain additional insight and empathy for each participant.

Phase 2: Capturing modified consumption habits (3 weeks)

In this next phase, participants documented their experience with the sustainable diet they had chosen to follow. Participants were already familiar with documentation and reflection processes so the aim of this phase was to help me understand the barriers that emerged in their diet modifications as well as the workarounds or 'failures' participants experience when attempting to stick to the new diets.

Third group meeting at Carnegie Mellon University

The final group meeting had two aims. First, I asked participants to reflect on the diet modification challenges as a group, which achieved the goal of sharing some of their own discoveries and recognizing commonalities among their responses. This part of the meeting enabled me to ascertain the most important factors for each participant, revealing patterns in the group and highlighting what to look out for when analyzing their diaries.

The second aim of the meeting was to understand the single biggest pain point that each participant experienced during the exercise. To accomplish this goal, I asked participants to imagine a magic device or service that would help them maintain a sustainable diet (Figure 13). By naming and drawing this device or service, participants generated ideas that would support them through the challenges of sustainable diet change. This activity enabled participants to articulate their pain points through another creative form without boundaries, helping me prioritize their pain points and understand the common components between the magic interventions that they felt would help.

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Figure 14: Instructions page in the diary study workbook

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WORKBOOK DESIGN

The workbook was one of the core elements of the diary study, guiding the reflections of participants. As a result, the content and form of the workbook was very important to thoroughly consider and design in order to ensure that I gained relevant insights for my study.

Content

One of the key considerations for content focused on determining the amount of structure provided in the workbooks, ranging from open text to questionnaires. I decided to incorporate a medium amount of structure, including both multiple choice and open-ended questions (Figure 15). This structure provided participants with enough flexibility and agency to express themselves but also ensured that there was enough guidance that helped them provide relevant responses for my study.

The multiple choice questions proved incredibly useful in priming participants for their open-ended responses, pushing them to reflect on how they felt about their eating habits. They also gave me the ability to quantify the frequency of the words chosen each day over the duration of the study, creating patterns in my learnings between participant responses.

The open-ended questions yielded mixed levels of detail. Some participants were very descriptive, taking the time to detail their eating habits each day while others kept responses to a couple of sentences. In the less descriptive scenarios, the mixed amount of structure in the workbooks was very helpful, enabling participants to continue engaging in the study while exerting minimal effort.

Figure 15: Workbook reflection questions

Form

The consideration of form was the most difficult part of the workbook process, as I had never worked in print. As a result, the workbook went through multiple iterations in fidelity.

First, I explored various scales and proportions to determine an appropriate and effective size for the workbook. I chose a half-letter size with a full page spread dedicated to each day. Not only did this make the workbook easy to carry around and fill out, it ensured that participants had enough space to write without being overwhelmed with questions. I believe that the chosen layout was particularly important given the length of the study, enabling participation without significant cognitive load.

The next priority was to test different paper weights. This was important as it would determine the thickness of the book and the binding technique that I would use. Ultimately, I decided to use a thicker, glossy paper for the cover of the workbook and standard printing paper for the inside pages. I chose this combination as each paper type has a different affordance. The thicker paper afforded sturdiness while the printing paper afforded hand written or drawn reflections, which together created the feel of a logical workbook. I believe that it was important to invest care in the assets I gave to participants to show that their opinions mattered to me, thereby inspiring them to take the same care in the responses they provided.

Finally, I used staples to bind the workbooks. This was a simple method that also enabled the workbook to flatten or be folded, making writing easy in any environment. Given the level of commitment required in the study, I worked to make participation as easy as possible in every aspect of my form decisions to remove as many barriers to engagement as possible.

OVERALL LEARNINGS

After analyzing the survey and diaries as well as reflecting on the group meeting activities and discussions, I came to five key insights regarding the challenges of individual diet change.

There is a great diet divide

The people that we frequently eat with strongly influence our diet. We are often willing to adjust our personal food preferences to accommodate the relationship.

The tendency to forego our eating preferences frequently manifests because we are often uncomfortable with being different or feel guilty about potentially being perceived as difficult. This belief is especially true when someone else is preparing the food, as we see the preparation of food as an act of love and friendship for the people who have chosen to commit energy to preparing a meal for us.

Out of sight, out of mind

When we eat out, we are more likely to deviate from the sustainable eating habits that we may practice at home. In the case of meat, a majority of us choose to consume it more frequently outside the home.

This behavior often arises because there is limited access to reasonably priced plant-based options as well as much less information and control over preparation when dining outside the home. This makes us feel less implicated in our food decisions to consume meat as we feel that we have less agency over the decision-making process.

The meat system is as clear as mud

The food chain is long and convoluted with limited amounts of information and transparency. The complexity and abstraction of the food chain makes it incredibly difficult for us to understand how the system works and thereby we struggle to assess the extent to which investing effort in a plant-based diet could have a broader impact beyond ourselves.

In addition, cognitive load is increased by the fact that most of us only experience meat by consuming it, meaning that we often feel that we can only truly understand the cost, convenience and health implications of meat.

The power of plants goes unnoticed

We have grown up with the notion that meat is the main part of any meal, providing the most nutritional value and having the highest capacity to keep us satisfied, especially in comparison to plants.

This view of meat has remained intact as a result of the limited exposure that we have to creative plant-based meals as well as the lack of skills and knowledge necessary to combine the right types of plant-based ingredients together to be both nutritious and delicious. This perspective causes plant-based meals to feel much harder to prepare, and therefore less convenient, in comparison to meat.

Convenience is prioritized over planning

When we feel physically or emotionally stretched, food falls to the bottom of our priorities, making us less mindful of what we consume, simply 'eating to survive'. This often means opting for the most convenient and familiar options that require the least mental processing, which frequently ends up being meat.

Although we are not satisfied with satisficing, planning meals requires a high level of effort that we often find difficult to adopt. This makes a transition to a plant-based diet hard to maintain.

IDENTIFYING CONCEPTS

**Focusing on first-time
expecting and new parents
as agents of change**

INTRODUCTION

The first conceptualizing phase of my research included the application of theory. Based on the work I had done during the exploratory and generative stages, I was able to identify possible leverage points that would contribute to a shift towards sustainable systems both in the target audience and concepts generated. One such leverage point my research began to focus on was small communities, mobilizing the collective for larger scale change. In particular, I identified first-time expecting and new parents as one such community that would function as an effective leverage point. By visualizing the initial concepts and testing them, I was able to have concrete discussions with my target audience about my hypotheses, which helped me fine-tune plans for my final thesis interventions. The following section summarizes my process for identifying possible leverage points, determining concepts testing prototypes, and the learnings I gleaned.

NARROWING PROCESS

After analyzing the insights gleaned from the exploratory and generative research, it became clear that individual food habits were heavily influenced by social factors. As I found in the diary study, influencers are evident at the interpersonal level, where we adjust our eating according to friends and family as well as at the organizational level, where the availability of certain foods dictates what we can eat outside the home. Furthermore, the food system itself is so large that even those intrinsically motivated to pursue sustainable food habits find it challenging to maintain sustainable eating practices without some support.

It is important to note that, for many individuals, shifts in consciousness towards sustainable eating habits do not serve as an adequate motivator to enact change. As Peter Block (2008) notes "a community benefits from shifts in individual consciousness, but needs a communal connectedness as well, a communal structure of belonging that produces the foundation for the whole system to move" (p.78). This is further supported by SPT, with Scott *et al* (2012) explaining that changing practices are a social process, with individual actions and social norms constantly influencing each other. As a result, it became evident that in order to create meaningful change in food practices at a systems level, community was going to be a crucial lever.

I considered two variables for my approach to understanding the type of community necessary to enact changes in food practices: the degree of establishment of a community and the community's size. I decided to focus on established communities as they had some existing member commitment, trust and influence whereas new communities would be difficult to create or analyze, requiring a long period of time to become established. For community size, I chose to focus on small communities, basing my decision on the insights gleaned from my literature review. In his book, *Community* (2008), Peter Block argues that a small group serves as an effective unit for transformation as it enables "intimate and authentic relatedness" (p. 97) to be built through meaningfully designed conversation and the ability for each voice to be heard. Block explains that these small groups give members a sense of belonging as they discover common concerns through their interactions. In his book, *The Social Edge* (2018), paediatrician Anthony Costello similarly highlights the power of small groups, which he calls Sympathy Groups, to create change. He defines Sympathy Groups as communities of up to 15 people, leveraging Robin Dunbar's research defining the amount of social complexity that we can handle at different levels of intimacy. Through applied case studies, Costello finds that common challenges create a focus for action, developing a sense of trust through shared experiences.

To narrow my research further, I explored different modes of engaging with small communities to determine the biggest opportunity area. To accomplish this goal, I leveraged the *Discovery Framework* (Myers *et al.*, 2013), targeting the opportunity gaps I had uncovered through my analysis of existing interventions (Figure 16). According to the SPT research that I discovered in my literature review, reflection is a critical component of any change as it triggers us to critically evaluate practices that were previously considered natural or normal. As a result, any entry point into small communities, must also include this component.

The first mode of engagement that I explored focused on adult learning, where small communities are built through the creation of formal learning environments. Despite the existence of many youth focused programs, I found that there were very few opportunities for adults to engage in meaningful, extended learning experiences outside of school. However, creating an adult learning environment doesn't target the initial underlying challenge of motivating people to reflect on their existing consumption habits. Instead, it targets a self-selecting group that already understands this to be an issue. Furthermore, formal learning environments require high commitment and as well as high levels of intrinsic motivation in the learners to opt-in to such an experience. As a result, it did not seem that this entry point would gain sufficient traction among my audience.

Figure 16: Discovery Framework initial ideation

HOW MIGHT WE EMPOWER CONSUMERS TO ADOPT A MORE SUSTAINABLE, PLANT-BASED DIET?

	A — Domination of the industrialized food supply chain	B — Discomfort with being different	C — People are dissociated from the food system	D — Vegetables as the side, meat as the main
Barriers / Design principles				
1 Make change feel familiar	Beyond Meat; Impossible foods; Tofurkey; Tofu; Quorn; Seitan; Bitty foods; Farm to College; National farm to food network	Include sustainable food resources in the mindfulness or exercise apps e.g. Sweat; Incorporate resources into yoga studios; Host sustainable dinner with friends - guided discussion, must learn something to make the meal (e.g. Pollan's dinner)	Memphis meats; JUST; Future meat technologies; More-Than-Human lab; Interactive food display of seasonal, local produce - information table that displays product data (similar to museums)	Blue apron; Every plate; SunBasket; Gobble; Green chef; HelloFresh; Introduce vegetable forward menu at sports games every few weeks - engage vegetarian/vegan players
2 Make food systems conversations ubiquitous	Patter road; Butcher Box; Good Meat Project: Switchboard; Sustainable food delivery app - only delivers from certified "Sustainable Pittsburgh" restaurants; Sustainable lunch delivery app - delivers from certified sustainable restaurants, only for lunch, targetting business outside downtown areas	Resident 'onboarding'/foster families - new residents paired with close neighbor with content on sustainability systems in the neighborhood	Farm to People; Open Food Network; Local Food Connection; FoB foods; Beef tracking devices; Eat Wild; Buycott; 'Be my eyes' but crowdsourcing vegetarian recipes from picture of contents of fridge/vegetables; Hospital urban garden; "Vivino for food" - depicting ecological impacts of menu choices	Plates/scales that can determine nutrient content - helpful alternatives if low on something, learns eating habits with AI
3 Re-engage a stewardship worldview	Farmer's market; Metropolitan buying clube; Co-ops; CSAs; Belcampo; Mindful meats; Food exchange/donation - exchange produce you're not going to use with someone else or donate to non-profit	Sustainable food quest - guided bonding activity introducing small groups to existing sustainable systems and possible new behaviors	CrowdCow; Goodby; Portland Meat Collective; Atlas of Butchery; Indigenous farming project; Square roots; Agri-hoods; INFARM; Edible Schoolyard; Big Green; Red Hook farm; The food project; Center for land-based learning; FFA	Promote food tourism in Pittsburgh - could be promoted on platforms such as Airbnb
4 Eliminate the floundering moment	Purple carrot; Sakara life; Epicured; Veestro; Urban remedy; Mosaic; Sprinly	Cooking courses for new parents - work with their children	Sustainability point system created by a group of food producers - remove cognitive load; App that helps people assess what moves they can personally make to be more sustainable	Plantable; Forks over Knives; Equal parts; 'Sweat app'/'Taste app for individual diet change, providing toolkit
5 Remix existing contexts and and content in creative ways	People's grocery; St Louis MetroMarket	AbillisInverg	Shared earth; Smallhold; Babylon microfarms; Grocery stores/restaurant receipts showing total cost AND total externalities of food choices	Classes in grocery stores for vegetarian/vegan cooking
6 Building food communities	Simple feast	Veganuary; Plant-based transition sympathy groups - groups of 15 people that share a desire to change diets and support each other through it; No corn challenge	Indigenous food and agriculture initiative; Slow food movement; Aggregated city database of produce available from local farmers that restaurants/grocery stores can view/purchase from	Re-frame food seasonality as taste profiles - Pittsburgh 'terroir' week, chefs explore what Pittsburgh tastes like through vegetables

The second mode of engagement with small communities that I investigated focused on storytelling and the possibility of re-shaping the story being told about food, vegetables and meat, thereby changing the social meaning of them through conversations and metaphor. Reflection is a necessary component of changing a story and it requires a collective imagining of the future that we desire as a community. I investigated whether the role of existing organizations in the community could pivot towards sustainability, leveraging familiar brands or places to start a conversation about our existing food stories. This approach included physical spaces such as workplaces, grocery stores, hospitals and schools. I felt that these contexts would provide opportunities to make the conversation about sustainability ubiquitous, inspiring people to consider its importance based on exposure to it from organizations that they trusted. However, none of these contexts aligned with the intimacy of the communities that both Block and Costello believed to be necessary for transformational change. Furthermore, given my lack of experience in the industry itself, I did not believe that I was in a position to re-shape the various stories around food with authority.

The last mode of engagement that I explored through the lens of community and reflection was natural fractures. Through the SPT research and my own life experiences, I discovered the potential of natural fractures, or transitions that we experience in life, to prepare us for change and act as triggers. When change occurs, we naturally search for support, often finding existing communities or building new ones to develop new practices. Change also prompts reflection on existing practices as we decide which to keep and which to let go in our new contexts. Through my literature review, I discovered that O'Neil, Clear, Friday and Hazas (2019) similarly found the importance of natural fractures as a mechanism for changing practices in their research on food practices in the UK. The authors noted that a common trigger for change that arose in interviews was having children, which changed family dynamics and introduced an "ethics of care" (p. 229) that often meant deeper reflections on the types of purchasing and consumption habits practiced.

Upon reflection, many of my conversations with faculty kept coming back to this pivotal family moment, especially for those experiencing this change for the first-time. I was curious whether the ethics of care that new parents felt for their child would or could also extend beyond the family into the wider community and environment.

CHOOSING A TARGET AUDIENCE: FIRST-TIME EXPECTING AND NEW PARENTS

Based on my discoveries, I chose first-time expecting and new parents as the target audience for my interventions. There are a number of reasons why I believe that they serve as a logical entry point that can lead to broad impacts on sustainable diets:

Parents are already going through a natural life transition

Transitions in general help us become open to considering and enacting change. This perspective is often a result of big contextual changes, like having children, because they prompt us to reflect on the present and the future. BJ Fogg's behavior model (2009) speaks to the importance of timing in motivating change. He suggests that in order for any triggers to be effective, they need to be appropriately timed to leverage the values of the target audience. As such, an intervention that aligns with parents' values could have a higher chance of motivating behavior change.

Mothers are already undertaking dietary changes

As a result, mothers, and consequently fathers or non-pregnant partners, are naturally highly aware of their eating habits. As I found in my literature review, SPT theorists believe that reflection is crucial to motivating behavior change as it makes us question our existing habits that we subconsciously enact everyday (Scott *et al.*, 2012). Given that this is already occurring, the transition to a sustainable, plant-based diet is a much smaller leap.

Expecting and new parents are interested in developing and maintaining community

Community is crucial for parents because it functions as their primary support mechanism from pregnancy, to birth and beyond. I believe this view to be particularly true for first-time parents, who have never been through a pregnancy before. Communities help guide expecting and new parents through the vast amount of information that is available to them. As a result, parents' close communities often have a high level of influence on them.

Parents have the potential to influence the generations to come

Empowering parents to build sustainable and healthy food habits for themselves and their children has the potential to create generational change. First, by establishing a positive relationship with food for themselves, parents can model positive food behaviors and also have more energy to be present for their child. Second, by introducing good food habits early with children, they are able to integrate the values, skills and knowledge to continue positive behaviors themselves later in life.

Figure 17: Diversifying concepts across commitment and scale

IDEATION

With a target audience defined, I once again referred to the *Discovery Framework* (Myers *et al.,* 2013). I first assessed whether any of the ideas I had developed during my narrowing phase were relevant for first-time expecting and new parents. I then took a focused approach to ideation, exploring additional concepts that were specifically aimed at parents (Figure 18).

There were three major components that contributed to my ideation. First, I took inspiration from the interventions that I analyzed for the *Discovery Framework* (Myers *et al.,* 2013) that were both in the food industry connected communities such as Be My Eyes, mom's groups and Plantable. I noted the elements that resonated with me and aligned to the goals I outlined, and reflected on why they made sense or were working well. I also looked at existing services parents used frequently such as Glow Baby and Baby Center as well as goal setting apps such as Fabulous to understand the mental models and features that were embedded in them.

Secondly, I analyzed some of the core issues being experienced by first-time parents to determine whether they could be used as meaningful entry points for sustainability, which I found McCarthy (1996) highlights as a crucial starting point to learning experiences in my literature review. To get a sense of these pain points, I engaged in social listening on sites such as Reddit and Facebook, looking at parent specific groups or threads. Social listening is the process of gathering information through social media such as comments, number of likes or length of threads, which provides insight into expectations, needs and motivations based on customer conversations (Boyd, 2020). This helped me develop some hypotheses as to what might work with parents.

Finally, I leveraged the existing gaps in the *Discovery Framework* (Myers *et al.,* 2013) to orient the types of contexts that became the focus of my ideation, eliminating those that already had a lot of attention such as meal kits (Figure18). These gaps helped me reflect on why there might be no active interventions and how parents might find them interesting based on the mental model I had developed of parents' needs.

I chose three concepts to storyboard (Figure 19) based on the hypotheses that I wanted to test, the assumptions I wanted to verify or negate, and the differing levels of commitment and scale that each idea proposed. I believed that by spreading the concepts along different spectrums (Figure 17), I could begin to understand how they might work together to create community over time.

HOW MIGHT WE EMPOWER FIRST TIME EXPECTING AND NEW PARENTS TO ADOPT A MORE SUSTAINABLE, PLANT-BASED DIET?

Barriers / Design principles	Domination of the industrialized food supply chain	Discomfort with being different	People are disassociated from the food system	Vegetables as the side, meat as the main
Make change feel familiar	Beyond Meat; Impossible foods; Tofurkey; Tofu; Quorn; Seitan; Bitty foods; Farm to College; National farm to food network	Modelling existing parents who are sustainable	Memphis meats; JUST; Future meat technologies; More-Than-Human lab	Blue apron; Every plate; SunBasket; Gobble; Green chef; HelloFresh
Make food systems conversations ubiquitous	Porter road; Open Food Network; Good Meat Project: Switchboard	New parent conversation cards – introduced through classes; Sustainable lunchbox for parents – target those who do not work close to eating outlets	Farm to People; Open Food Network; Local Food Connection; Pod foods; Beef tracking devices; Eat Wild; Buycott	Plates/scales that can determine nutrient content – helpful alternatives if low on something, learns eating habits with AI
Re-engage a stewardship worldview	Farmer's market; Metropolitan buying clubs; Co-ops; CSAs; Belcampo; Mindful meats; Pittsburgh food secrets – newsletter that gives updates of what is going on in the food world e.g. farmer's markets, com pick up days; Food exchange/donation – exchange produce you're not going to use with someone else or donate to non-profit		CrowdCow; Cooolby; Portland Meat Collective; Atlas of butchery; Indigenous farming project; Square roots; Agri-hoods; INFARM; Edible Schoolyard; Big Green; Red Hook farm; Center for land-based learning; FFA	Easter show – once a year festival with rides that brings farmers to Pittsburgh for competitions
Eliminate the floundering moment	Purple carrot; Sakara life; Epicured; Veestro; Urban remedy; Mosaic; Sprinly; Baby and adult meal delivery	Baby and me survival guide – help parents get into routine, reach goals such as meal prep and introduce fun family activities; Cooking courses for new parents	Sustainability point system created by a group of food producers – remove cognitive load; Child and parent week-by-week meal plan guide – include how to make adult and toddler meals from same ingredients (partner with baby goods company)	Plantable; Forks over Knives; Equal parts; Pregnancy meal plan for different kinds of diets; Baby kitchen good that include meal plans/access to help
Remix existing contexts and content in creative ways	People's grocery; St Louis MetroMarket	Library food discovery events e.g. seed library	Shared earth; Smallhold; Babylon microfarms; Banks allowing for sustainability goals e.g. grocery CO2 emissions; Playground with education about sustainability – use metaphors e.g. cycle, balance, spring	Classes in grocery stores for vegetarian/vegan cooking
Building food communities	Simple feast	Veganary; Bites, pubs and bantor - food community through work	Indigenous food and agriculture initiative; Slow food movement; Aggregated city database of produce available from local farmers that restaurants/grocery stores can view/purchase from	Re-frame food seasonality as taste profiles - Pittsburgh "heroir" week, chefs explore what Pittsburgh tastes like through vegetables

Figure 18: Discovery Framework new parent ideation

HOW MIGHT WE EMPOWER CONSUMERS TO ADOPT A MORE SUSTAINABLE, PLANT-BASED DIET?

Barriers / Design principles	Domination of the industrialized food supply chain	Discomfort with being different	People are disassociated from the food system	Vegetables as the side, meat as the main
Make change feel familiar	Beyond Meat; Impossible foods; Tofurkey; Tofu; Quorn; Seitan; Bitty foods; Farm to College; National farm to food network	Include sustainable food resources in the mindfulness or exercise apps e.g. Sweat, Headspace; Incorporate resources into yoga studios; Host sustainable dinner with friends – guided discussion, must learn something to make the meal (e.g. Polan's dinner)	Memphis meats; JUST; Future meat technologies; More-Than-Human lab; Interactive food display of seasonal, local produce - information table that displays product data (similar to museums)	Blue apron; Every plate; SunBasket; Gobble; Green chef; HelloFresh; Introduce vegetable forward menu at sports games every few weeks - engage vegetarian/vegan players
Make food systems conversations ubiquitous	Porter road; Butcher Box; Good Meat Project: Switchboard; Sustainable food delivery app - only delivers from certified 'Sustainable Pittsburgh' restaurants; Sustainable lunch delivery app - delivers from certified sustainable restaurants, only for lunch, targetting business outside downtown areas	Resident 'onboarding'/foster families - new residents paired with close neighbor with content on sustainability systems in the neighborhood; 'Be my eyes' but crowdsourcing vegetarian recipes from picture of contents of fridge/vegetables	Farm to People; Open Food Network; Local Food Connection; Pod foods; Beef tracking devices; Eat Wild; Boycott; Hospital urban garden; 'vivino for food' – depicting ecological impacts of menu choices	Plates/scales that can determine nutrient content - helpful alternatives if low on something, learns eating habits with AI
Re-engage a stewardship worldview	Farmer's market; Metropolitan buying clubs; Co-ops; CSAs; Belcampo; Mindful meats; Food exchange/donation - exchange produce you're not going to use with someone else or donate to non-profit	Sustainable food quest - guided bonding activity introducing small groups to existing sustainable systems and possible new behaviors	CrowdCow; Cooolby; Portland Meat Collective; Atlas of butchery; Indigenous farming project; Square roots; Agri-hoods; INFARM; Edible Schoolyard; Big Green; Red Hook farm; The food project; Center for land-based learning; FFA	Promote food tourism in Pittsburgh - could be promoted on platforms such as Airbnb
Eliminate the floundering moment	Purple carrot; Sakara life; Epicured; Veestro; Urban remedy; Mosaic; Sprinly	Cooking courses for new parents - work with their children	Sustainability point system created by a group of food producers - remove cognitive load; App that helps people assess what moves they can personally make to be more sustainable	Plantable; Forks over Knives; Equal parts; 'Sweat app'/Taste app for individual diet change, providing toolkit
Remix existing contexts and content in creative ways	People's grocery; St Louis MetroMarket	Abilioveg	Shared earth; Smallhold; Babylon microfarms; Grocery stores/restaurant receipts showing total cost AND total externalities of food choices	Classes in grocery stores for vegetarian/vegan cooking
Building food communities	Simple feast	Veganary; Plant-based transition sympathy groups - groups of 15 people that share a desire to change diets and support each other through it; No corn challenge	Indigenous food and agriculture initiative; Slow food movement; Aggregated city database of produce available from local farmers that restaurants/grocery stores can view/purchase from	Re-frame food seasonality as taste profiles - Pittsburgh "heroir" week, chefs explore what Pittsburgh tastes like through vegetables

Figure 19: Discovery Framework new parent idea refinement and selection

CONCEPT 1: SQUARE ONE

Square One is a goal setting and tracking app that helps parents set and track sustainable eating goals and habits. The idea was inspired by the diet modification activity conducted during the diary study and the insight that many people did not understand the variety of sustainability moves available to them that could feel more approachable initially (Figure 20).

The concept is aimed at couples tackling sustainability and pregnancy together by allowing the father/non-pregnant partner to take the lead and keep the couple accountable. The concept also explores the way couples have conversations about their future and whether sustainability is included in their thinking and actions.

Over time, the app is intended to lead couples to interact more with their communities, land and existing sustainability initiatives around them as they complete their goals. As a result, they may create new types of communities through mutual interests and discover new sides of their neighborhoods and cities.

Square One

Context | **Entry** | **Engage** | **Extend**

Sam and Jesse are 10 weeks pregnant, expecting their their first child.

As the chances of miscarriage lower, Sam and Jesse are allowing the concept of being parents sink in. While excited for this new chapter, they are nervous. They want to make sure their child is happy and healthy but are also aware of the climate changes occuring.

Although they agreed to do a healthy pregnancy, Sam has found her aversions and cravings difficult to manage. However, as the first trimester comes to a close, she has begun to feel better so she wants to get back on track as she's been feeling guilty about her food habits.

After watching Sam go through the first trimester, Jesse wants to help in any way possible and sometimes feels at a loss for the best way to do this.

After a discussion one night about Sam feeling better, Jesse suggested that they set goals for themselves as a couple and work their way towards healthy, sustainable food habits together, with Jesse supporting Sam as much as possible.

Jesse had heard about Square One from one of his colleagues and a recent first time dad. It's an app that helps couples set and track sustainable eating goals and habits. The suggestions that help couples build towards their goals are driven by AI that learns from a couple's initial input, their behaviors using the app and scientific research on consumption habits that positively affect the earth.

When first starting to use the app, couples input goals, a time frame for when they would like to achieve the goals and answer a short questionnaire about their lifestyle.

Square One then suggests a trajectory towards sustainability goals with multiple actions suggested. It tailors these options to the couple's lifestyle and location but ultimately lets them decide the final path they take as the goal is to help couples build and maintain eating habits that are good for them and the environment.

While the app doesn't track nutrition, couples can input goals the doctor has set during check ups to keep it all in one spot. Jesse's colleague cautioned that the AI wouldn't use that as input, leaving nutrition to the doctor.

Sam thinks this is a great idea and appreciates Jesse's support. She wants to test the flexibility of the service as she isn't sure how her pregnancy is going to develop up to graduation.

Sam and Jesse fill out the questionnaire and their goals, prompting some good discussion on where they saw their future going. Jesse envisions a small vegetable garden while Sam wants to try more vegetarian meals. After setting some ground rules, Jesse agreed to spearhead the effort.

Over time, Sam and Jesse discover a whole new side to their neighborhood using Square One. They manage to stick to new habits by taking small steps at a time, building their knowledge and confidence. They even get their friends involved, volunteering at their local community garden together, creating a different relationship with land and place.

Learning gap

Knowledge gap - unsure how to help partner and maintain healthy, sustainable diet

Skills gap - difficulty setting and tracking sustainability goals

Knowledge gap - challenge finding a trajectory towards sustainability, do not understand options possible

Communication gap - unsure how to have conversations about sustainability

Skills gap - reinforce knowledge through activities

Motivation gap - lack of confidence in knowledge and skills to be sustainable

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Hypothesis

Hypothesis 1.1 FTEPs are the best entry point into sustainable dietary change

Hypothesis 1.3 FTEPs reflect on current behaviors in relation to sustainability due to child

Hypothesis 1.4 While there are variations in the audience, there are some common hopes, fears and needs

Hypothesis 1.2 FTEPs have high motivation for change and propsensity to act

Hypothesis 4.1 FTEP prioritize diet change

Hypothesis 2.1 Uncertainty of possible sustainable diet moves and difficulty planning are top reasons for lack of action to date

Hypothesis 2.2 Low commitment channels, such as an online platforms, are a desirable entry point

Hypothesis 3.2 New parent communities have a large influence on new parent decisions

Hypothesis 4.2 FTEP are willing to commit more time to sustainable eating habits if they see progress

Hypothesis 4.4 Goal directed practice and targeted, timely feedback will encourage continued habit change

Hypothesis 4.3 Sustainable diet knowledge and planning skills empower FTEP, leading to sustained diet change

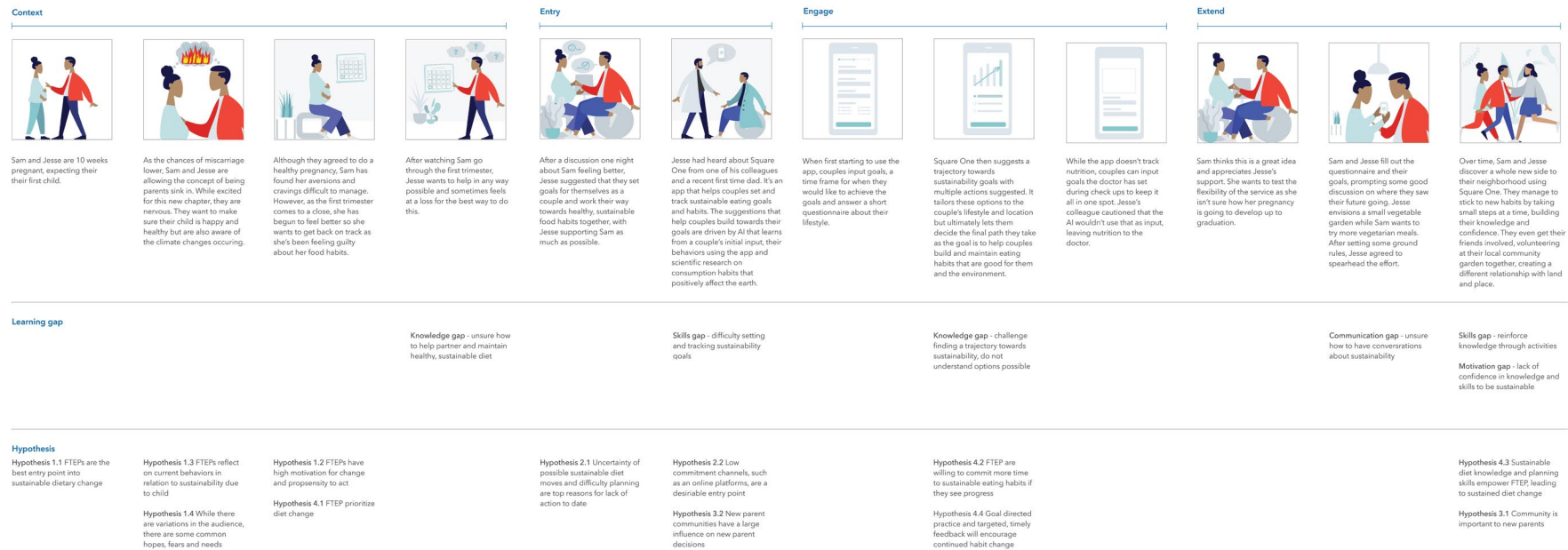Hypothesis 3.1 Community is important to new parents

Figure 20: Square One storyboard

CONCEPT 2: HELPING HAND

Helping hand is an open platform that enables people to share photos of produce with their community of users and get ideas from the community in their vicinity on how to best use the produce. It also provides information about local sustainable businesses and events, growing awareness for what already exists in the region (Figure 21).

The concept is inspired by 'Be my eyes' and the increasing popularity of text-a-chef services. It aims to leverage the knowledge of the community to help people become more confident in trying new, local produce. While conducting research, I also commonly heard that people had trouble finding new recipes, especially when they were looking to shift their diet towards plant-based meals.

Over time, the intention of the concept is to strengthen local food confidence in individuals, supporting the concept of farmer's markets and CSAs. Along the way, this concept could also foster an online community through small acts of support and gratitude between residents. Given that the online community is comprised of people who reside in the same region, an opportunity for self-organized, in-person events arises as well.

Helping Hand

| Context | | | Entry | Engage | | | | | Extend | |

Context

Charlie and Avery are 20 weeks pregnant, expecting their first child. They are interested in maintaining a diet that is healthy for their baby, themselves and the Earth.

They have always wanted to maintain a good food habits but life is hectic with a never-ending list of commitments so it never made it to the top of the priority list. That is, until their first doctor's meeting when they found out they were pregnant. They found out just how much their diets could affect their child.

After a few weeks of trying healthy and sustainable eating, farmer's market trips and (much) less take out, Charlie and Avery feel like they are running out of ideas. Sometimes they are just too exhausted for meal prep or recipe research, falling into some of their old habits.

Entry

One morning, on the way to work, Avery scrolls through instagram and sees an ad for a service called Helping Hand.

Engage

She discovers that Helping Hand is an open platform that allows users to share photos of produce that they have in their fridge or are unsure how to use with people in their community. The service sends push notifications to members of the app who are closest.

This allows people to crowdsource ideas from others in their area who know the local food outlets available or have more familiarity with seasonal produce.

Helping Hand also provides easy access to information about sustainable eating in Pittsburgh such as websites about local produce, farmer's markets and restaurants with sustainability certifications. This allows residents to identify places or businesses that may help them maintain sustainable eating habits, making small habit changes easier.

Avery shares this with Charlie as an option to get them out of their recipe rut. Together, they agree to give Helping Hand a shot.

Later that night, they post a photo of chanterelles they had picked up at the farmer's market as they weren't sure what to do with them. Within minutes, three people respond with suggestions and links to easy, healthy recipes.

Extend

After that experience, Charlie and Avery decide to use Helping Hand to help them meal prep and give them confidence to try new vegetables local to Pittsburgh. They also feel it is important to give back by sharing their own favorite recipes too.

After a few months of using the app, Avery and Charlie feel more confident maintaining healthy, sustainable eating habits now and even when the baby comes. Not only did they learn a lot about the food around them from their neighbors, they even made a few friends along the way.

Learning gap

| | Motivation gap - healthy, sustainable diet not a priority before child | Knowledge gap - do not know many easy, quick and healthy recipes | | Knowledge gap - unsure how to use or combine new produce | Environment gap - does not currently support ad hoc community sharing of recipes | Knowledge gap - lack of knowledge of available produce in the area | | | Communication gap - lack of capability to be recognized for giving back | Environment gap - difficulty establishing new communities that facilitate adult learning |

Motivation gap - lack of time to research and prepare

Skills gap -

Communication gap - visibility of local, sustainable businesses

Hypothesis

Hypothesis 1.1 FTEPs are the best entry point into sustainable dietary change

Hypothesis 1.2 FTEPs have high motivation for change and a propensity to act

Hypothesis 1.3 FTEPs reflect on current behaviors in relation to sustainability due to child

Hypothesis 1.4 While there are variations in the audience, there are some common hopes, fears and needs

Hypothesis 2.1 Uncertainty of possible sustainable dieit moves and difficulty planning are top reasons for lack of action to date

Hypothesis 4.1 FTEP prioritize diet change

Hypothesis 2.2 Low commitment channels, such as online platforms, are a desirable entry point

Hypothesis 2.3 Peer to peer learning is desired and builds community

Hypothesis 4.3 Sustainable diet knowleddge and planning skills empower FTEP, leading to sustained diet change

Hypothesis 4.2 FTEPs are willing to commit more time to sustainable eating if they see progress

Hypothesis 3.1 Community is important to new parents

Figure 21: Helping Hand storyboard

CONCEPT 3: BITES, BUBS AND BANTER

Bites, bubs and banter is a dinner event exclusively for moms that is organized by employers once a month aimed at helping new moms meet each other and create a supportive network within the workplace. The event is moderated by a 'Host mom' and topics focus on sustainable, mom-safe food (Figure 22).

The concept aims to help mothers effectively deal with the isolation from other adults that they often experience, leveraging existing commonalities in their life stage and workplace. While conducting research, many mothers mentioned their life being entirely about their children or pregnancy so the intention is to provide a structured, alternative focus that they also share.

Over time, the goal of the events is to create a strong support network for women both inside and outside of the workplace while building foundational knowledge and skills in sustainable eating. Participating women could extend their knowledge and skills to the family home by talking to their partners and friends about their experiences. This process can foster awareness of sustainability, possible moves and model behaviors for others.
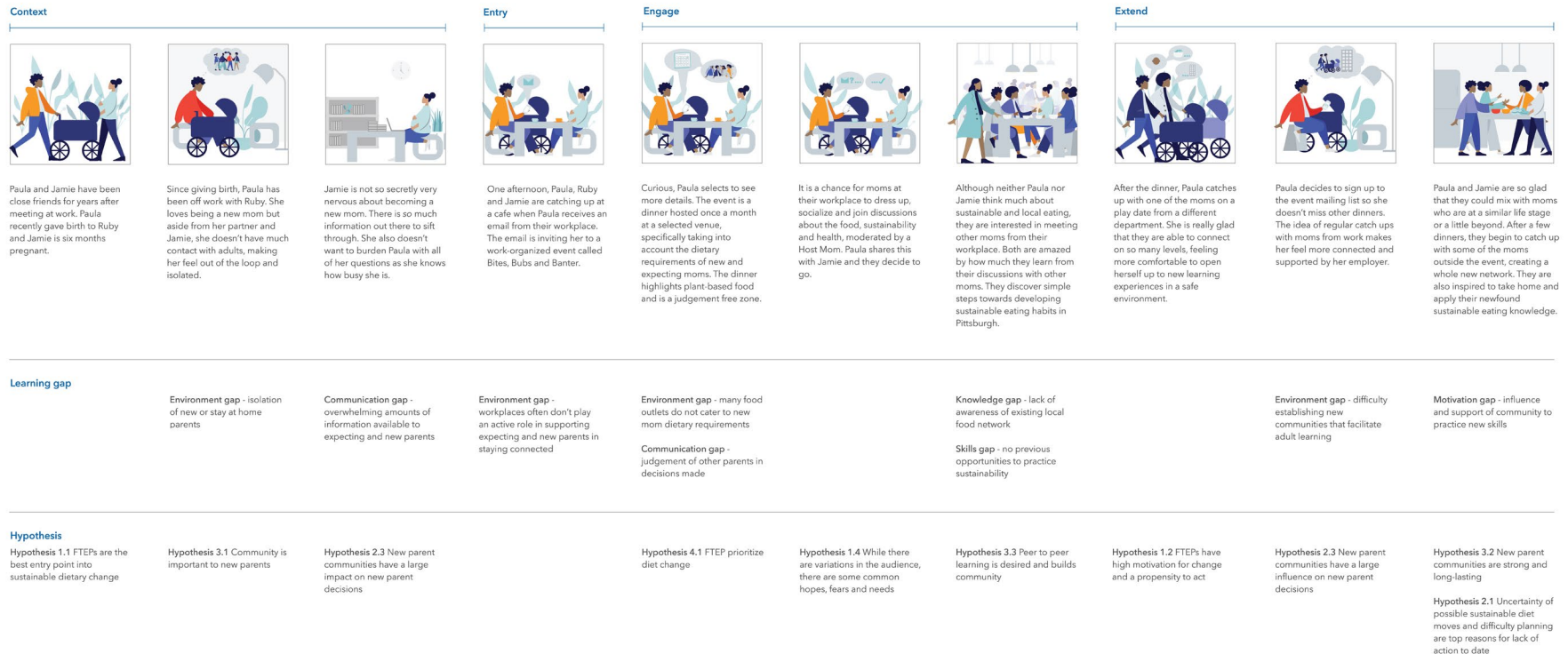
Bites, Bubs and Banter

Context

Paula and Jamie have been close friends for years after meeting at work. Paula recently gave birth to Ruby and Jamie is six months pregnant.

Since giving birth, Paula has been off work with Ruby. She loves being a new mom but aside from her partner and Jamie, she doesn't have much contact with adults, making her feel out of the loop and isolated.

Jamie is not so secretly very nervous about becoming a new mom. There is so much information out there to sift through. She also doesn't want to burden Paula with all of her questions as she knows how busy she is.

Entry

One afternoon, Paula, Ruby and Jamie are catching up at a cafe when Paula receives an email from their workplace. The email is inviting her to a work-organized event called Bites, Bubs and Banter.

Engage

Curious, Paula selects to see more details. The event is a dinner hosted once a month at a selected venue, specifically taking into account the dietary requirements of new and expecting moms. The dinner highlights plant-based food and is a judgement free zone.

It is a chance for moms at their workplace to dress up, socialize and join discussions about the food, sustainability and health, moderated by a Host Mom. Paula shares this with Jamie and they decide to go.

Although neither Paula nor Jamie think much about sustainable and local eating, they are interested in meeting other moms from their workplace. Both are amazed by how much they learn from their discussions with other moms. They discover simple steps towards developing sustainable eating habits in Pittsburgh.

Extend

After the dinner, Paula catches up with one of the moms on a play date from a different department. She is really glad that they are able to connect on so many levels, feeling more comfortable to open herself up to new learning experiences in a safe environment.

Paula decides to sign up to the event mailing list so she doesn't miss other dinners. The idea of regular catch ups with moms from work makes her feel more connected and supported by her employer.

Paula and Jamie are so glad that they could mix with moms who are at a similar life stage or a little beyond. After a few dinners, they begin to catch up with some of the moms outside the event, creating a whole new network. They are also inspired to take home and apply their newfound sustainable eating knowledge.

Learning gap

Environment gap - isolation of new or stay at home parents

Communication gap - overwhelming amounts of information available to expecting and new parents

Environment gap - workplaces often don't play an active role in supporting expecting and new parents in staying connected

Environment gap - many food outlets do not cater to new mom dietary requirements

Communication gap - judgement of other parents in decisions made

Knowledge gap - lack of awareness of existing local food network

Skills gap - no previous opportunities to practice sustainability

Environment gap - difficulty establishing new communities that facilitate adult learning

Motivation gap - influence and support of community to practice new skills

Hypothesis

Hypothesis 1.1 FTEPs are the best entry point into sustainable dietary change

Hypothesis 3.1 Community is important to new parents

Hypothesis 2.3 New parent communities have a large impact on new parent decisions

Hypothesis 4.1 FTEP prioritize diet change

Hypothesis 1.4 While there are variations in the audience, there are some common hopes, fears and needs

Hypothesis 3.3 Peer to peer learning is desired and builds community

Hypothesis 1.2 FTEPs have high motivation for change and a propensity to act

Hypothesis 2.3 New parent communities have a large influence on new parent decisions

Hypothesis 3.2 New parent communities are strong and long-lasting

Hypothesis 2.1 Uncertainty of possible sustainable diet moves and difficulty planning are top reasons for lack of action to date

Figure 22: Bites, Bubs and Banter storyboard

ESTABLISHING CONCEPT HYPOTHESES

Given that I have never been an expecting or new parent myself, I felt that it was important to make explicit the assumptions and hypotheses that informed my three concepts. I aligned these hypotheses to the objectives of my research and the concepts.

Objective 1: Understand the profile and behaviors of the target group for interventions

- Hypothesis A: First-time expecting and new parents are an effective entry point into sustainable dietary change

- Hypothesis B: First-time expecting and new parents have high motivation for change and a propensity to act

- Hypothesis C: First-time expecting and new parents reflect on current behaviors in relation to sustainability to support their child

- Hypothesis D: While there are variations in the audience, there are exists common hopes, fears and needs across the cohort

Objective 2: Understand trigger points for intervention

- Hypothesis A: People's lack of understanding of possible sustainable diet steps and a difficulty in planning are top reasons for a lack of action to date

- Hypothesis B: Low commitment channels, such as online platforms, are a desirable entry point for participants

- Hypothesis C: New parent communities have a large influence on new parent decisions

Objective 3: Understand the importance and possibilities of community

- Hypothesis A: Community is important to new parents

- Hypothesis B: New parent communities are strong and long-lasting

- Hypothesis C: Peer to peer (democratized) learning is desired and builds community

Objective 4: Identify and test potential conditions for sustainable dietary change

- Hypothesis A: First-time expecting and new parents prioritize diet change

- Hypothesis B: First-time expecting and new parents are willing to commit more time to sustainable eating habits if they see progress

- Hypothesis C: Sustainable diet knowledge and planning skills empower first-time expecting and new parents and lead to sustained diet change

- Hypothesis D: Goal-directed practice and targeted, timely feedback is important to encourage continued habit change

TESTING THE CONCEPTS

To validate these hypotheses, I conducted a one-hour resonance testing session with six expecting and new parents, using the storyboards as a visual prompt.

METHODOLOGY

Resonance testing is a method used for evaluating ideas and experiences with a target audience to understand how well their needs are met (WAVE Design, 2020). This activity is conducted by walking participants through visual stimuli and asking them to explain what resonates with them at each step and asking follow up questions as needed for depth. Resonance testing sheds light on the preferences of users and rationales for these preferences, informing the refinement of concepts.

By conducting resonance testing with first-time expecting and new parents, I gained an understanding of them, their needs and values. I also determined whether or not the concepts I proposed were relevant and meaningful to them.

I conducted the testing online via Google Hangouts using InVision to digitally share the storyboards created. Learning from my diary study recruitment process, I recognized that it would be very difficult for expecting and new parents to come to campus for a one-hour session. As a result, I reduced the barriers to participation in order to gain useful insights.

RECRUITMENT

To recruit participants, I leveraged the university community and the faculty in the School of Design as they were most accessible. I found that existing parents often know other parents through mother's groups, work or daycare and they happily referred me to those people who they believed would be interested. As a result, the diversity of my participant group increased. I interviewed one expecting parent and five new parents, which included four mothers and two fathers.

OVERALL LEARNINGS FROM RESONANCE TESTING

After conducting the resonance testing, I used affinity diagramming to find the patterns between the different feedback sessions I conducted. This method enables the visible clustering of observations into meaningful groups and organizes the qualitative data (Harrington and Martin, 2012). The groups highlight the relationships between the observations, which enabled me to draw insights based on the underlying themes of the relationships, their importance to participants and the frequency at which they were mentioned. The insights were:

Sustainability is not a factor of consideration (hypothesis 1C)

While parents do think about the future and mothers become more conscious of their eating habits during pregnancy, their driving concern is health or practical day-one planning. As a result, sustainability needs to be embedded within a utility-driven trigger rather than being the explicit reason why a service product is used. *Values: health of child, practical knowledge, limited time to prioritize anything beyond what is happening at this moment.*

Parents see their child's wellbeing as different from their own (hypothesis 4A)

Parents spoke about buying organic foods and home cooking their child's food but preparing a frozen pizza for themselves. With the time that they had, they wanted to invest it in their child's health rather than their own. However, parental health is crucial for them to be able to continue caring for their child to the fullest extent possible, especially over the long-term. Connecting care with sustainability can be an important motivating factor for parents. It is also important to note that mothers were typically the main food decision makers, often because they physically had to change their eating habits. *Values: selflessness, health and safety.*

Meal prep is seen as a milestone by parents (hypothesis 1B)

When talking about planning and routine in relation to eating, parents mentioned meal prepping as a symbol of normal habits and coping with new parent life. The concept of having time to cook is important to parents and although they eat a lot of take-out during pregnancy and the early months of parenthood, none of them seem to be using services such as pre-prepared meal delivery. This behavior is potentially due to cost and a stigma to admitting 'failure' to cook by purchasing these meals. *Values: routine, home cooked meals, pride in cooking, time, planning.*

New parents build their network during their pregnancy and work on maintaining this network after birth (hypotheses 2C and 3A)

Given the amount of information that exists, expecting parents' first turn to their immediate network of new/existing parents for advice. These people often have similar lifestyles and values, modeling the type of pregnancy the couple would prefer. Parents seem to grow their network as they connect to other expecting or new parents in solidarity and support. Classes and birth clubs facilitate the expansion of such networks. Once the child is born, social events become a bigger commitment and there exists a lot of uncertainty as activities are planned according to the child's schedule. As a result, focusing on building community during pregnancy would likely be beneficial. *Values: trusted sources of information, advice, community, support, am I doing this right.*

Sustainability is regarded as disconnected from parents' common activities and behaviors (hypothesis 2A)

Although parents note that they do not explicitly think about the Earth, many of them would go on to describe behaviors that align with the mindset of sustainability by mentioning activities such as going to the farmer's market, growing a garden, purchasing locally at co-ops and choosing organic produce. Once again, their primary driver was health without any clear links to sustainability. *Values: health, supporting local.*

Classes and workplaces are not well leveraged as a natural entry point for intervention (hypothesis 1D)

All parents attended classes during pregnancy where many different kinds of topics were discussed, providing an opportunity to include sustainability. The concept of work-organized mom events in large organizations resonated with the parents I met. I found that similar events were already happening naturally in smaller workplaces, narrowing the type of organization where this event would work best. *Values: convenience—meet me where I already am.*

Very few action-based apps exist (hypothesis 4D)

Many of the apps available are focused on the physical state of an expecting mother, such as tracking development of the fetus, or utility-focused, such as timing contraction length. Goals are never set by the parents but rather by doctors who follow certain medical standards. *Values: reassurance, understand what can't be seen, safety of the baby.*

There is little willingness to download new apps (hypothesis 2B)

Parents generally were not huge fans of apps, only using a couple during or after their pregnancy that were recommended by friends. Facebook was a common touchpoint used for moms. They leveraged the online moms groups that were available as well gained feedback from members. *Values: privacy, low commitment, opinion of the network around them.*

DEEPENING THE CONCEPTS

**Developing detailed designs to
stimulate social change in food systems**

INTRODUCTION

The second concepting phase of my research enabled me to pursue two possible interventions—Munch and FamilyFuel—in detail based on my insights from the previous phase of work. In this stage, I developed detailed storyboards and a prototype to visually communicate the concepts. This process enabled me to make the theory concrete, actionable, and interactive for a final round of testing to ensure I was applying my insights to the interventions in a meaningful way. The following section summarizes my process of creating the final two concepts, describes my usability testing and outlines the insights I gleaned. It also offers a potential future meta-story of systems change.

CONCEPT 1: MUNCH

Munch is a moderated lunch time event exclusively for moms that is organized by a workplace once a month. The event introduces moms to the local food scene, enables them to gain hands-on experience and provides a space for them to discuss popular food topics with a local expert, such as a chef, who specializes in the focal topic. It gives moms the chance to meet other parents and create a supportive network within the workplace. By building skills, knowledge and community focused on food, sustainable eating practices are introduced in a meaningful and engaging way. The community created serves as an important motivator for parents to continue participating in lunches and at home, creating shared experiences that extend beyond their current life stage.

CONNECTION TO INSIGHTS

Navigating a new identity and lifestyle as a mother

Mothers need help navigating a new identity and lifestyle, where they learn how to engage all parts of their identity. These changes are dictated by children who often define family schedules based on their sleep and eating patterns, especially in the early months of their lives.

As a result, Munch is solely for mothers so that they can spend dedicated time engaging parts of their identity beyond motherhood, exploring their interests and developing themselves (Figure 23). This approach emerged from two findings. First, becoming a mother is a very specific neurobiological experience. However, most research focuses on the development of the child rather than a woman's transition into a new identity. Consequently, I felt it was important to provide a

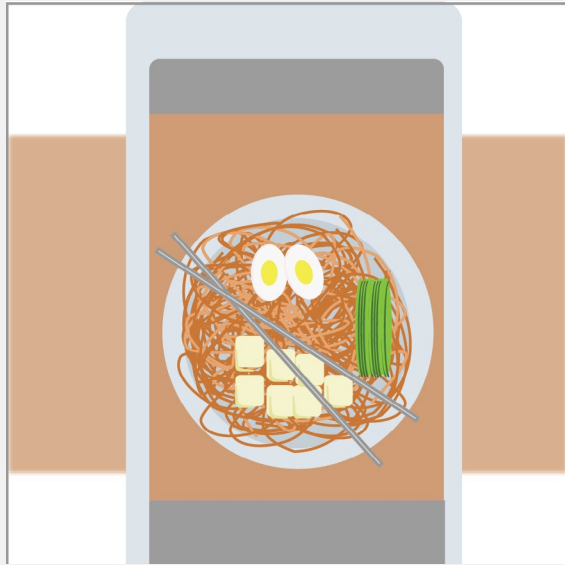Figure 23: Mothers only lunch to engage their identity beyond motherhood

Figure 24: Munch timed at lunch to lower barriers to entry

Figure 25: Moderated discussions to scaffold conversation

space for women to explore inevitable changes with those who could deeply empathize, utilizing the unifying nature of food to bring women together. Second, the mothers I spoke to mentioned the difficulty of leaving the house with young children and the inability to relax, so it became clear that the event needed to exclude children to allow mothers to focus on themselves.

Munch is purposely timed to be at lunch when mothers will already likely be at work or have their child at a daycare, which lowers the barriers to entry (Figure 24). A new identity requires mothers to juggle many roles at once, which reduces the time available to focus on themselves. During the resonance testing, mothers raised concerns about the original timing of the event at dinner, explaining that there are many competing priorities at that time of the day, especially when establishing a routine with young children. I identified this problem as an environment gap (Dirksen, 2012), where my proposed intervention was raising unnecessary roadblocks that might prevent it from succeeding. As a result, I shifted the timing to meet mothers in their existing schedules and locations.

The discussion during lunch is moderated, providing loose structure and focus to the conversations, especially given that many participants will, at least initially, be strangers (Figure 25). Given the insight that children determine so much of a new parent's life, I felt it was important to scaffold conversations to ensure a diversity of topics were covered while working towards learning goals. Block (2008) reinforces this notion by highlighting the importance of conversation and facilitated discussion in creating communities through the types of discussions they deem important to have, building trust and collaboration skills within the group.

Overcoming isolation

My research found that new mothers commonly experienced isolation, which was often linked to the lack of an existing community. This finding points to Munch as being particularly important for my audience.

With regular lunch attendance by mothers, the intention of Munch is to create a network of women who share similarities in life stage and workplace, and eventually their interest in food (Figure 26). In this network, mothers are able to have meaningful and relevant discussions with each other, while giving and receiving advice. In order to motivate mothers to regularly attend Munch, I considered ways of reintroducing a meaningful reason for them to return to the community after each lunch. McCarthy's 4MAT system (1996) highlights the importance of the entire lunch experience in motivating attendees to return by focusing on making

Figure 26: Commonalities between women help overcome isolation

Figure 27: Expert moderators maintain engagement in event

personal connections to the learning topic. Initially, learners strive to find personal relevance in the purpose of the content to attend the event. Then, they look for the content to show them how the skills are applicable to their daily lives through practice. Finally, learners aspire to make personal adaptations of their discoveries to practice what they've learned. By constantly relating their learning to the existing, personal values of mothers, meaning and relevance are reinforced.

Leveraging existing values to motivate learning about sustainability

I found that first-time expecting and new parents do not often search for information about sustainability as it is not a priority amongst all the changes that they are encountering. As a result, it is beneficial for any information about sustainability to be delivered in connection to existing values, which was reinforced through my exploration of McCarthy's 4MAT system (1996).

Munch aims to build foundational knowledge and skills for sustainable eating driven by community needs. The community of moms expresses the knowledge and skills they are interested in learning about food, which informs the theme for each of the lunches. This component of the event not only acts as a motivating factor but also as a mechanism that invites ownership and commitment. Block (2008) states that "community is created the moment we decide to act as creators of what it can become" (p.133), which highlights how ownership, through creation and commitment, work together. As a result, this component gives agency to mothers to identify their own needs with others in their community, focusing on the theme of food and creating their own experience through their values.

Munch also tries to make adult learning dynamic and relevant by having lunches in restaurants and also allowing local experts such as chefs to moderate the events (Figure 27). This approach makes the events feel important and the information reliable, as it is coming from an industry professional. Given that building knowledge and skills takes time, these components are designed to maintain attention. I leveraged Dirksen's research (2012) that identifies mechanisms that are proven to aid learning. The local chefs play the role of storytellers, giving context to the learning and making the experience memorable. By learning together through Munch, mothers not only collaborate with each other, which strengthens their attention, but they also become engaged as a result of seeing their peers take part in the learning. Finally, the hands-on experience uses a multitude of senses, which Dirksen highlights as holding attention and activating deeper memory.
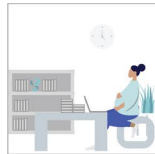
Munch

Paula and Jamie have been close friends for years after meeting at work. Paula recently gave birth to Ruby and Jamie is six months pregnant.

Since giving birth, Paula has been off work with Ruby. She loves being a new mom but aside from her partner and Jamie, she doesn't have much contact with adults, making her feel out of the loop and isolated.

Jamie is very nervous about becoming a new mom. There is so much information out there to sift through. She's so glad she has Paula and some of her other mom friends to help her through this process.
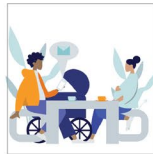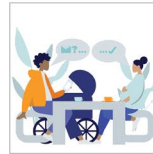
One afternoon, Paula, Ruby and Jamie are catching up at a cafe when Paula receives an email from their workplace. The email is inviting her to a work-organized event called Munch.

Curious, Paula selects to see more details. The event is a lunch hosted once a month at a selected venue near work, gathering moms for the love of food, introducing them to the local food scene and providing a space to discuss popular food topics, pregnancy related or not. Munch organizers then collaborate with local chefs to provide insight and a meal to match the topic. Paula shares this with Jamie and they decide to go.

It is a chance for moms at their workplace to socialize and connect on different levels. Topics are determined by polling food questions suggested by moms at the beginning of each month.

Although neither Paula nor Jamie think much about sustainable and local eating, they are interested in meeting other moms from their workplace. At their first lunch, they learn about the impacts of buying seasonally and where they can do this in Pittsburgh over food sourced from nearby farms. They leave with the chef's guide to seasonal produce to put on their fridge and a recipe to recreate at home.

After the lunch, Paula catches up with one of the moms on a play date from a different department, who has already gone back to work. They discussed her transition back, something Paula has been thinking about as her maternity leave comes to an end. After chatting with her and the lunch with Munch, she feels more confident about returning.
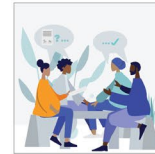
The moms support her initiative, especially given what they have been learning. After a few meetings with corporate catering, they came to an agreement to roll out catering that supports seasonal produce from Pittsburgh's local bioregioin in the entire organization.
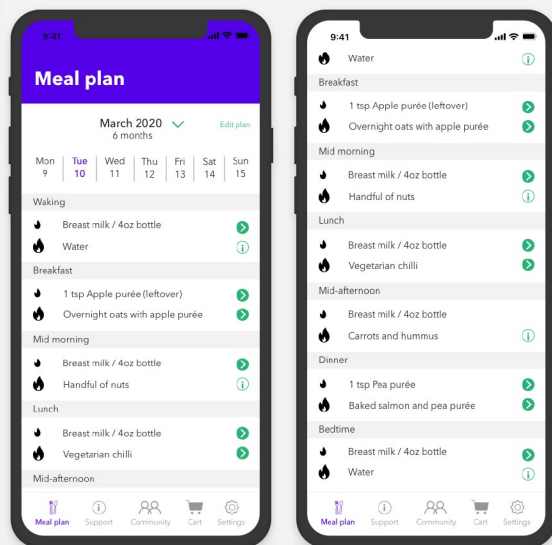
Figure 28: Munch storyboard

Figure 29: Automated meal plans to reduce cognitive load

CONCEPT 2: FAMILYFUEL

FamilyFuel is a personalized, seasonal weekly meal plan for babies and parents, lightening the cognitive load of meal planning and shopping especially as a child reaches the age that they can eat solids. The app increasingly tailors meals as it is used and includes information on the nutrition, local purchasing options and sustainability of each recipe, creating a link between health and sustainability. FamilyFuel gives parents the reliable information that they need to make decisions for their family's eating practices. It highlights the importance of healthy and sustainable food practices for both their child's health and their own. It also provides guidance and support for each new phase of eating that their child experiences. This process helps all participants build knowledge and confidence in their abilities to practice new habits.

CONNECTION TO INSIGHTS

The features built into the prototype relate directly back to the four key insights gained through my research.

Lightening the cognitive load is valued by parents

Through resonance testing, I found that parents appreciated anything that could lighten their cognitive load as they went through the many dietary developments that their child experienced in their first year of life.

For this reason, I decided to automate the meal plans rather than enabling parents to create their own (Figure 29). An additional benefit to automation is that the latest research on sustainability and health can be built into the meal plan. This inclusion not only provides parents with peace of mind for their child's health but also allows them to naturally discover sustainability through the meal plan. Through resonance testing and social listening, I learned that the rapid dietary changes that children go through in their first year greatly influence parents' eating habits. As a result, a child's dietary changes serve as an important entry point to kickstart a shift to sustainable eating practices. Parents mentioned the biggest initial change in eating practices as being the need to plan meals. However, through my diary study I found that planning was incredibly difficult for people to actually implement, requiring a great deal of time and research that parents did not have. In light of this, I believe that it is critical for the service to include an automatic, personalized meal plan for both parents and children to alleviate some of the anxiety that parents feel about their child's dietary development and provide them with sustainable options for eating practices.
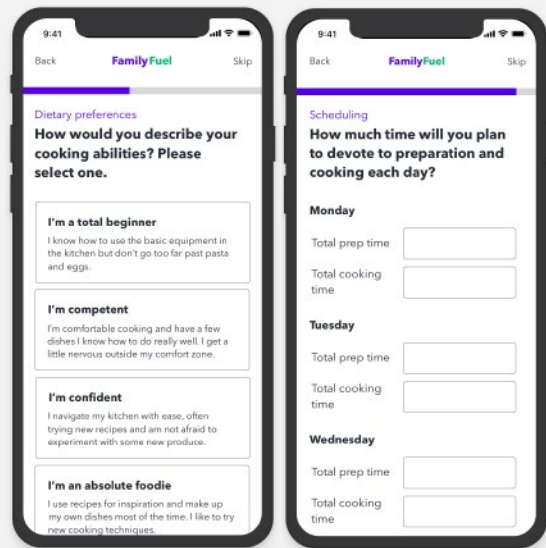
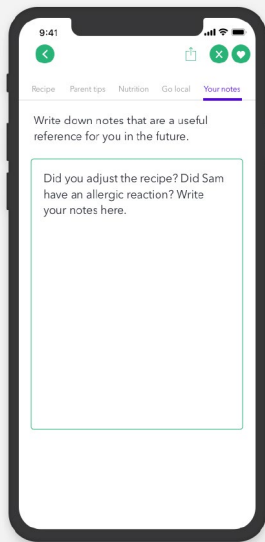Figure 30: Onboarding process personalizes the experience

Figure 31: Notes aid clear documentation of child's food journey

The onboarding process that parents initially go through on FamilyFuel is intended to personalize the eating experience as much as possible so that many of the usual, yet unnecessary, considerations are removed from the equation (Figure 30). As a 'smart' app, it learns from each user's actions and tailors recommendations and the overall experience to the individual over time. Through conversations with parents, I found that they were doing a lot of additional research to ensure any technique suggested by health specialists or friends would work for their family, given that each pregnancy and child is unique. As a result, it is clear that personalization is an important value to achieve the greater goal of successful parenting. I decided to leverage personalization to establish the instrumental value (Ambrose *et al.,* 2010) of FamilyFuel, motivating parents to invest some energy upfront to ensure a positive experience later. Furthermore, personalization builds in ownership of the service, especially given that the app adapts over time, increasing parents' expectation for success.

Leveraging existing tracking habits as foundation for action

Parents track the developments of their baby during pregnancy and in the first few years, working with paediatricians to ensure their baby's development falls within what are deemed to be normal ranges. This activity is important to parents as it provides reassurance that their baby is developing well. FamilyFuel combines tracking with action to help parents feel comfortable extending their existing behaviors and setting goals based on the tracking.

The ability to add notes to recipes and eating stages is intended to help parents remember changes they make to recipes or record their child's reaction to food (Figure 31). The notation process is especially important for recognizing allergies as parents often introduce one fruit or vegetable at a time to ensure any allergies are identified quickly. During resonance testing, many parents expressed the importance of tracking apps in helping them have meaningful conversations with their child's paediatrician based on clear documentation rather than general perceptions. Given that a child's eating habits are an important part of their development, I believe that it is important for parents to have their child's eating history accessible and that it be accompanied by parent observations to strengthen parents' confidence and remove some of their stress that is associated with knowing their child's behaviors. I leveraged the affordances of an app to make taking notes dynamic and personal, embedding it in close proximity to relevant information that would be helpful to provide context, such as a recipe. Embedding this feature in FamilyFuel instantly provided value to parents by streamlining adjacent eating and cooking practices within the app instead of requiring them to search for and find recipes online.
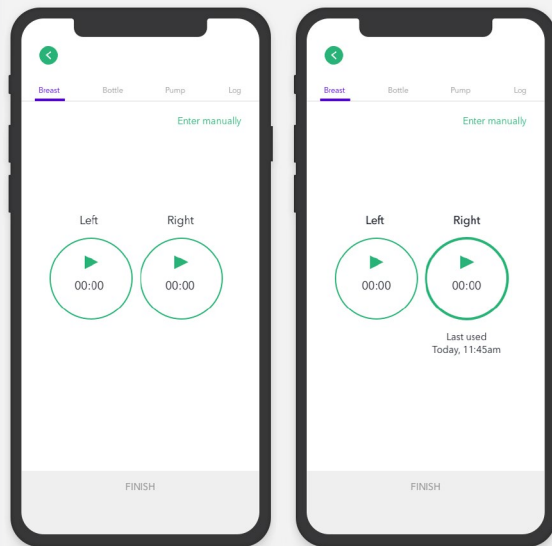
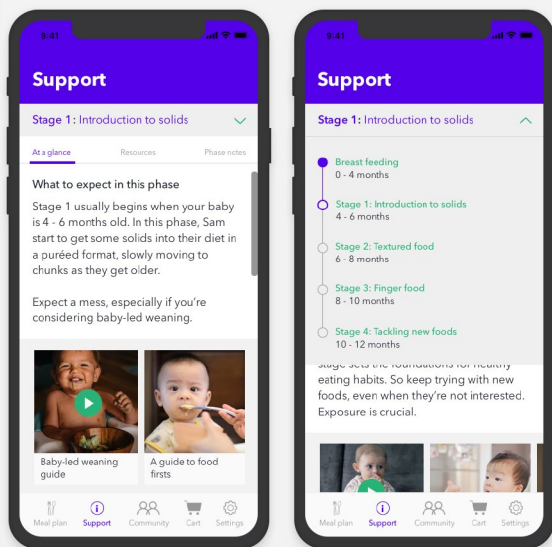Figure 32: Breastfeeding tracking to cover all eating practices

Figure 33: Information pages support parents at each stage

Although many baby tracking apps already have breastfeeding and bottle tracking functionality, I believed that this was important information to retain as it remains a core component of a child's nutrition even as parents begin to introduce solids (Figure 32). Similar to the inclusion of notes as a feature, the breastfeeding and bottle tracking is an important feature in the group of practices that focus on eating and cooking for a baby. In their research on sustainable food practices, Scott *et al* (2012) highlight the importance of understanding the network of practices that individuals undertake if they are to successfully shift towards sustainability because the practices mutually reinforce each other. As a result, I ensured that the full food journey was accounted for in the features of FamilyFuel.

Streamlining access to reliable dietary information

Many parents do a lot of research to ensure that their baby gets what they need for their development but there is a sea of information available, which can cause parents to feel very overwhelmed.

The information pages provide a clear overview of what to expect at each eating stage for the child and signposts additional links to reputable sources for those who want to dig into content deeply (Figure 33). Furthermore, parents have the ability to see the path ahead for their child, enabling them to prepare for upcoming stages, which may lower their anxiety. The eating stages are depicted as a journey to visualize the process that health authorities had constructed for a baby's eating development and compartmentalize the information for parents. However, in order to create an effective learning experience for parents, Dirksen (2012) advocates designing for accomplishments over time and enabling the learner to see the next goal. She explains that this approach maintains motivation and increases confidence as learners know what type of feedback to look for to verify that they're on course. Parents' propensity to track developments shows just how important this information is to them. Furthermore, I added signpost information to provide flexibility to parents, allowing them to decide how much information they want to gather.
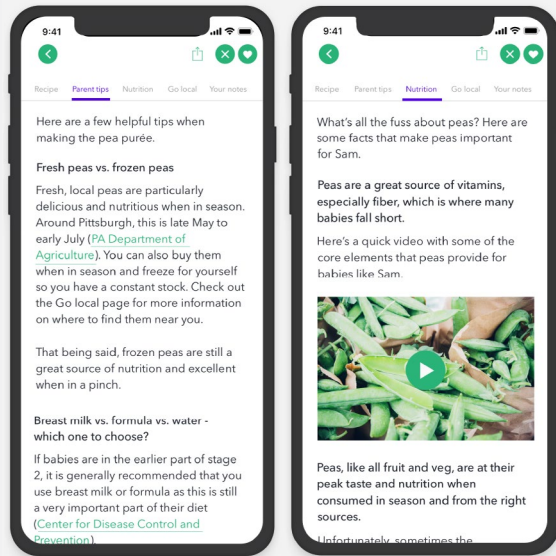
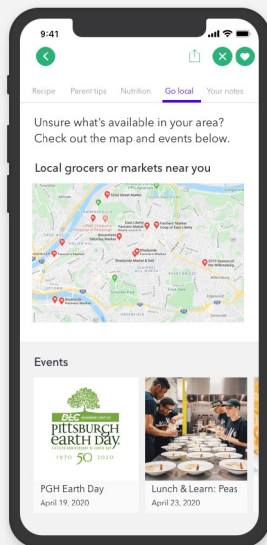Figure 34: Nutrition restricted to recipes to reduce information overload

Figure 35: Go Local increases awareness of local purchasing options

Integrating sustainability through the lens of health

FamilyFuel integrates learning about sustainable food options into the local community through the lens of health, leveraging values that parents already attain.

Every recipe has a detailed set of parent tips and nutrition facts that parents can peruse, especially when their child begins to eat solids (Figure 34). By restricting this information to each recipe, parents are not overloaded with a mass of content at one time and only receive facts about the elements of the dish that they are about to cook that day or week. The feedback I received during resonance testing indicated that parents felt sustainability was complex, which pointed to a clear knowledge gap (Dirksen, 2012) that made the concept seem unapproachable to parents. As a result, I believed it was important to temporarily constrain information to the important recipe ingredients, thereby helping parents make sustainable food decisions one recipe at a time. This approach aligns with Ambrose's strategies (2010) to build task fluency by removing some of the cognitive load and increasing self efficacy, which in turn increases parents' motivation to engage with sustainability and health in their eating habits.

Although many parents are generally supportive of buying locally and contributing to small businesses, many of them have not ventured far beyond their local chain grocery store. As a result, the Go Local page in Family Fuel highlights the options available in the area close to them, increasing awareness (Figure 35). Once again, a lack of familiarity was present in parents' knowledge of existing small businesses near them, making it difficult for parents to enact their supportive attitude of buying locally. This discovery indicated another knowledge gap and also an environment gap, where larger chain stores have more publicity and better real estate in comparison to smaller stores. To bring these two needs together, I believed that there was an opportunity to create a space on FamilyFuel to help improve small business visibility in order to support the existing pieces of the system already working towards sustainable eating practices.
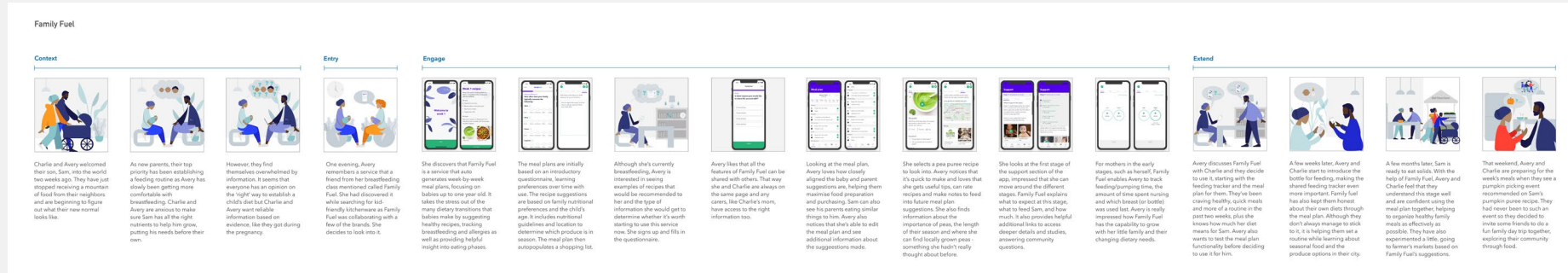
Family Fuel

Context

Entry

Engage

Extend

Charlie and Avery welcomed their son, Sam, into the world two weeks ago. They have just stopped receiving a mountain of food from their neighbors and are beginning to figure out what their new normal looks like.

As new parents, their top priority has been establishing a feeding routine as Avery has slowly been getting more comfortable with breastfeeding. Charlie and Avery are anxious to make sure Sam has all the right nutrients to help him grow, putting his needs before their own.

However, they find themselves overwhelmed by information. It seems that everyone has an opinion on the 'right' way to establish a child's diet but Charlie and Avery want reliable information based on evidence, like they got during the pregnancy.

One evening, Avery remembers a service that a friend from her breastfeeding class mentioned called Family Fuel. She had discovered it while searching for kid-friendly kitchenware as Family Fuel was collaborating with a few of the brands. She decides to look into it.

She discovers that Family Fuel is a service that auto generates week-by-week meal plans, focusing on babies up to one year old. It takes the stress out of the many dietary transitions that babies make by suggesting healthy recipes, tracking breastfeeding and allergies as well as providing helpful insight into eating phases.

The meal plans are initially based on an introductory questionnaire, learning preferences over time with use. The recipe suggestions are based on family nutritional preferences and the child's age. It includes nutritional guidelines and location to determine which produce is in season. The meal plan then autopopulates a shopping list.

Although she's currently breastfeeding, Avery is interested in seeing examples of recipes that would be recommended to her and the type of information she would get to determine whether it's worth starting to use this service now. She signs up and fills in the questionnaire.

Avery likes that all the features of Family Fuel can be shared with others. That way she and Charlie are always on the same page and any carers, like Charlie's mom, have access to the right information too.

Looking at the meal plan, Avery loves how closely aligned the baby and parent suggestions are, helping them maximise food preparation and purchasing. Sam can also see his parents eating similar things to him. Avery also notices that she's able to edit the meal plan and see additional information about the suggestions made.

She selects a pea puree recipe to look into. Avery notices that it's quick to make and loves that she gets useful tips, can rate recipes and make notes to feed into future meal plan suggestions. She also finds information about the importance of peas, the length of their season and where she can find locally grown peas - something she hadn't really thought about before.

She looks at the first stage of the support section of the app, impressed that she can move around the different stages. Family Fuel explains what to expect at this stage, what to feed Sam, and how much. It also provides helpful additional links to access deeper details and studies, answering community questions.

For mothers in the early stages, such as herself, Family Fuel enables Avery to track feeding/pumping time, the amount of time spent nursing and which breast (or bottle) was used last. Avery is really impressed how Family Fuel has the capability to grow with her little family and their changing dietary needs.

Avery discusses Family Fuel with Charlie and they decide to use it, starting with the feeding tracker and the meal plan for them. They've been craving healthy, quick meals and more of a routine in the past two weeks, plus she knows how much her diet means for Sam. Avery also wants to test the meal plan functionality before deciding to use it for him.

A few weeks later, Avery and Charlie start to introduce the bottle for feeding, making the shared feeding tracker even more important. Family Fuel has also kept them honest about their own diets through the meal plan. Although they don't always manage to stick to it, it is helping them set a routine while learning about seasonal food and the produce options in their city.

A few months later, Sam is ready to eat solids. With the help of Family Fuel, Avery and Charlie feel that they understand this stage well and are confident using the meal plan together, helping to organize healthy family meals as effectively as possible. They have also experimented a little, going to farmer's markets based on Family Fuel's suggestions.

That weekend, Avery and Charlie are preparing for the week's meals when they see a pumpkin picking event recommended on Sam's pumpkin puree recipe. They had never been to such an event so they decided to invite some friends to do a fun family day trip together, exploring their community through food.

Figure 36: FamilyFuel storyboard

CONDUCTING USABILITY TESTING WITH THE FAMILYFUEL PROTOTYPE

Although FamilyFuel is based on learnings from the resonance testing, I believed that it was important to determine whether I had truly understood participants' feedback. As a result, I created a clickable prototype from the screen flows to test the concept and form in one-hour usability testing sessions.

METHODOLOGY

Usability testing is a method for evaluating features and experiences with digital applications. It often includes a think-aloud protocol and scenarios to identify any major issues with the interface, which inform further design iterations (Harrington and Martin, 2012). By conducting usability testing, I can ensure that the navigation, design and content work together to address parents' needs.

Once again, I conducted the testing online using Google Hangouts and InVision, which enabled participants to click through the different flows of the interface and provide detailed feedback.

RECRUITMENT

This time, when recruiting participants, I aimed to gain insights from the community outside of CMU. I found a few mother's groups on Facebook that I hadn't reached out to before and contacted them in the hopes that they would share a flyer or information about my study with their members.

The organizer of New Mom's Coffee group helped me recruit participants from many different parts of Pittsburgh. As a result, I reflected on the role of a gatekeeper in activating small communities, such as mom's groups, potentially playing an important role in the change process.

I interviewed six new mothers in this process, with children aged two months to 13 months old.

"The meal plan is compelling because it takes up a lot of mental energy [to plan]."

"It [meal plan] would make my life easier."

"Food introduction for the baby is probably key to grabbing me."

"I am more likely to use the plan for the baby and occasionally for me."

"I like that it has recommendations from the AAP. It shows that it's based on scientific fact"

"I'm skeptical of a lot of information online so it's helpful to find good sources"

"This gives me the data and information that makes me confident in my decision"

LEARNINGS FROM USABILITY TESTING

Coordinating meals is a gamechanger for mothers

All the moms loved the idea of being able to share food and the eating experience with their baby, especially as they began to introduce solids to them. For moms, the implications of this concept were not only important for bonding but were practical. By pairing meals, moms recognized the efficiency gained in the way that they purchased food and prepared meals. Many mothers also explained the importance of the meal plan in reducing cognitive load, mentioning the automatic shopping list as a feature that they appreciated. As a result, it was clear that the concept aligned with the values that moms held.

Children's health and establishing good eating habits are still the key focuses

Although mothers appreciated the app for its efficiency in coordinating meals, most conceded that the personalized food introduction plan for their baby would be the feature to draw them in. Many of the participants described how they experimented with new types of produce to introduce new flavors to their child. This seems like an interesting opportunity to include local fruit and vegetables in their family diet.

All participants expressed the desire to show their children what healthy eating meant through their own behaviors and many purchased organic produce when their child first started eating solids, even though they "couldn't afford it forever". This indicates that there could be a stickiness to the adult meal plan as well.

Community suggestions provide direction for further research

The community of mothers becomes particularly important as they prepare to introduce solids to their child. The participants mentioned that the group was an important source of information, providing ideas for where to begin the feeding journey and modelling the different types of feeding options possible. However, given the unique attributes of each baby, all the participants explained that they would always do additional research to see if the approach was right for them.

Many of the mothers referred to health bodies such as the Centre for Disease Control (CDC), the American Academy of Paediatrics (AAP), the World Health Organization (WHO) or the National Health Service (NHS) in the UK (especially if pursuing baby-led weaning). As a result, they found the evidence-based approach to information on the prototype to be very compelling, giving them confidence in the concept and potentially reducing anxiety associated with the process.

"On other apps we used for tracking, it was a deal breaker if an app didn't have that [share] ability"

"This is very helpful. I wasn't able to do this meal kits so my husband I had to create fake email addresses that we both had access to"

Moms play a crucial role in developing early feeding habits but collaborative parenting is key for a sustained shift

Given that a mother's eating habits directly impacts a child's development during pregnancy and breastfeeding, it is natural that mothers play the main role in feeding during the first few months. This is further reinforced through maternity leave or becoming a stay at home parent.

However, all the mothers expressed the importance of the sharing feature in the concept, some even describing it as a "deal breaker" if it wasn't available. This indicates the importance of transparency as parents raise their children together, making important decisions about family food habits collaboratively.

FUTURE IMPLICATIONS

Figure 37: Rogers' model of the diffusion of innovation (2003)

INTRODUCTION

In the final phase of this project, I applied my discoveries to develop a vision that articulates the sustainable, systems-level change facilitated by my interventions. To do this, I developed four possible scenarios of the future, based on my research, and identified the preferable future I hoped my interventions would inspire. I then visualized the interplay of interventions using the MLP diagram to highlight key milestones on the path to achieving sustainable food systems. Finally, I used the backcasting methodology to indicate the series of events that would pave the way for these milestones to occur. These frameworks enabled me to articulate the envisioned impacts of my interventions through a systems lens, depicting the roles they play in instigating change at a systems level. The following section summarizes my process in creating these artifacts and constructing possible visions of the future.

THE ROLE OF COMMUNITY IN FACILITATING SYSTEMS CHANGE

Community plays a crucial role in interventions that transition through the levels of the MLP, shifting the system and creating positive change. It creates tipping points within interventions, taking them from the fringes of the niche to mainstream acceptance on the regime level. This process of creating tipping points is articulated in Everett Rogers' theory for the diffusion of innovations (2003), which describes the way innovations are adopted and the components that influence adoption or rejection. As a result, he defines diffusion "as a kind of social change...the process by which alteration occurs in the structure and function of a social system" (p.6). This definition highlights the capability of communities to build momentum to achieve significant systemic change.

In Figure 37, the four main elements of diffusion are depicted: the innovation itself, the communication channels used, time and the social system (Rogers, 2003). Of the four elements, community has a significant impact on two. First, small communities, such as parent groups, effectively act as communication channels. This process was evident in my resonance and usability testing as new parents often leveraged their communities to parse through large amounts of information about children's food development. Rogers emphasizes that interpersonal relation-ships are particularly effective at persuading individuals to accept new ideas, especially if they share important commonalities, which is already a characteristic of sympathy groups. He describes how modeling behaviors, which are promoted by both Munch and FamilyFuel, are at the heart of diffusion. As a result, these elements of the interventions are likely to play an important role in their acceptance.
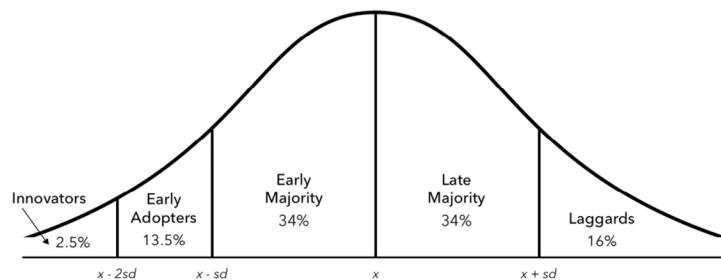
Figure 38: Cone of possibilities (Hancock and Bezold, 1994)

Second, social structures influence the innovativeness of the members of the social system through established norms and opinion leaders, which determine whether innovation diffusion will be impeded or facilitated. Communities play an important role in defining the social systems, binding them together by working towards a common goal (Rogers, 2003). As a result, a community establishing a positive innovation culture through norms and role models could have large, positive implications for diffusion. This theory highlights the important roles that both Munch and FamilyFuel could play as incubators for the acceptance of other niche interventions.

In order to create large-scale systems change, there are two major milestones connected with introducing new innovations into communities (Moore, 2014). The first milestone is reaching early majority adopters, which means that the innovation has a wide enough appeal that it survives the early product life stage. Moore refers to a 16% adoption rate as crossing the chasm. The second milestone is the tipping point, where the innovation is further accepted by late majority adopters and moves into the growth stage of the product life cycle. Moore refers to a 50% adoption rate as the tipping point. These two milestones provide important context for the amount of diffusion necessary to support large scale change. They also highlight the importance of leveraging community when considering systems level transformations.

SCENARIO BUILDING FOR POSSIBLE AND PLAUSIBLE FOOD FUTURES

Hypothesizing the potential impact of the two interventions I designed required me to define my conception of the future. However, given that the future is inherently full of uncertainties, futurists argue there is actually no single future to predict, but rather an infinite multitude of possibilities to be analyzed based on current trends and weak signals to understand what is possible (Dator, 2009). To scaffold my understanding, I used the cone of possibilities framework (Figure 38).

This framework highlights four boundaries with which to think about the future (Hancock and Bezold, 1994). First is possible futures, which encompass anything that could possibly happen, no matter how unlikely. Second is plausible futures, which represent a narrower scope of what could happen, and are based on trends research. Next are probable futures, which we deem more likely to occur and often contain little significant change. Finally, there are preferable futures, which describe the futures we want to happen, commonly represented in visions.
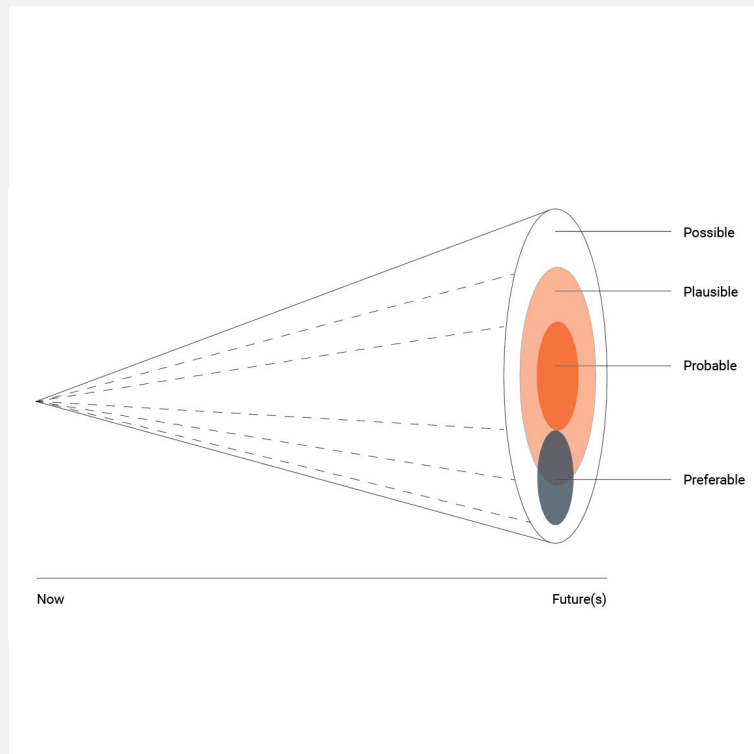
Using this model, it became clear to me that I first needed to investigate plausible food futures before articulating my preferred vision for sustainable food systems in order to ground my thinking in the research I conducted during the exploratory and generative phases of work. Hancock and Bezold (1994) identify scenario building as a mechanism for compiling such research into differing images of the future. They explain that scenarios go into more detail about how current trends may be expressed and the events that lead to their adoption or rejection.

In his essay *Alternative Futures at the Manoa School* (2009), Jim Dator builds on the aforementioned theory by defining four generic categories of scenarios based on his investigation into how people conceptualize 'the future': growth, collapse, constraint and transformation. I used Dator's framework to generate my scenarios, seen in Figure 39, scaffolding the plausible alternative food futures I could envision. To illustrate the relationships between the scenarios, I adapted the matrices in the below figure from the World Economic Forum *The Future of Global Food Systems* report (2017). The horizontal axis speaks to the demand shifts that occur between the different futures. The vertical axis refers to the connectivity between people, including trust, openness of trade and sharing of resources between different cities and nations.
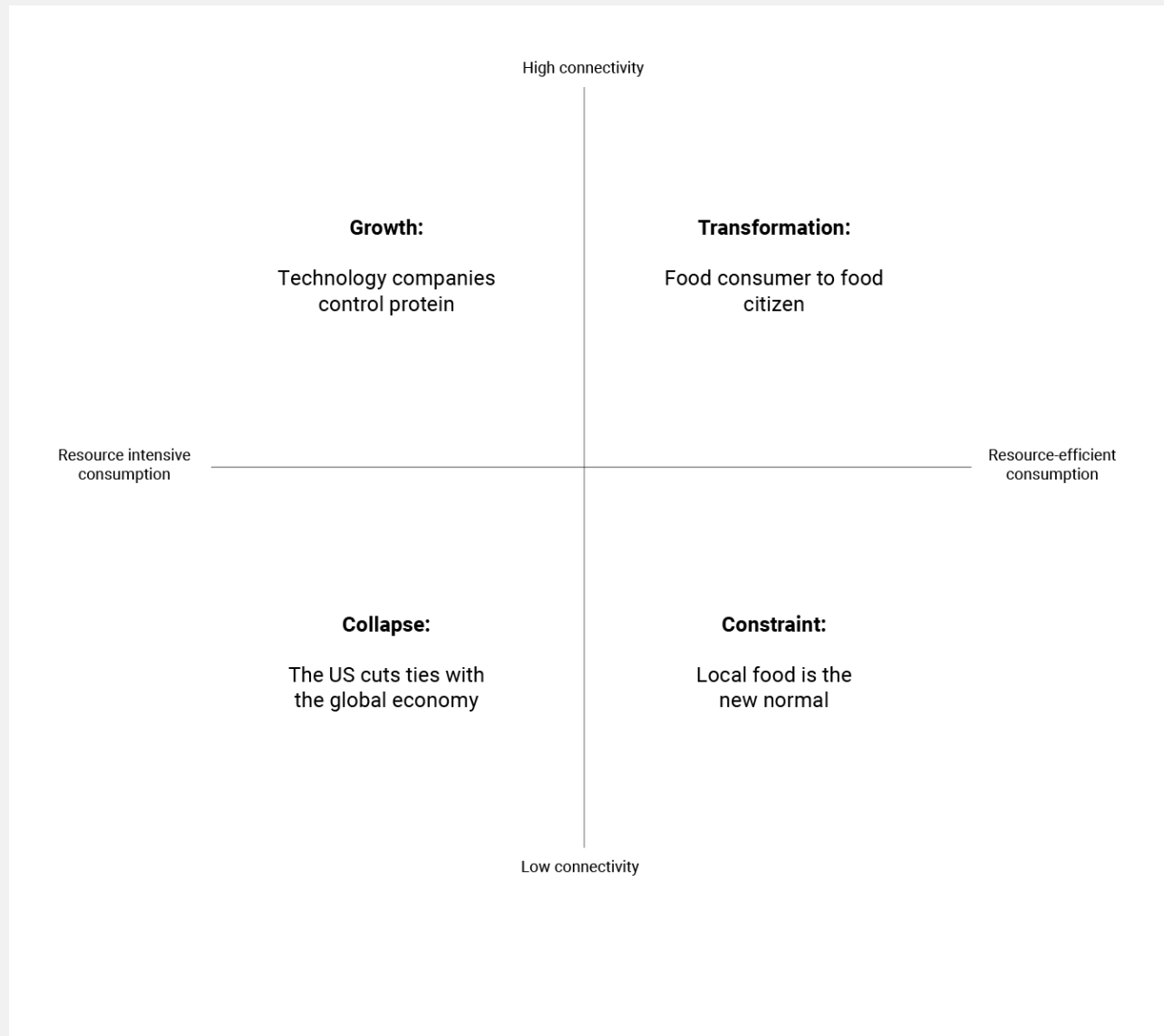
High connectivity

Growth:

Technology companies
control protein

Transformation:

Food consumer to food
citizen

Resource intensive
consumption

Resource-efficient
consumption

Collapse:

The US cuts ties with
the global economy

Constraint:

Local food is the
new normal

Low connectivity

Figure 39: Four images of the future. Framework adapted from the World Economic Forum 2017 report
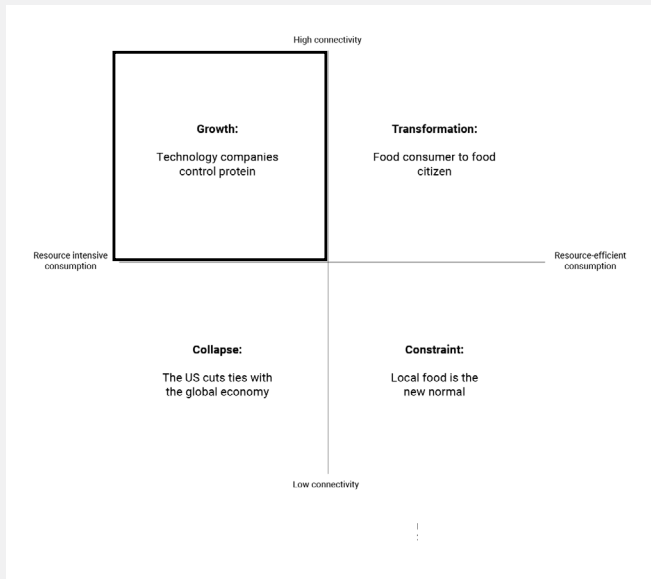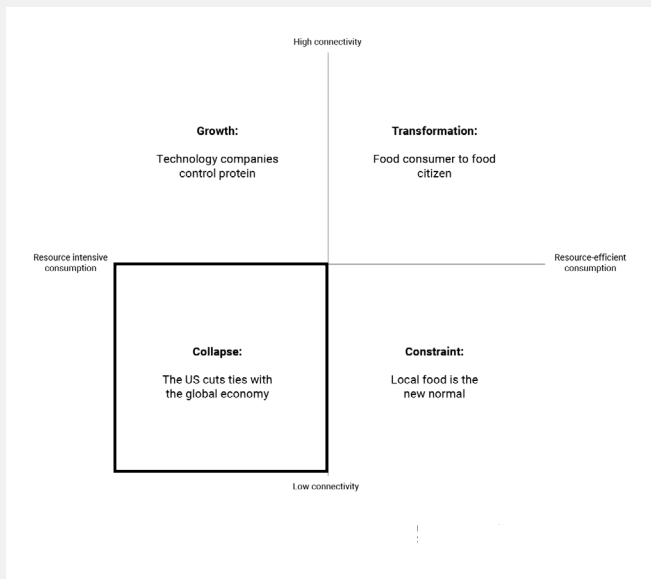
Figure 40

Figure 41

Growth: Technology companies control protein

The growth scenario is defined as a future where progress, often economic or technological, has continued (Dator, 2009). Dator highlights this approach as the dominant narrative of the future for today's society.

In a growth food future (Figure 40), we see a continual drive towards economic growth and a heightened investment into in-vitro meat and meat alternatives, such as Beyond Meat, as the Earth continues to warm. A combination of climate existential anxiety and a desire to hold onto existing eating practices pushes these new forms of meat past the tipping point and into mainstream growth. As a result, the technology companies producing meat alternatives take control of the market, continuing to develop the taste and texture of their products to mimic meat. Technology also plays a large role in manufacturing hybrid food products in response to the diminishing food landscape. These advances help build new food cultures and sustain populations in a variety of environmental conditions, becoming particularly common in areas that have been dramatically affected by global warming. However, hybrid food products are less nutritious, leading to a disproportionate representation of food and health issues in these regions. While governments create global sustainability standards in recognition of the environmental crisis, technology companies control the implementation, supporting the paradigm of growth and productivity with an eco-tinted lens.

Collapse: The US cuts ties with the global economy

Collapse is the scenario where an event or a combination of causes leads to either extinction or a lower stage of development to what we are currently experiencing (Dator, 2009). The climate crisis, global financial crises and pandemics such as COVID-19, have made this scenario increasingly prevalent in social discourse.

In a collapsed food future (Figure 41), there is a failure for governments to agree on common goals, following 'business as usual' practices that lead to limited behavior and policy change in response to large landscape shifts like the climate crisis and COVID-19. These actions lead to continual disease outbreaks, which compound the problems already caused by the climate crisis such as hunger, access to potable water and the number of climate refugees. Over time, countries focus inward, with the US moving to practice total isolationist policies, creating substantial implications on the food industry. There is greater reliance on national farming, renewing interest in agricultural practices. However, existing supply chains are unprepared for the pressure, creating large disruptions in access to food that cause confidence to diminish among recipients. Local food chains are

Figure 42

Figure 43

established to combat national and international problems but trade and labor restrictions increase the cost of food production, which continues to limit food access. With a reduction in global trade, economic growth all but halts, leading to an unprecedented number of job losses as the country manages the shift to lower growth. Rationing is implemented by the government in partnership with private business, creating rising tensions as the socio-economic gap widens and hunger increases without plans for change in an increasingly volatile global environment.

Constraint: Local food is the new normal

In the scenario of constraint, there is a refocusing on economic and social practices, which moves away from economic growth and towards more fundamental values (Dator, 2009). In his research, Dator observed that preservation and restoration were often prioritized to ensure survival.

In a food future where constraint is practiced (Figure 42), environmental degradation and zoonotic diseases have diminished peoples' confidence in existing large scale food systems, creating a shift towards local food production and acquisition. People believe that their locally grown and produced food is safe and of high quality because they are able to shape local food regulations, thereby instilling greater trust. In response to the increased value of local food, urban and vertical farms become mainstream, which redefines the concept of local food systems and improving the access to food. Architecture and city planning reflects these shifts in value, repurposing existing infrastructure to support this expansion. Technologies, such as the cloud, play an important role in data management as they enable people to manage the small, distributed farms through big data collection. These capabilities also slow rural migration to cities, which revive rural towns. However, communities where environmental degradation has hindered the ability to produce food struggle to survive. They are forced to 'import' food but are heavily taxed by the government for the negative externalities produced by transportation. This process increases the cost of food for these communities, leading to malnutrition, especially for those with lower disposable incomes.

Transformation: People shift from consumers to food citizens

The final scenario of transformation anticipates a fundamental change in our existence where a dream society emerges (Dator, 2009). While Dator's definition of transformation is driven by technology, my scenario explores a transformation of mindset and posture.

In a transformed food future (Figure 43), after a few especially dark periods, global governments take a strong stand to limit human impact on the earth in response to
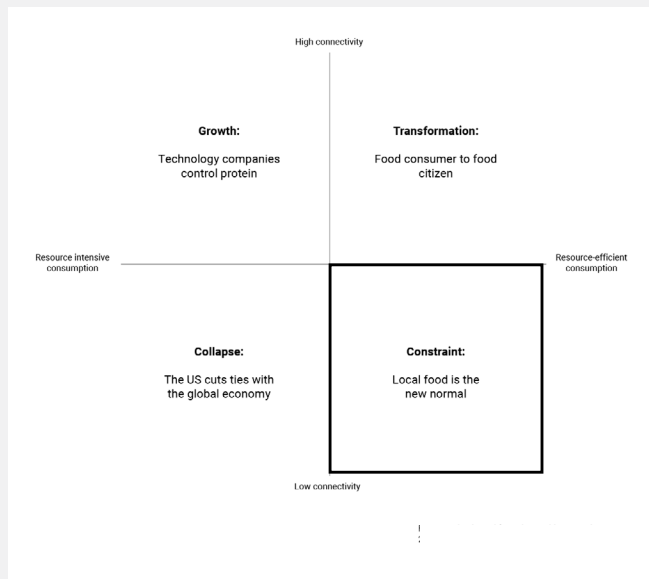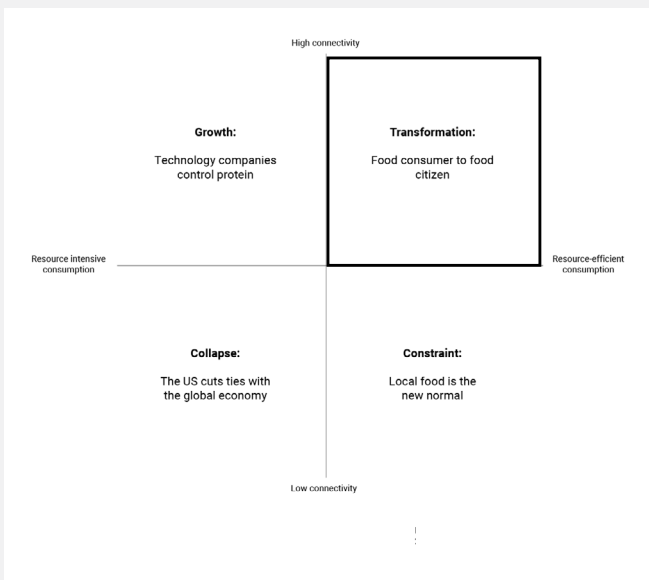
the climate crisis. Their actions include a transformative shift in the measurement of success away from economic growth to green growth, using human and non-human wellbeing as indicators. Technologies such as sensors and blockchain, have enabled radical transparency, showing how food systems operate, and increasing collaboration, confidence and the capability to steward the land through data and effective policy implementation. Given technology's important role in supporting this new system, its implementation is community-led to respond to the unique needs of each local group. Government initiatives to improve food literacy leverage ancient indigenous principles and are integrated into the school system and less formal learning environments. These efforts result in a fundamental shift in the way that people perceive their role in the food system, moving them from consumers to food citizens. As opposed to simply viewing food through a consumptive lens, people take responsibility for stewarding the environment around them, thereby shifting the way people see themselves in relation to earth. Although environmental shocks are not eliminated, greater collaboration with the earth and each other has enabled increased resilience in the food system.

IDENTIFYING PREFERABLE FOOD FUTURES

Preferred futures are critical to articulate because they establish a logical vision based on reflection. This vision can be used to inform an emergent strategy, proactively putting in place the pieces that are necessary to actualize the vision, where people are "making the future rather than the past determine present action" (Grin *et al.,* 2010, p. 270).

As can be seen in the cone of possibilities image, preferable futures straddle the possible and the plausible. Of the scenarios generated, the transformation scenario is the closest articulation of my preferred future, because it acknowledges the fundamental mindset shift that needs to occur to reach it. To me, the preferred future is one that is equitable, celebrates diversity of both humans and non-humans, and practices principles of stewardship and resilience in ways that are accessible to everyone.

I used the lens of my preferred future to inform the construction of my interventions as well as articulate their purpose and trajectory within the system.

INFLUENCING THE SYSTEM

The interventions that I have proposed are situated along a larger development path that is necessary in order to achieve the preferable future vision. As a result, taking a systems perspective to problem solving means understanding and highlighting the relationships among components that will collectively lead to profound change. To achieve this goal, I used the backcasting approach to articulate one possible narrative to realize the important milestones I identified and leveraged the MLP to visualize such a path through a systems lens.

BACKCASTING FROM PREFERABLE FUTURE MILESTONES

Based on my research, especially in the exploratory and generative phases, there are four key changes that need to occur in order to reach a state of sustainable food systems: re-localizing food systems, creating widespread education initiatives, establishing social safety nets and fundamentally changing meat production practices.

As shown below, I used the backcasting approach to establish important possible milestones along the path. Backcasting is a method used to analyze preferable futures and develop strategies or pathways that suggest an approach to reach the preferable future envisioned (Vergragt and Quist, 2011). While backcasting is typically done as a collaborative activity, I leveraged it as a mechanism to temporarily untangle various threads in the system as I analyzed possible paths for change.

Re-localizing food systems

Two of the biggest underlying problems that I discovered during my exploratory research were a detachment from place and the reductionism with which we view the environment. I believe that concentrating on local bioregions as a source of food is an important move because it begins to counteract these two issues. Feagan defines bioregions as the ecological attributes of a region rather than by human activity (Feagan, 2007). He does not suggest a sole reliance on local produce, but rather emphasizes the creation of the right infrastructure to make effective use of the bioregions around us.

By establishing the infrastructure to produce food in the bioregion, carbon dioxide emissions, known as food miles, are reduced. However, I believe that the biggest benefit of this approach would come from the decreased separation between humans and the production of food. By including the production cycle and seeing a greater portion of the food system than what is currently evident, we can begin to perceive food beyond the singular, consumptive lens. There is also increased opportunity for participation and the creation of meaningful relationships that raise personal investment in food and food choices.

The figure below (Figure 44) offers one possible path to re-localizing food systems over time, highlighting the tipping point towards bioregional food production as being an important milestone. Given the increased interest in productive home gardens in light of COVID-19 as well as the need to deepen existing networks of food providers, community creation will be crucial to facilitate the sharing of knowledge and resources and serves as an important entry point for FamilyFuel and Munch.
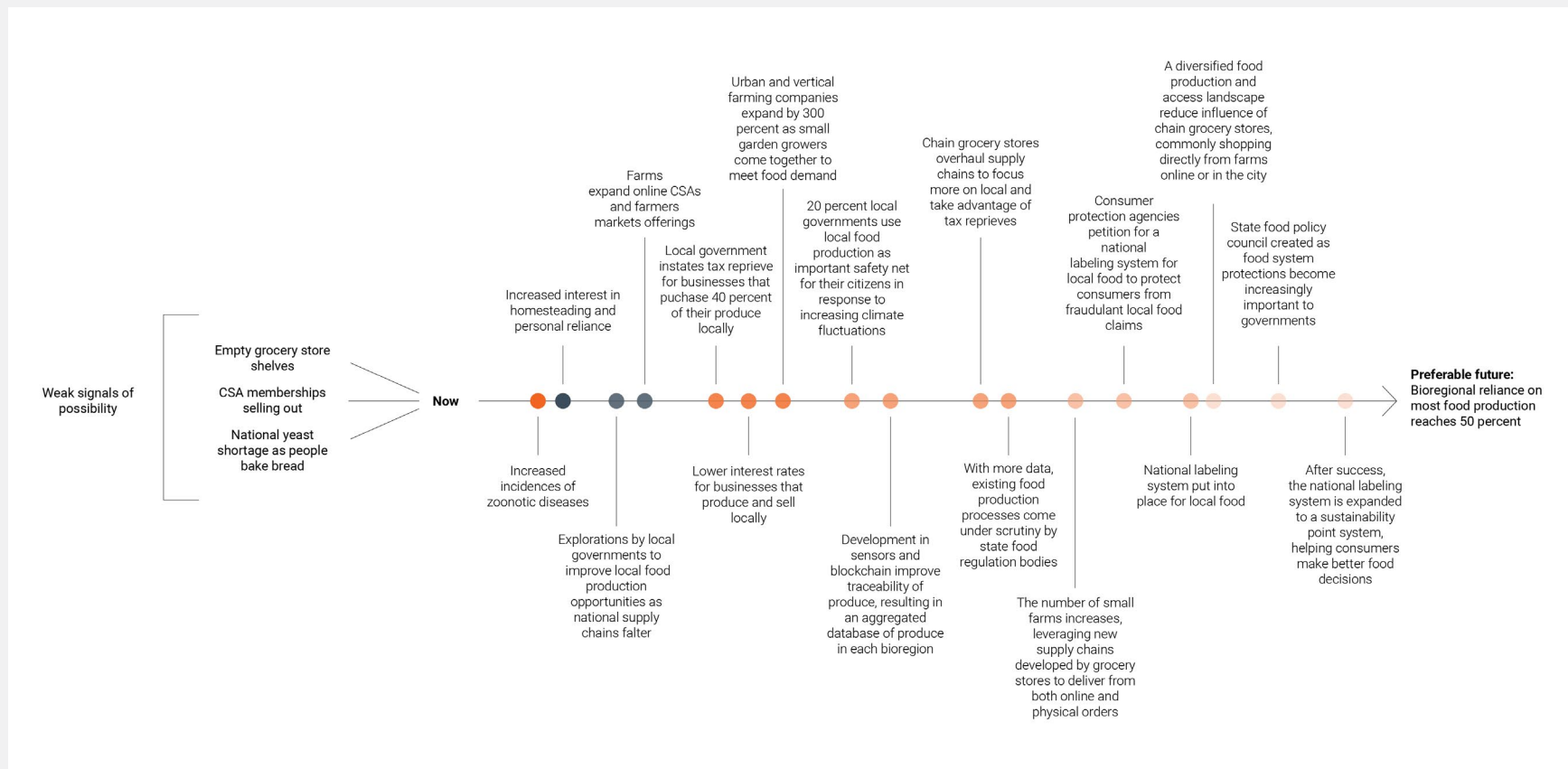
Figure 44: Backcasting from re-localized food systems

Weak signals of possibility
- Empty grocery store shelves
- CSA memberships selling out
- National yeast shortage as people bake bread

Now

Increased interest in homesteading and personal reliance

Increased incidences of zoonotic diseases

Explorations by local governments to improve local food production opportunities as national supply chains falter

Farms expand online CSAs and farmers markets offerings

Local government instates tax reprieve for businesses that puchase 40 percent of their produce locally

Lower interest rates for businesses that produce and sell locally

Urban and vertical farming companies expand by 300 percent as small garden growers come together to meet food demand

20 percent local governments use local food production as important safety net for their citizens in response to increasing climate fluctuations

Development in sensors and blockchain improve traceability of produce, resulting in an aggregated database of produce in each bioregion

Chain grocery stores overhaul supply chains to focus more on local and take advantage of tax reprieves

With more data, existing food production processes come under scrutiny by state food regulation bodies

The number of small farms increases, leveraging new supply chains developed by grocery stores to deliver from both online and physical orders

Consumer protection agencies petition for a national labeling system for local food to protect consumers from fraudulant local food claims

National labeling system put into place for local food

A diversified food production and access landscape reduce influence of chain grocery stores, commonly shopping directly from farms online or in the city

State food policy council created as food system protections become increasingly important to governments

After success, the national labeling system is expanded to a sustainability point system, helping consumers make better food decisions

Preferable future: Bioregional reliance on most food production reaches 50 percent

Engaging in widespread food sustainability education initiatives

In tandem with building bioregional infrastructure, there needs to be widespread educational initiatives that are embedded into existing educational infrastructure, such as schools and universities, as well as platforms to network existing, informal classes in local areas with local experts. These initiatives could create a shared understanding of food systems, highlight why sustainability and local food is important, explain how to participate and provide agricultural entrepreneurship support. Such initiatives could repair the severed ties with land and depict the complexities associated with our current consumption, especially in regards to meat, which could help people make better informed decisions about their food.

Embedding sustainability education as a mandatory part of learning has multiple possible benefits. First, these programs could raise awareness of sustainability and build support for the growth of local bioregional infrastructures and other sustainability initiatives. Through practical learning, citizens could also become empowered to adopt more sustainable practices in their own lives, either professionally or personally. Second, classes often create communities by engaging people deeply and encouraging continued practice through collaboration. Given that People of Color and Indigenous people have been engaging in these practices for years, there is a chance to broaden the reach of their knowledge. Finally, by embedding sustainability into schools and universities, there is an opportunity for widespread, multi-generational impact on food culture in the United States, which could solidly establish sustainability in the mainstream.

The figure below (Figure 45) illustrates a possible path to integrating sustainability and agriculture as mandatory components in the national schooling system. It highlights the need to leverage the existing trend towards urban and home farming by creating supportive systems that provide educational resources and contacts to establish a thriving culture of stewardship. This approach enables citizens to see the value of sustainable food practices first-hand. Communities such as co-ops are an important mechanism for organizing efforts for which FamilyFuel and Munch could contribute.

Figure 45: Backcasting from mandatory sustainability education

Establishing social safety nets

The existing industrialized food system, particularly when it comes to meat, operates on the fact that it makes logical economic sense to use resources that incur the smallest production costs. However, smaller production costs are rarely passed on to consumers and often come as a result of the exploitation of the environment and workers. This process has produced a highly inequitable system both in terms of access to healthy, sustainable food and worker rights. I believe that establishing proper social safety nets, such as Universal Base Income (UBI), would provide the financial means for more people to act beyond financial necessity and in line with their values.

Safety nets like UBI work on two fronts. First, they give people the chance to think beyond the next paycheck, which enables citizens to consider what it means to be sustainable and actually have the means to implement what they know without the pressures of simply surviving. Second, as a result of increased financial freedom, UBI shrinks the market of workers that need to accept exploitative working conditions in order to survive. This approach has financial implications on Big Meat's margins. As a result of increased worker costs, Big Meat faces the choice of either decreasing profit margins or passing on the cost to consumers, thereby losing some of the competitive advantage gained in their pricing.

The diagram below (Figure 46) backcasts from the milestone of UBI introduction as the signals available in the present day are quite weak. In this pathway, UBI is introduced as a result of economic necessity to stimulate recovery. Although my interventions are not directly tied to UBI, the economic conditions that are associated with its acceptance play an important contextual role for sustainability.
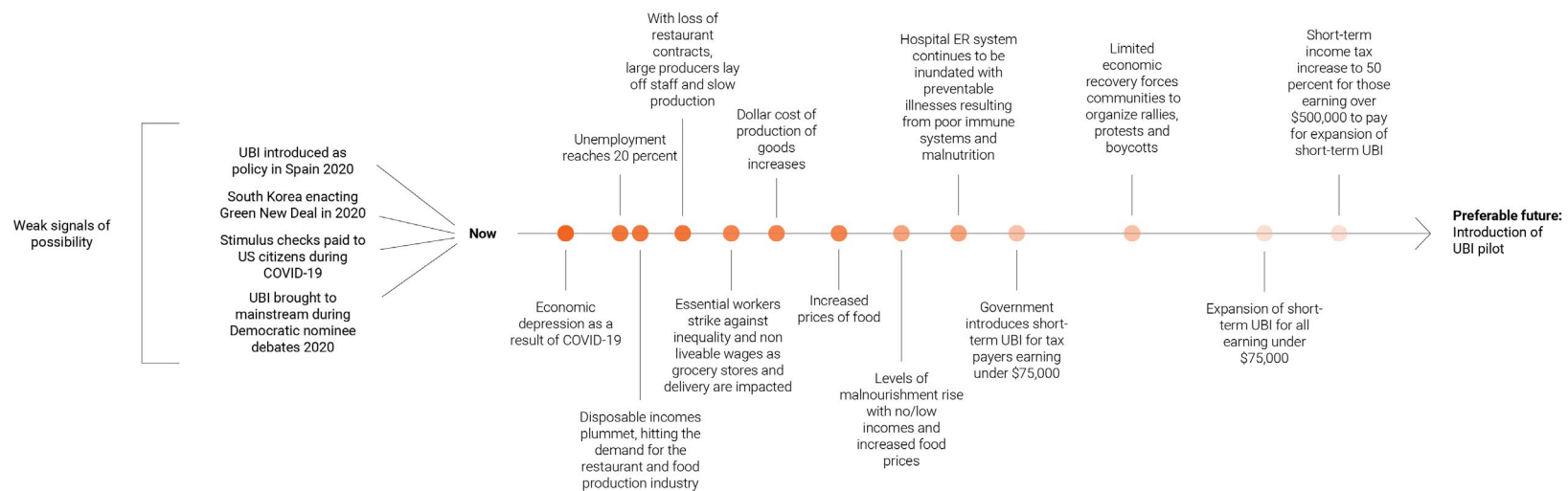
Figure 46: Backcasting from established social safety nets

Weak signals of possibility

UBI introduced as policy in Spain 2020

South Korea enacting Green New Deal in 2020

Stimulus checks paid to US citizens during COVID-19

UBI brought to mainstream during Democratic nominee debates 2020

Now

Economic depression as a result of COVID-19

Unemployment reaches 20 percent

Disposable incomes plummet, hitting the demand for the restaurant and food production industry

With loss of restaurant contracts, large producers lay off staff and slow production

Essential workers strike against inequality and non liveable wages as grocery stores and delivery are impacted

Dollar cost of production of goods increases

Increased prices of food

Levels of malnourishment rise with no/low incomes and increased food prices

Hospital ER system continues to be inundated with preventable illnesses resulting from poor immune systems and malnutrition

Government introduces short-term UBI for tax payers earning under $75,000

Limited economic recovery forces communities to organize rallies, protests and boycotts

Expansion of short-term UBI for all earning under $75,000

Short-term income tax increase to 50 percent for those earning over $500,000 to pay for expansion of short-term UBI

Preferable future: Introduction of UBI pilot

Changing meat production practices

The United States currently has an agro-industrial complex as Big Meat and Big Agriculture's financial success enables them to have a disproportionately large impact on the policies that are passed for the American food system. However, the negative impacts of the industrialized food chain that they have created are becoming obvious as there are increasing incidences of animal and zoonotic diseases linked to this type of production. As a result, I believe that citizens who increasingly fear food contamination will build pressure on policy makers to create substantial changes to meat production. I envision parents being particularly vocal ambassadors for change, given the underdeveloped immune systems of their children.

Community plays an especially important role in this area as a tipping point will be required to create any process change, given the power of Big Agriculture. Community influence could promote better labelling standards to make sustainable and healthy food decisions more accessible to everyone. The vigilance and increased demand for transparency of information could also lead to large consumer action, where important milestones such as a ban of antibiotics in meat production would be more readily attainable, prompting large-scale change in existing practices.

The backcasting map below (Figure 47) speculates on the path to banning antibiotics for animal growth or preventative purposes. Fundamentally, it advocates for existing communities to partner together to educate citizens and facilitate necessary regulations. In this model, participants pressure regulating bodies to take important actions by establishing small-scale, distributed city bans on meat treated with antibiotics to stifle demand. FamilyFuel and Munch have the opportunity to play an important role in supporting alternative sources of protein such as meat alternatives and farm raised CSA meat, thereby establishing them as mainstream options.
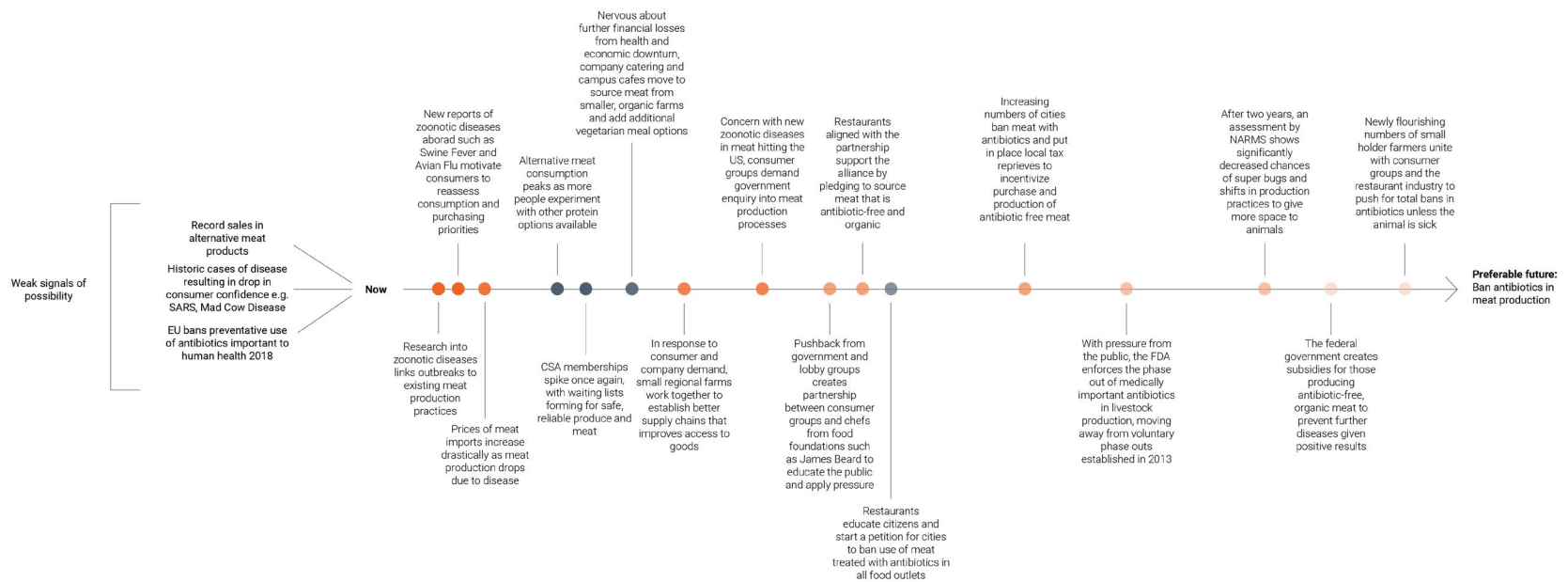
Weak signals of possibility

Record sales in alternative meat products

Historic cases of disease resulting in drop in consumer confidence e.g. SARS, Mad Cow Disease

EU bans preventative use of antibiotics important to human health 2018

Now

New reports of zoonotic diseases aborad such as Swine Fever and Avian Flu motivate consumers to reassess consumption and purchasing priorities

Research into zoonotic diseases links outbreaks to existing meat production practices

Prices of meat imports increase drastically as meat production drops due to disease

Alternative meat consumption peaks as more people experiment with other protein options available

CSA memberships spike once again, with waiting lists forming for safe, reliable produce and meat

Nervous about further financial losses from health and economic downturn, company catering and campus cafes move to source meat from smaller, organic farms and add additional vegetarian meal options

In response to consumer and company demand, small regional farms work together to establish better supply chains that improves access to goods

Concern with new zoonotic diseases in meat hitting the US, consumer groups demand government enquiry into meat production processes

Restaurants aligned with the partnership support the alliance by pledging to source meat that is antibiotic-free and organic

Pushback from government and lobby groups creates partnership between consumer groups and chefs from food foundations such as James Beard to educate the public and apply pressure

Restaurants educate citizens and start a petition for cities to ban use of meat treated with antibiotics in all food outlets

Increasing numbers of cities ban meat with antibiotics and put in place local tax reprieves to incentivize purchase and production of antibiotic free meat

With pressure from the public, the FDA enforces the phase out of medically important antibiotics in livestock production, moving away from voluntary phase outs established in 2013

After two years, an assessment by NARMS shows significantly decreased chances of super bugs and shifts in production practices to give more space to animals

The federal government creates subsidies for those producing antibiotic-free, organic meat to prevent further diseases given positive results

Newly flourishing numbers of small holder farmers unite with consumer groups and the restaurant industry to push for total bans in antibiotics unless the animal is sick

Preferable future: Ban antibiotics in meat production

Figure 47: Backcasting from changed meat production practices

VISUALIZING THE PREFERABLE FUTURE THROUGH THE MULTI-LEVEL PERSPECTIVE MAP

While using the MLP as a sensemaking tool during my exploratory analysis, I identified some of the key elements holding our existing, unsustainable food system in place. In this section, I extend the framework into my vision of a preferable future to visualize the dynamics that my interventions could contribute (Figure 48). To do this, I analyzed the backcasting exercise to identify any common milestones and potential holes when all the elements were considered as a system. I then identified specific areas where FamilyFuel and Munch could contribute to positive change.

FamilyFuel

The main aim of FamilyFuel is to bring sustainability consciousness into the family home through daily eating practices, which are often ripe for change as a child begins to eat solids. Given that FamilyFuel connects well with existing CSAs and Farmers Markets by easily integrating into purchasing habits through meal plans, it serves as a tool that can increase awareness and demand of niche food purchasing locations new parents and their families.

Looking forward, there are three major areas where FamilyFuel can trigger change towards sustainable diets. First, partnerships continue to be important. As CSAs and Farmers Markets expand online due to zoonotic diseases, they become increasingly convenient for parents looking to support local businesses and stay at home. FamilyFuel can become an important platform that acts as a trusted intermediary to help parents choose the right options for them. Partnerships with hospitals and existing pregnancy services will also be important as food is connected closely to health. While these services can play a role in promoting FamilyFuel to new parents, second time parents who already use FamilyFuel can begin to exert pressure on these medical services for the integration of sustainability topics into classes through demand for more information than they currently receive. I believe this effort would significantly increase the scale of influence that communities can leverage and empower parents with some of the tools necessary to engage in sustainable eating habits.

Second, as technologies such as blockchain become increasingly mainstream, they offer improved transparency into the food system. FamilyFuel can leverage new niche interventions such as aggregated databases of the locations of local produce to further reduce barriers for parents looking to access sustainably grown food. As food purchasing diversifies beyond grocery stores, suppliers begin to lose their influence over purchasing habits. This shift in control can potentially provide a space for new labelling and consumption practices that align well to the needs of local residents.

Finally, one of the most important outcomes of FamilyFuel is its ability to impact multiple generations within the family and their relationship with food through everyday habits. However, these habits can also impact people outside of the family through interactions with other existing communities, such as schools. As schools play an increasingly important role in establishing the importance of sustainability in our society, both parents and children exposed to sustainable eating habits through FamilyFuel can support and educate others. As a result, growing networks have the opportunity to facilitate broad learning changes.

Munch

Munch aims to educate mothers about sustainable eating habits by spotlighting existing local food and sustainability landscapes, making learning practical and approachable. In an effort to connect mothers with the diversity present in local food systems, partnerships are crucial for Munch, especially those accessible to a city. These partnerships include urban and community gardens, small food businesses as well as restaurants, which can bring mothers on-site and expose them to a wide view of the food system. As Munch extends its network of mothers and businesses, it can also expand its informal learning experiences to the wider bioregion, thereby supporting the growth of local food tourism and pride in local food production.

Although Munch is intended to be an in-person experience, landscape occurrences such as COVID-19 raise the importance of other forms of access to learning about sustainable eating habits. The importance of sustainability and stewarding local food sources has become increasingly clear as the fragility of the existing food system is exposed. Such occurrences provide opportunities for platforms like Munch to educate people and offer them important resources. As more local farmers and experts build online platforms and offerings, Munch can transform into a service that can act as the go-to platform that consolidates and curates a range of online learning experiences.

One of the most important features of Munch is the creation of a community of mothers that share commonalities on multiple levels, including personal life stages and the workplace. The ability to share common concerns and foster empowerment through iterative informal learning experiences sparks the possibility of workplace policy change through employee action. This effort can include workplace sustainability initiatives or adapting the way that the workplace supports working parents through leave policies, which thereby encourage organizations to act in accordance with employee values.

The network of businesses and mothers with which Munch has relationships enables those who conduct the service to gather insights into the food landscape as well as peoples' evolving relationships with food. This collaboration puts Munch in a unique position to participate in large, city-scale conversations. It can represent the citizens' perspectives from a grassroots-level position and potentially influence the emergence of a supportive landscape for small, sustainable businesses.
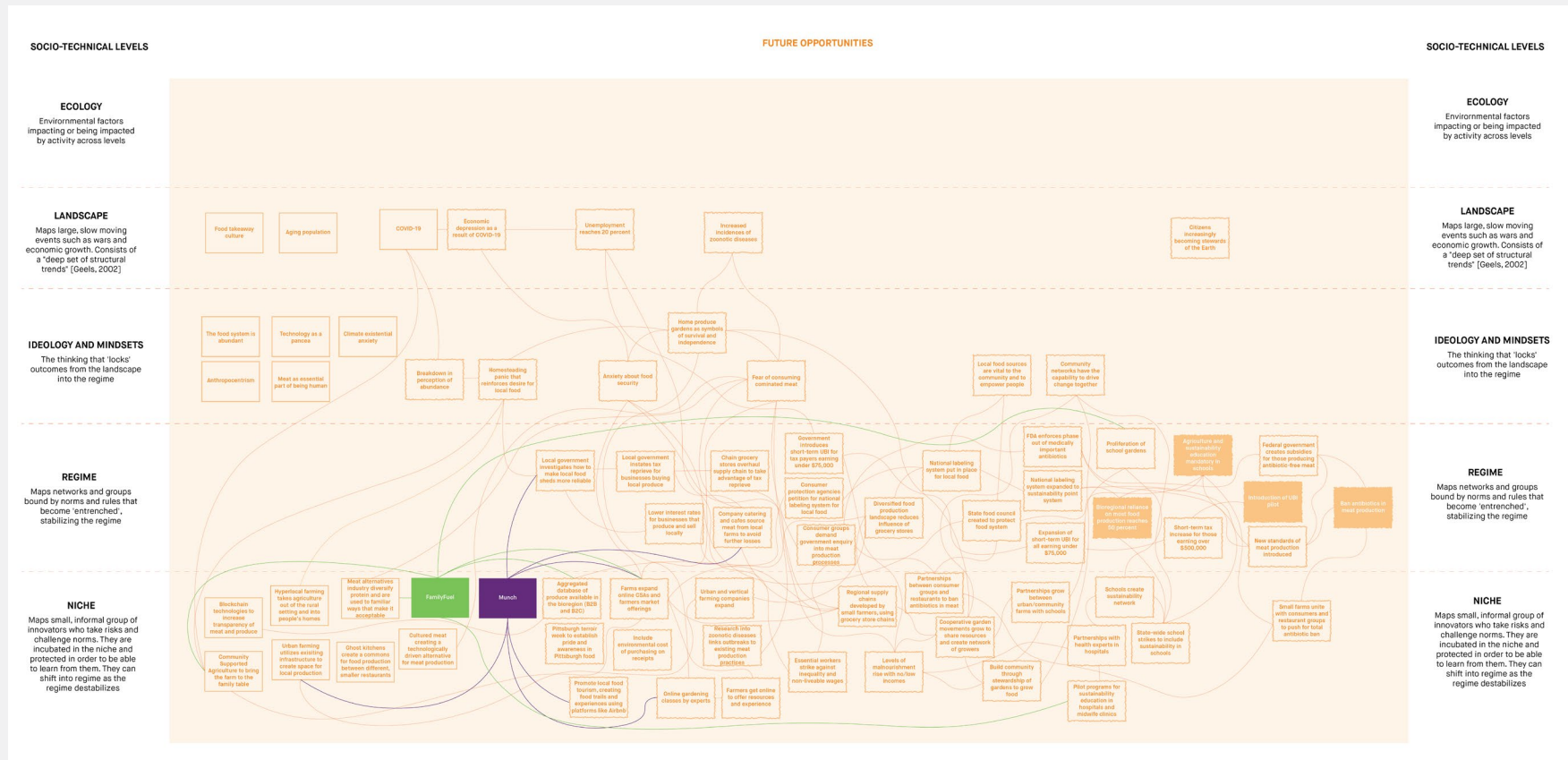
Figure 48: Interventions collaborating in the system towards a preferable future

FUTURE WORK

People today, especially in light of the pandemic virus COVID-19, are increasingly conscious of our interconnectivity with each other and the Earth. Even prior to the pandemic, small but growing shifts in the food system illustrated the impacts of an increasingly climate anxious population. In light of the pandemic, we have a rare and momentous opportunity to change the dominant narrative of our relationship with food, suggesting that the US food landscape will see dynamic activity and change over the coming years. As a result, interventions in the food system are as relevant as ever to support a positive shift towards sustainability.

Transition Design often refers to the necessity of context, patience and time when implementing interventions for change. In order to truly validate the interventions presented in this thesis, the implementation of a pilot test with participants in context is crucial. The pilot test would need to occur over a longer period of time to assess the capability of the interventions to instigate change towards sustainable food systems and the enabling of systems necessary to support such a shift. This work would be incredibly impactful to pursue once the nation has moved out of crisis mode.

Second, the proposed interventions encourage bottom up change. However, I discovered through my research that all expecting parents use similar services to prepare them to care for their child such as hospitals, midwife centers and breastfeeding classes. As a result, I believe there is an opportunity to leverage these existing regime structures, reshaping their role to include sustainability efforts. This top-down approach would complement the efforts of citizen-led change, potentially enabling policy changes towards sustainability that begin to reverberate across the entire food system. The fissures that have been highlighted in the healthcare system during the pandemic open up the possibility for discussions about an alternate future role for such organizations and propose ways that they can be woven effectively into the social fabric.

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APPENDIX

IRB Approval Letters

Carnegie Mellon University
Institutional Review Board
Federalwide Assurance No: FWA00004206
IRB Registration No: IRB00000352

APPROVAL OF SUBMISSION

October 21, 2019

Type of Review:	Initial Study
Title of Study:	Survey for diary study participant recruitment
Investigator:	Ema Karavdic
Study Team Members:	Stacie Rohrbach
IRB ID:	STUDY2019_00000411
Funding:	None

The Carnegie Mellon University Institutional Review Board (IRB) has reviewed and granted **APPROVAL under Exempt Review on 10/21/2019, in accordance with 45 CFR 46.104. You will be asked to update the IRB on the progress of your study at the assigned "Check-In" date of 10/20/2021.**

However, if you wish to make modifications to this protocol, please contact the IRB regarding these changes prior to their implementation to ensure compliance with this designation.

The Investigator(s) listed above in conducting this protocol agree(s) to follow the recommendations of the IRB of any conditions to or changes in procedure subsequent to this review. In undertaking the execution of this protocol, the investigator(s) further agree(s) to abide by all CMU research policies including, but not limited to the policies on responsible conduct research and conflict of interest.

Sincerely,

John Zimmerman, IRB Chair

Carnegie Mellon University
Institutional Review Board
Federalwide Assurance No: FWA00004206
IRB Registration No: IRB00000352

APPROVAL OF SUBMISSION

October 31, 2019

Type of Review:	Initial Study
Title of Study:	Diary study into food consumption habits and changes in practice towards sustainable meat consumption
Investigator:	Ema Karavdic
Study Team Members:	Stacie Rohrbach
IRB ID:	STUDY2019_00000481
Funding:	None

The Carnegie Mellon University Institutional Review Board (IRB) has reviewed and granted **APPROVAL under EXPEDITED REVIEW on 10/31/2019 per 45 CFR 46.110 and 21 CFR 56.110. You will be asked to update the IRB on the progress of your study at the assigned "Check-In" date of 10/30/2021.**

Unanticipated problems and adverse events must be reported to the IRB within three (3) working days. Any additional modifications to this research protocol or advertising materials pertaining to the study must be submitted for review and granted IRB approval prior to implementation.

The Investigator(s) listed above in conducting this protocol agree(s) to follow the recommendations of the IRB of any conditions to or changes in procedure subsequent to this review. In undertaking the execution of the protocol, the investigator(s) further agree(s) to abide by all CMU research policies including, but not limited to the policies on responsible conduct of research and conflict of interest.

Sincerely,

John Zimmerman, IRB Chair

Carnegie Mellon University
Institutional Review Board
Federalwide Assurance No: FWA00004206
IRB Registration No: IRB00000352

APPROVAL OF SUBMISSION

February 14, 2020

Type of Review:	Initial Study
Title of Study:	Storyboard interviews
Investigator:	Ema Karavdic
Study Team Members:	Stacie Rohrbach
IRB ID:	STUDY2020_00000072
Funding:	None

The Carnegie Mellon University Institutional Review Board (IRB) has reviewed and granted **APPROVAL under Exempt Review on 2/14/2020, in accordance with 45 CFR 46.104. You will be asked to update the IRB on the progress of your study at the assigned "Check-In" date of 2/14/2022.**

However, if you wish to make modifications to this protocol, please contact the IRB regarding these changes prior to their implementation to ensure compliance with this designation.

The Investigator(s) listed above in conducting this protocol agree(s) to follow the recommendations of the IRB of any conditions to or changes in procedure subsequent to this review. In undertaking the execution of the protocol, the investigator(s) further agree(s) to abide by all CMU research policies including, but not limited to the policies on responsible conduct research and conflict of interest.

Sincerely,

John Zimmerman, IRB Chair

FamilyFuel introduction screens
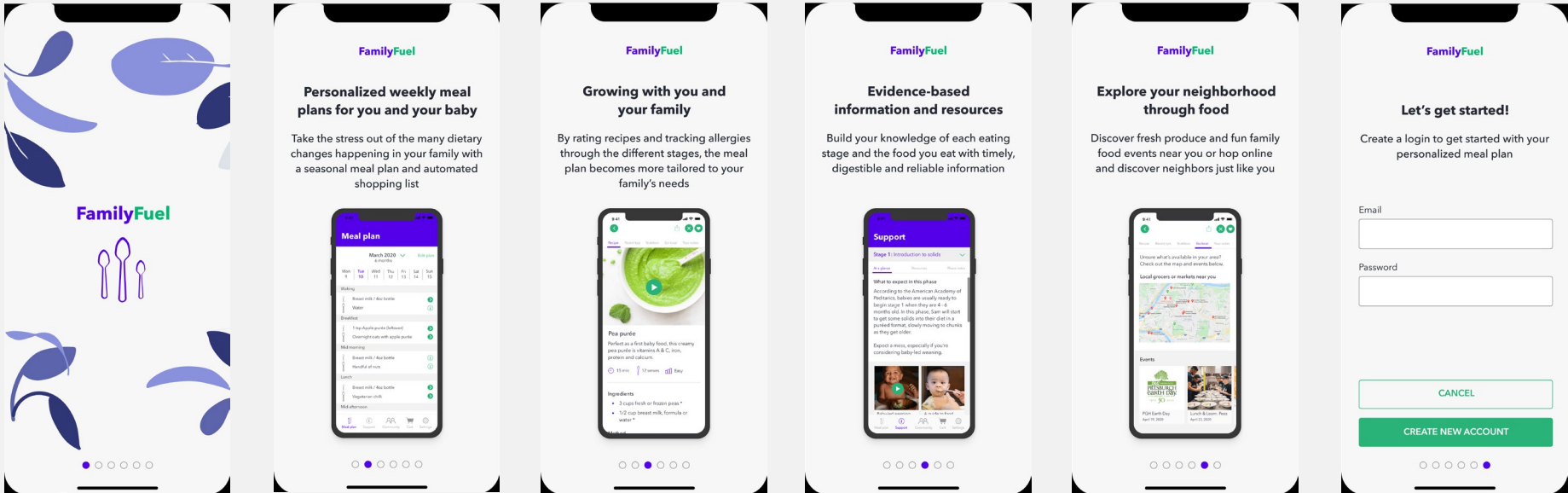
FamilyFuel onboarding screens

Screen 1 — Profile

9:41 · FamilyFuel · Skip

Profile
Getting to know you

My name is
_____

I am
- Expecting a child
- Expecting more than one child
- A new parent

I have a family of
- 2 people
- 3 people
- 4 people
- 5 people
- 6 people
- More than 6 people

NEXT QUESTION

Screen 2 — Profile

9:41 · Back · FamilyFuel · Skip

Profile
Getting to know your child

My child's name is
_____

My child was born
- Month
- Day
- Year

ADD ANOTHER CHILD

NEXT QUESTION

Screen 3 — Profile

9:41 · Back · FamilyFuel · Skip

Profile
What kind of meal plan would you like to receive?

Family meal plan
Totally coordinated meals for child(ren) and parents.

Adult only meal plan
Often selected by expecting parents testing out FamilyFuel.

Infant only meal plan
Selected by families who are looking for guidance when feeding their child.

Note: these can be changed in Settings at any time.

NEXT QUESTION

Screen 4 — Dietary preferences

9:41 · Back · FamilyFuel · Skip

Dietary preferences
How often does your family typically consume the following:

Meat ⓘ
Never — Rarely — Sometimes — Often — Always

Dairy ⓘ
Never — Rarely — Sometimes — Often — Always

Grains ⓘ
Never — Rarely — Sometimes — Often — Always

Legumes ⓘ
Never — Rarely — Sometimes — Often — Always

Nuts and seeds ⓘ
Never — Rarely — Sometimes — Often — Always

Eggs ⓘ
Never — Rarely — Sometimes — Often — Always

Fruits ⓘ
Never — Rarely — Sometimes — Often — Always

Vegetables ⓘ
Never — Rarely — Sometimes — Often — Always

NEXT QUESTION

Screen 5 — Dietary preferences

9:41 · Back · FamilyFuel · Skip

Dietary preferences
Are there specific foods you do not want to see in your meal plan? Please note any below.

Please note any foods that your family will not eat.

NEXT QUESTION

Screen 6 — Dietary preferences

9:41 · Back · FamilyFuel · Skip

Dietary preferences
Are you aware of any existing allergies in your family? Please note any below.

Please note any known allergies that your family may have.

NEXT QUESTION

FamilyFuel onboarding screens

Screen 1

9:41

Back **FamilyFuel** Skip

Dietary preferences
How would you describe your cooking abilities? Please select one.

I'm a total beginner
I know how to use the basic equipment in the kitchen but don't go too far past pasta and eggs.

I'm competent
I'm comfortable cooking and have a few dishes I know how to do really well. I get a little nervous outside my comfort zone.

I'm confident
I navigate my kitchen with ease, often trying new recipes and am not afraid to experiment with some new produce.

I'm an absolute foodie
I use recipes for inspiration and make up my own dishes most of the time. I like to try new cooking techniques.

I'm a pro
I have training, have worked or currently work in the food industry so the kitchen is highly familiar territory for me.

NEXT QUESTION

Screen 2

9:41

Back **FamilyFuel** Skip

Dietary preferences
Which of the statements best describes your approach to feeding your child(ren)?

Baby-led weaning
I want to skip the purées and let my child(ren) feed themselves finger foods from the start.

Parent-led feeding
I want to spoon-feed my infant(s) at least half of the time, starting with puréed foods.

Note: these can be changed in Settings at any time.

NEXT QUESTION

Screen 3

9:41

Back **FamilyFuel** Skip

Scheduling
Which adult meals do you plan to prepare at home for each day of the week?

Monday
Breakfast Lunch Dinner

Tuesday
Breakfast Lunch Dinner

Wednesday
Breakfast Lunch Dinner

Thursday
Breakfast Lunch Dinner

Friday
Breakfast Lunch Dinner

Saturday
Breakfast Lunch Dinner

Sunday
Breakfast Lunch Dinner

NEXT QUESTION

Screen 4

9:41

Back **FamilyFuel** Skip

Scheduling
Which infant meals do you plan to prepare at home for each day of the week?

Monday
Breakfast Lunch Dinner

Tuesday
Breakfast Lunch Dinner

Wednesday
Breakfast Lunch Dinner

Thursday
Breakfast Lunch Dinner

Friday
Breakfast Lunch Dinner

Saturday
Breakfast Lunch Dinner

Sunday
Breakfast Lunch Dinner

NEXT QUESTION

Screen 5

9:41

Back **FamilyFuel** Skip

Scheduling
How much time will you plan to devote to preparation and cooking each day?

Monday
Total prep time
Total cooking time

Tuesday
Total prep time
Total cooking time

Wednesday
Total prep time
Total cooking time

Thursday
Total prep time
Total cooking time

Friday
Total prep time
Total cooking time

Saturday
Total prep time
Total cooking time

Sunday
Total prep time
Total cooking time

NEXT QUESTION

Screen 6

9:41

Back **FamilyFuel** Skip

Share
Are there any other caregivers you would like to connect with this account? ⓘ
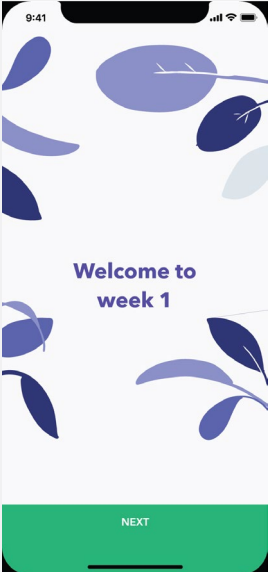
Email address

Email address

Email address

Email address

FINISH QUESTIONNAIRE

FamilyFuel meal plan week introduction

FamilyFuel meal plan and breastfeeding

9:41

Welcome to week 1

NEXT

9:41

Preparing for the week ahead

Milestone week: Introducing Sam to Solids

Congrats! Sam is 6 weeks old and could be ready to move to solids!

According to the American Academy of Pediatrics, babies often exhibit the following behaviors when they are 4 - 6 months old, indicating that they are ready for solids:

Does Sam:

- Have **good head control**, keeping it in a steady, upright position?
- **Sit upright** in high seat? This is important to be able to swallow.
- Show **significant weight gain** - at least 13 pounds?
- Move **food to the back of their mouth**, rather than the front?

No, Sam is not ready

Yes, Sam is ready for solids

In comparison to your typical week, how much time do you have for cooking this week?

About the same

I have some more time

I have some less time

NEXT

9:41

Week 1 recipes

Great, this week is looking delicious. Here is a snapshot of the recipes you will see available:
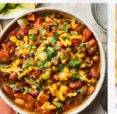
For you

- Vegetarian burritos
- Baked salmon and pea purée
- Mushroom risotto
- Vegetarian chilli

For Sam

Peas are in season in Pittsburgh! Let's introduce Sam to solids with these tasty, versatile veggies.

Pea purée   Vegetarian chilli

LET'S GO!

9:41

Meal plan

March 2020 ⌄   Edit plan
6 months

| Mon 9 | Tue 10 | Wed 11 | Thu 12 | Fri 13 | Sat 14 | Sun 15 |

Waking
- Breast milk / 4oz bottle ➤
- Water ⓘ

Breakfast
- Breast milk / 4oz bottle ➤
- Overnight oats with apple purée ➤

Mid morning
- Breast milk / 4oz bottle ⓘ
- Handful of nuts ⓘ

Lunch
- Breast milk / 4oz bottle ➤
- Vegetarian chilli ➤

Mid-afternoon
- Breast milk / 4oz bottle ➤
- Carrots and hummus ➤

Dinner
- 1 tsp pea purée ➤
- Baked salmon and pea purée ➤

Bedtime
- Breast milk / 4oz bottle ➤
- Water ⓘ

Meal plan | Information | Community | Cart | Settings

9:41

<

Breast | Bottle | Pump | Log

Enter manually

Left   Right

▶   ▶
00:00   00:00

FINISH

9:41

<

Breast | Bottle | Pump | Log

Enter manually

Left   Right

▶   ▶
00:00   00:00

Last used
Today, 11:45am

FINISH

FamilyFuel baby recipe

Screen 1 — Recipe tab

9:41

Recipe Parent tips Nutrition Go local Your notes

Pea purée

Perfect as a first baby food, this creamy pea purée is vitamins A & C, iron, protein and calcium.

Time	Yield	Difficulty
Prep: 5 min Cook: 10 min	12 serves	Easy

Ingredients

- 3 cups fresh or frozen peas *
- 1/2 cup breast milk, formula or water *

Method

1. Place a steamer insert into a saucepan and fill it with water so it comes just below the bottom of the steamer.

   If boiling peas directly, ignore this first step and go to step 2

2. Bring water to boil, then add peas

3. Cover and steam for 15 minutes

4. Once tender, place peas and chosen liquid into a blender or food processor and purée until creamy *

5. Serve warm

* Check out the parent tips section for some additional resources

---

Screen 2 — Parent tips tab

9:41

Recipe Parent tips Nutrition Go local Your notes

Here are a few helpful tips when making the pea purée.

Fresh peas vs. frozen peas

Fresh, local peas are particularly delicious and nutritious when in season. Around Pittsburgh, this is late May to early July (PA Department of Agriculture). You can also buy them when in season and freeze for yourself so you have a constant stock. Check out the Go local page for more information on where to find them near you.

That being said, frozen peas are still a great source of nutrition and excellent when in a pinch.

Breast milk vs. formula vs. water - which one to choose?

If babies are in the earlier part of stage 2, it is generally recommended that you use breast milk or formula as this is still a very important part of their diet (Center for Disease Control and Prevention).

However, given that Sam is now reaching their sixth month, they are able to start drinking some water so this option is available to you as well. Consider how well Sam is feeding before making a decision.

Creamy texture

Some blenders or food processors don't get the mixture quite as creamy as others. At this stage, Sam should be fine with the small chunks - in fact, this may be helpful in his feeding journey. However, if he's fussing, strain the mixture through a fine-mesh sieve to remove lumps.

Storage

This pea purée recipe is perfect to freeze and store for up to two months.

To do this, spread the pea mixturer into a ice cube tray and freze until solid for 2-3 hours. Once solid, store in silicon bag.

To serve, reheat on a stove until it is warm (not hot).

Screen 3 — Nutrition tab

9:41

Recipe Parent tips Nutrition Go local Your notes

What's all the fuss about peas? Here are some facts that make peas important for Sam.

Nutrition facts

Peas are a great source of vitamins, especially fiber, which is where many babies fall short.

Here's a quick video with some of the core elements that peas provide for babies like Sam.

Peas, like all fruit and veg, are at their peak taste and nutrition when consumed in season and from the right sources.

Unfortunately, sometimes the convenience of our closest grocery store isn't one of those places. If you don't have access to some farmer's markets, Community Supported Agriculture (CSA) or co-ops, then frozen peas are the best option for you.
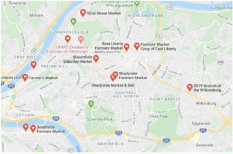
Pea season around Pittsburgh typically goes from late May to early July (PA Department of Agriculture) so keep an eye out for the fresh options then.

Screen 4 — Go local tab

9:41

Recipe Parent tips Nutrition Go local Your notes

Unsure what's available in your area? Check out the map and events below.

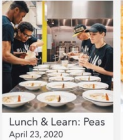**Local grocers or markets near you**

Events

PGH Earth Day
April 19, 2020

Lunch & Learn: Peas
April 23, 2020

Screen 5 — Your notes tab

9:41

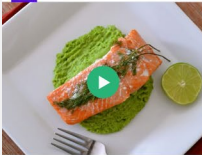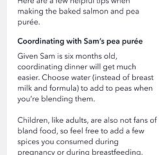Recipe Parent tips Nutrition Go local Your notes

Want to keep track of any recipe-related notes that may be useful in the future? Write them below.

Did you adjust the recipe? Did Sam have an allergic reaction?

FamilyFuel adult recipe

9:41
Recipe | Parent tips | Nutrition | Go local | Your notes

Baked salmon and pea purée
This recipe is a great way to do a lighter dinner, get some great vitamins in and (almost) share a meal with your child.

Time — Prep: 15 min / Cook: 20 min
Yield — 3-4 serves
Difficulty — Easy

Ingredients
- 3 - 4 salmon fillets fresh or frozen (4 - 6 ounces each, skin on) *
- 2 cups fresh or frozen peas (about 10 ounces) *
- 1/4 cup olive oil, some more to sear salmon
- 1/2 cup grated parmesan (optional)
- 2 tablespoons sour cream (optional)
- Salt and pepper to taste

Method
1. Preheat the oven to 375F
2. Place a steamer insert into a saucepan and fill it with water so it comes just below the bottom of the steamer.
   If boiling peas directly, ignore this first step and go to step 2
3. Bring water to boil, then add peas, boiling for around 3-5 minutes or steaming for 15 minutes
4. Once tender, place peas, olive oil, parmesan, sour cream, salt and pepper into a blender or food processor and purée until creamy. The parmesan and sour cream are optional but really add to the creaminess *
5. Add olive oil to a skillet or pan, warming to a medium high heat
6. Add the salmon to the hot pan, skin side down for around 3 minutes to brown the skin. If you get larger pieces of salmon, just account for a little extra time
7. Transfer the pan to the oven or transfer the salmon to an oven safe dish and roast for another 10 minutes
8. Take the salmon out of the oven and let it rest for 5 minutes
9. Serve warm

* Check out the parent tips section for some additional resources

Recipe | Parent tips | Nutrition | Go local | Your notes

Here are a few helpful tips when making the baked salmon and pea purée.

Coordinating with Sam's pea purée
Given Sam is six months old, coordinating dinner will get much easier. Choose water (instead of breast milk and formula) to add to peas when you're blending them.

Children, like adults, are also not fans of bland food, so feel free to add a few spices you consumed during pregnancy or during breastfeeding.

Once you've blended the peas appropriately for Sam, take out the amount you want to give them or store away for later. Then, simply blend in the rest of the ingredients in your recipe.

Wild salmon vs. farmed salmon
Salmon, in general, is a great addition to a diet with plenty of protein and omega-3 fatty acids. However, given the different diets of wild and farmed salmon, there will be both nutritional and taste differences. Check out the nutrition page for more information on these differences.

There are many great options either way. So at the end of the day, whichever type you choose, watch out for contaminants and antibiotics, especially in farmed fish.

The Monterey Bay Seafood Watch is a great resource to help you decide which salmon to buy that's available in your region.

Checking salmon for doneness
Rare, medium-rare or medium salmon are all great, healthy choices when consuming salmon as it doesn't have the same bacteria as meat. How 'done' you want your salmon is simply a preference of texture.

To tell how cooked your salmon is, check the color of the flesh. From left to right in the image, we have rare, medium-rare and medium salmon.

Fresh peas vs. frozen peas
Fresh, local peas are particularly delicious and nutritious when in season. Around Pittsburgh, this is late May to early July (PA Department of Agriculture). You can also buy them when in season and freeze for yourself so you have a constant stock. Check out the Go local page for more information on where to find them near you.

That being said, frozen peas are still a great source of nutrition and excellent when in a pinch.

Creamy texture
Some blenders or food processors don't get the mixture quite as creamy as others. Just as with Sam's recipe, you can strain the pea mixture in a sieve. However, you also have the option of adding sour cream and parmesan as well.

Storage
Just like in Sam's recipe, the peas without any additional elements can be frozen and last a few months.

However, if dairy elements have been added, the pea mixture should be refridgerated and be consumed within the week.

Simlarly, cooked salmon sealed off in a silicon bag can also last in the fridge for 3-4 days.

Recipe | Parent tips | Nutrition | Go local | Your notes

Everything you need to know about the stars of the show: peas and salmon.

Nutrition facts

Peas are a great source of vitamins, especially fiber, which is where many babies fall short.

Here's a quick video with some of the core elements that peas provide for babies like Sam.

Peas, like all fruit and veg, are at their peak taste and nutrition when consumed in season and from the right sources.

Unfortunately, sometimes the convenience of our closest grocery store isn't one of those places. If you don't have access to some farmer's markets, Community Supported Agriculture (CSA) or co-ops, then frozen peas are the best option for you.

Pea season around Pittsburgh typically goes from late May to early July (PA Department of Agriculture) so keep an eye out for the fresh options then.

There is a season for salmon but when bought frozen, it can be great year-round too.

Given that Pittsburgh is not close to the sea or a seaside port, frozen salmon can be the perfect option. However, getting it in season can also get you a great price and even greater taste as it hasn't been on ice for as long.

Typically, the season for salmon in the Northern Hemisphere is mid May to the end of September.

Wild salmon is less fatty and contains less contaminants but better technology and reporting makes farmed salmon increasingly safe.

However, given different diets, the taste will absolutely be different.

Farmed salmon is much higher in fat, often having three times the amount of saturated fat as wild salmon. It slightly more omega-3s, something we don't often get enough of and great in vitamin C.

Wild salmon is higher in minerals such as zinc, potassium and iron. The biggest factor, however, is the lack of toxins, making it safer to consume in the long run.

Given better technology and reporting, it is possible to buy safe, farmed salmon to enjoy the benefits of eating it at a more affordable cost to your family. Ask questions and research where your salmon comes from to be sure using the Monterey Bay Seafood Watch.

FamilyFuel information screens
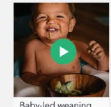

Information
Stage 1: Introduction to solids

At a glance | Resources | Phase notes

What to expect in this phase
According to the American Academy of Pediatrics, babies are usually ready to begin stage 1 when they are 4 - 6 months old. In this phase, Sam will start to get some solids into their diet in a puréed format, slowly moving to chunks as they get older.

Expect a mess, especially if you're considering baby-led weaning.

Baby-led weaning guide | A guide to food firsts

What to feed your baby
Sam will still rely heavily on breast milk or formula but will likely start showing interest and exploring new (mushy) foods. This phase will be mostly single fruits or veggies, starting to combine and get chunkier towards the end.

This stage is important as it sets the foundations for healthy eating habits. So keep trying with new foods, even when Sam doesn't seem interested. Exposure is crucial for them.

5 tips to developing healthy eating habits | How to introduce new foods

How much to feed your baby
Have no fear! The family fuel meal plan will guide you. Initially, Sam will be eating small amounts of purées and runnier foods - around teaspoon, once per day.

Eventually, they'll start eating around a tablespoon each day through different sittings.
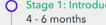
3 signs your baby is full | The baby poop guide

Meal plan | Information | Community | Cart | Settings

Information
Stage 1: Introduction to solids
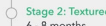
- ● **Breastfeeding** 0 - 4 months
- ○ **Stage 1: Introduction to solids** 4 - 6 months
- ○ **Stage 2: Textured food** 6 - 8 months
- ○ **Stage 3: Finger food** 8 - 10 months
- ○ **Stage 4: Tackling new foods** 10 - 12 months

Baby-led weaning guide | A guide to food firsts

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Stage 1: Introduction to solids

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Daily community questions
Q: How do I raise my child as a vegetarian? | Q: Is cereal bad for my baby?

Fueling knowledge
Breastfeeding — 50 articles | Formula — 35 articles
Solids — 43 articles | Equipment — 20 articles
Allergies — 23 articles | Sustainable eating — 30 articles

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Stage 1: Introduction to solids

At a glance | Resources | Phase notes

Want to keep track of any stage-related notes that may be useful in the future? Write them below.

Are there any major changes you've noticed in this period with Sam? How are doing with the changes being experienced?

Meal plan | Information | Community | Cart | Settings

cost inputs

Use of cheap grain to feed cattle

Country special-ization

Beef oli-gopoly-/centraliza-tion

Specialization of farmers

Mono-cultures on farms

Depen-dence on foriegn markets

Increased beef con-sumption

Social stru shifts

Changing family structures

Demand for convenience

Increasing women in the workforce

Demand for convenience

ving an pop-ons

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Industrialized food chain

Maintenance of cheap inputs

Agro-industrial complex

Beef culture

Rise in super-markets

Demand for convenience

Highway culture

Rise in fast food

ent from place

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