

FLAVOUR FLEET



BACHELOR OF INDUSTRIAL DESIGN THESIS REPORT
TIMOTHY KRAULIS

How may we improve nutritional value and promote steady food supply?

by

Timothy Kraulis

Submitted in partial fulfillment of the requirements for the degree of

Bachelor of Industrial Design

Faculty of Applied Sciences & Technology

Humber Institute of Technology and Advanced Learning

Supervisors: Catherine Chong

December 16, 2022

Abstract

Within many communities there exists a gap in their food supply, these gaps in food supplies are called food deserts and food swamps. When there is a gap in supermarket access, there is a major impact on the health, wellbeing, and finances of the local residence. Currently residents rely on a mix of local options that often lack full nutritional value or use transportation that increases the impact of their time and budgets. Soup kitchens and social programming are available, but they do not exist as a complete solution to the problem that lower income families face. Budgeting and education play a role in their situation. Nutritious food often takes a back seat to other bills while waiting for fresh income. Education for preparing food with what is available also presents a challenge. User studies based on the daily food habits of residence of a food desert will include interviews and surveys to show an in-depth look at the impacts of difficult supply situations. A one-to-one scale model will be developed to prove the full-bodied ergonomic solution and to validate the final design. The solution will improve the lifestyle and wellbeing of the residents of food deserts by improving their access to nutritious diet options.

Acknowledgements

Throughout this thesis process there have been many people that gave insight, guidance and assistance which helped me reach the end of the project.

Thank you to my professors, specifically Catherine Chong, who has helped me throughout this program with all the skills I will base my career from.

Thank you to my family for all the help throughout the project. Without your financial, and more importantly, emotional support, this thesis would have been impossible.

Thank you to my cohort who pushed to improve my work throughout the last four years. I am grateful to Andrew Chartrand and Justin Ho for being with me throughout this project, it would not have been possible or enjoyable without you all.

Consent for Publication in the Humber Digital Library (Open Access)

Consent for Publication: Add a (X) mark in one of the columns for each activity

Activity		Yes	No
Publication	I give consent for publication in the Humber Library Digital Repository which is an open access portal available to the public	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Review	I give consent for review by the Professor	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Copyright © 2023 « Student Name »

The author grants Humber College of Technology and Advanced Learning the nonexclusive right to make this work available for noncommercial, educational purposes, provided that this copyright statement appears on the reproduced materials and notice is given that the copying is by permission of the author. To disseminate otherwise or to republish requires written permission from the author.

I warrant that the posting of the work does not infringe any copyright, nor violate any proprietary rights, nor contain any libelous matter nor invade the privacy of any person or third party, nor otherwise violate the Humber Library Digital Repository Terms of Use.

Student Signature : Timothy Kraulis

Student Name : Timothy Kraulis

Table of Contents

Abstract	11
Acknowledgements	12
Chapter 1 Problem Definition.....	13
1.1 Problem Definition.....	13
1.2 Rationale & Significance.....	13
1.2.1 Key Information to be determined	13
1.2.2 Key Questions to be Answered	13
1.2.3 Investigative approach	14
1.3 Background/History/Social Context	14
1.3.1 Demographic Trends and Lifestyle Trends.....	14
1.3.2 Media Trends.....	14
1.3.3 Product Trends	14
Chapter 2 User Research.....	16
2.1 User Research	16
2.1.1 User Profile – Persona.....	16
2.1.2 Current User Practice	18
2.1.3 User Observation – Activity Mapping.....	20
2.1.4 User Observation – Human Factors of Existing Products	20
2.1.5 User Observation – Safety and Health of Existing Products.....	21
2.2 Product Research	21

2.2.1 Benchmarking – Benefits and Features	22
2.2.2 Benchmarking – Functionality of Existing Products.....	23
2.2.3 Benchmarking – Aesthetics and Semantic Profile of Existing Products.....	24
2.2.4 Benchmarking – Materials and Manufacturing of Existing Products	24
2.2.5 Benchmarking – Sustainability of Existing Products.....	25
2.3 Summary of Chapter 2	25
CHAPTER 3 Analysis	27
3.1 Analysis	27
3.1.1 Needs/Benefits Not Met by Current Products	27
3.1.2 Latent Needs	27
3.1.3 Categorization of Needs	28
3.2 Analysis – Usability	28
3.2.1 Journey Mapping	28
3.3 Analysis – Human Factors	29
3.3.1 Product Schematic – Configuration Diagram	29
3.3.2 Ergonomic – 1:1 Human Scale Study	31
3.4 Analysis – Aesthetics & Semantic Profile	31
3.6 Analysis – Innovation Opportunity	33
3.6.1 Needs Analysis Diagram	33
3.6.2 Desirability, Feasibility & Viability.....	34
3.7 Summary of Chapter 3 – Defining Design Brief	34

Chapter 4 – Design Development	36
4.1 Initial Idea Generation	36
4.1.1 Aesthetics Approach & Semantic Profile	36
4.1.2 Mind Mapping	37
4.1.3 Ideation Sketches	37
4.2 Concept Exploration	41
4.2.1 Concept One	41
4.2.2 Concept Two	42
4.3 Concept Strategy	43
4.3.1 Concept Direction & Product Schematic One	43
4.3.2 Concept Direction & Product Schematic Two	44
4.4 Concept Refinement & Validation	45
4.4.1 Design Refinement	45
4.4.2 Detail Development	46
4.4.3 Refined Product Schematic & Key Ergonomics	48
4.5 Concept Realization	49
4.5.1 Design Finalization	49
4.5.2 Physical Model Study	51
4.6 Design Resolution	54
4.7 Cad Development	55
4.8 Physical Model Fabrication	59

Chapter 5 – Final Design	63
5.1 Design Summary	63
5.2 Design Criteria Met	64
5.2.1 Full Bodied Interaction Design	64
5.2.2 Materials, Processes and Technology	65
5.2.3 Design Implementation	66
5.3 Final Cad Renderings	68
5.4 Physical Model.....	72
5.5 Technical Drawings.....	76
5.6 Sustainability.....	77
Chapter 6 Conclusion	78
Appendix.....	79
Appendix A - Discovery	79
Appendix B – Contextual Research	79
Appendix C – Field Research	81
Appendix D – Results Analysis	82
Appendix E – Cad Development.....	83
Appendix F – Physical Model Photos	86
Appendix G – Technical Drawings.....	87
Appendix H – Bill of Materials.....	88
Appendix I – Sustainability info.....	89

Appendix J – Approval Forms.....90

Appendix K – Advisor Meetings & Agreement Forms93

References96

Table of Figures

Figure 1 - Demographics	16
Figure 2 - Journey Map	20
Figure 3 - Product Comparison.....	21
Figure 4 - Product Comparison 2.....	22
Figure 5 - Product Comparison Chart	23
Figure 6 - Advertising Styles Mood Board – Sources available via Miro.....	24
Figure 7 - User Journey Map	29
Figure 8 - Product Schematic 1	30
Figure 9 - Product Schematic 2	30
Figure 10 - Ergonomic Study 1	31
Figure 11 - Ergonomic Study 2.....	31
Figure 12 - Style Design Mood Board – Sources available via Miro.....	32
Figure 13 - Needs Analysis Diagram	33
Figure 14 - Aesthetic Mood Board	36
Figure 15 - Needs and Pain Points Diagrams	37
Figure 16 - Ideation page 1.....	38
Figure 17 - Ideation Page 2	39
Figure 18 - Ideation Page 3	40
Figure 19 - Ideation Page 4	40
Figure 20 - Concept Development 1	41
Figure 21- Concept Development 2	42
Figure 22 - Concept Development 3	43
Figure 23- Concept Development 4	44

Figure 24- Concept Development 5	45
Figure 25 - Concept Development 6	46
Figure 26 - Detail Development 2	47
Figure 27 - Detail Development 1	47
Figure 28 - Schematic 1	48
Figure 29 - Ideation Page	49
Figure 30 - Bin Ideation	50
Figure 31 - Information Screen	51
Figure 32 - Produce Bin Graphics.....	51
Figure 33 - Sketch Model 2.....	52
Figure 34 - Sketch Model 1.....	52
Figure 35 - Sketch Model Produce Bin	53
Figure 36 - Sketch Model Hitch	53
Figure 37 - Sketch Model 3.....	53
Figure 38 - Final Render Wheel.....	54
Figure 39 - Cad Development 1	55
Figure 40 - Cad Development 2.....	56
Figure 41 - Keyshot Screen Capture	57
Figure 42 - Cad Development 3.....	58
Figure 43 - Cad Development 4.....	58
Figure 44 - Cad Development 5.....	59
Figure 45 - Early Final Model Picture.....	60
Figure 46 - Produce Bin 3D Print.....	61
Figure 47 - Produce Bin Lineup	61
Figure 48 - Freshly Painted Door.....	62
Figure 49 - Final Model Progress.....	62

Figure 50 - Human Scale Comparison.....	64
Figure 51 - Scale Reference for Produce Bins.....	65
Figure 52 - In Situ Render	68
Figure 53 - Studio Render	69
Figure 54 - Produce Bin in Situ.....	70
Figure 55 - Produce Bin.....	70
Figure 56 - Information Screen 2	71
Figure 57 - Information Screen	71
Figure 58 - Physical Model 1	72
Figure 59 - Physical Model 2	72
Figure 60 - Model Top View.....	73
Figure 61 - Model Front View	73
Figure 62 - Rear 3/4 View.....	74
Figure 63 - Left Side View	74
Figure 64 - Produce Bin Cart.....	75
Figure 65 - Produce Bin Technical Drawing.....	76
Figure 66 – Trailer Technical Drawing	76
Figure 67 - Information Screen	77
Figure 68 - Flavour Fleet Trailer Render.....	78
Figure 69 - User Testing of Store Shelves	81
Figure 70 - Cad Development Screenshot 1	83
Figure 71 - Cad Development Screenshot 2.....	83
Figure 73 - Cad Development Screenshot 3.....	84
Figure 72 - Cad Development Screenshot 4.....	84
Figure 74 - Cad Development Screenshot 5.....	85
Figure 75 - Produce Bins.....	86

Figure 76 - Produce Bin Views86

Figure 77 - Produce Bin Height Technical Drawing87

Figure 78 - Exploded View.....88

Figure 79 - Cad Approval.....90

Figure 80 – Thesis Topic Approval90

Figure 81 - TCPS 2 Certificate of Completion90

Figure 82 - WTA Schedule91

Figure 83 - FTA Schedule.....91

Figure 84 - Advisor Certificate 293

Figure 85 - Advisor Certificate 193

Figure 86 - Participant Certificate94

Figure 87 - Advisor Communication.....95

Table of Tables

Table 1 - Bill of Materials and Business Model Cost67

Table 2 - Bill of Materials Cont.....88

Chapter 1 Problem Definition

1.1 Problem Definition

Food deserts within North America present a challenging health risk to the surrounding communities. The United States Department of Agriculture states that an estimated 18.8 million people (6.1%) of the United States population lives in areas that are more than 1 or 10 miles from a supermarket (*Food Access Research Atlas 2022*). Residents of these areas have significantly higher barriers to provide nutritious, healthy, and fulfilling meals for themselves and their families. Food deserts are located in many parts of North America, not limited to rural towns but also includes areas of densely populated cities (Walsh, 2022). Food deserts contribute to the larger issue of food insecurity and decrease the quality of life of those who are affected.

1.2 Rationale & Significance

1.2.1 *Key Information to be determined*

The current habits and food consumption and purchasing decisions must be understood in order to provide a solution for residents of food deserts. Consideration of the current issues with transportation, logistics and economic factors will be conducted. Current use of food banks and other social programs will be studied, what is offered through these programs and who operates them in which locations. Dietary requirements and restrictions will be explored to provide well rounded options for users. Research into locations of need and logistic options will be conducted as well.

1.2.2 *Key Questions to be Answered*

A local food bank manager, food bank volunteer and internet resources will be assisting in answering the following questions: How do food banks currently assist with food insecurity?

What methods are available to assist those who do not have personal transportation? What is currently available at food banks and how does the produce get acquired? Are there any efforts to assist in cooking education within the food insecurity mitigation efforts? What do customers traditionally receive from food banks and in what quantities?

1.2.3 Investigative approach

Through interviews with different invested parties, user research and product research will be conducted. User observation, product benchmarking and needs analysis will all be conducted in order to understand the current issues and opportunities in relation to food deserts and food insecurity.

1.3 Background/History/Social Context

1.3.1 Demographic Trends and Lifestyle Trends

The trends of low-income food bank users are primarily skewed towards older individuals, with the age group of 31 to 64 making up 43.1% of the food bank usage within Ontario. Food banks primarily get used four or more times a month with that population making up 55% of the usage group. Education is becoming less of a factor with college and university educated groups growing as food bank users.

1.3.2 Media Trends

Currently there is an increasing trend of people who value sustainability within the food sector. Showing more care towards the packaging that their products come in. This will be a beneficial aspect of the final product through supporting reusable packaging.

1.3.3 Product Trends

Currently a variety of products fill the food desert gap. Delivery apps such as Grocery Gateway for grocery deliveries and Uber Eats for single meal deliveries have become

increasingly popular. With the surge in convenience that is brought by these services there leaves room for the traditional shopping experience within a more convenient package.

Chapter 2 User Research

2.1 User Research

2.1.1 User Profile – Persona

2.1.1.1 - Primary, Secondary, Tertiary Users

The primary users consist of low-income individuals living within a food desert. They are directly impacted by transportation costs, price fluctuations in produce and produce quality. The secondary users are the staff of supermarkets and food banks. Primarily assisting the primary user with purchasing and keeping the stores stocked for their visits. In the case of a food bank worker or volunteer, they can also be responsible for packaging and organizing personal parcels of produce for the primary user to pick up. The tertiary users are the supermarket and food bank owners and managers. They are responsible for the logistics and preparation of the store and ensure that there is a steady flow of donations and produce.

2.1.1.2 – Demographics

According to stats Canada (*Low income statistics by age, sex and Economic Family Type 2022*), the demographic breakdown of low-income individuals in Canada is as follows.

Geography ⁵	Canada ⁶ (map)	
Low income lines	Market basket measure, 2018 base ^{7, 8}	
Statistics	Percentage of persons in low income	
Persons in low income	2019	2020
All persons	10.3 ^B	6.4 ^B
Persons under 18 years	9.4 ^C	4.7 ^C
Persons 18 to 64 years	11.8 ^B	7.8 ^B
Persons 65 years and over	5.7 ^C	3.1 ^C
Persons in economic families ⁹	7.0 ^C	3.4 ^C
Elderly persons in economic families ¹⁰	3.0 ^D	1.3 ^D
Persons under 18 years in economic families	9.2 ^C	4.6 ^C
Persons under 18 years in couple families with children	7.0 ^D	3.0 ^D
Persons under 18 years in female lone-parent families	28.6 ^D	16.9 ^D
Persons not in an economic family	26.9 ^B	20.9 ^B
Elderly persons not in an economic family ¹⁰	12.0 ^C	7.4 ^C
Non-elderly persons not in an economic family ¹¹	33.8 ^B	27.3 ^B

Symbol legend:

^B data quality: very good

^C data quality: good

^D data quality: acceptable

Figure 1 - Demographics

To further develop the demographic profile, food bank users were studied. A breakdown of those who are food insecure is provided by Food Banks Canada (*Hungercount 2022*). Food Banks Canada states that 54.6% of Canadians that visit food banks receive their income from social assistance or disability support. The education level of food bank users has been rising as 36% have college diplomas or university degrees (Monsebraaten, 2016).

2.1.1.3 – User Behavior

The current user behavior is a mix of different solutions to the problem of food scarcity. Multiple methods currently exist: transit, deliver, or sacrificing nutrition. Some users choose transit to get to higher quality food options which has the limitation of carrying capacity for the purchased produce and increased cost due to transit fees. Delivery also carries drawbacks of charges per delivery but does not limit order size. Sacrificing nutrition is an all-too-common answer to the food desert problem. The final behavior is choosing low nutritional value foods from fast food restaurants or local convenience stores.

2.1.1.4 – Expert Interviews / Surveys

The expert involved with this thesis is Nate Dirks. Nate is the Action Pastor for Southridge community church in Vineland, Ontario. He oversees various social programming including programs that deal with food insecurity. A selection of the questions asked during the first interview are as follows:

What are the challenges associated with food insecurity programs?

What are the top trends in the past 5 to 10 years in this space?

What are the newest opportunities that Southridge is looking into to improve the social programming?

Is there any impact from technology within this space?

From this interview many themes and challenges became apparent. The challenges are transportation, education, and access. Transportation to and from food banks to collect groceries can be challenging and costly, the time and money required to get to and from a food

bank can be expensive and taxing. Transportation is not always available and can be lacking in underdeveloped towns. The educational aspect is knowledge about what to do when quality produce is available, providing recipes and cooking classes became an opportunity of exploration for the target user. Access to quality produce is a challenge within a food desert, if food is available locally it isn't always high quality.

The conducted survey involved nine participants within the forum "Poverty Finance" hosted on reddit. The users were asked the following questions to better understand the target user.

Are healthy meal options a top priority when you are shopping?

Where do you do you mainly get your meals from?

What are the methods that you use provide healthy meal options for yourself or others?

How do you choose the groceries you purchase?

Does transportation affect your grocery shopping habits?

How frequently do you cook for yourselves or others?

Do you feel that you have a wide variety of meals you know how cook?

Do you have experience living in a food desert? What do you do to deal with that situation?

The responses to these questions followed the themes of cost saving as a priority, home cooking being the best option to save on cost and eat quality meals, and transportation being a large issue within a food desert.

2.1.2 Current User Practice

In this thesis, two regular tasks will be highlighted. Going to a supermarket and a food bank. The two tasks start by arriving via transit or by foot. This stage can be difficult based on the transit availability and the distance that must be covered. In a food desert this would be a challenging phase of the task with minimal supermarkets or food banks in the local area. The

following phase of the task is the shopping stage, selecting produce from a supermarket or collecting items from a food bank.

The supermarket shopping process involves careful planning and consideration of budget and cooking ingredients. As mentioned in 2.1.1.4, knowledge of how to cook a variety of meals can be a challenge in the user group.

The food bank process can look different based on the location that the user visits. The Food Banks Canada's "Hunger Count" (Monsebraaten, 2016) showed that there are 8 or more methods of food delivery from food banks across Canada. The primary method of delivery is in person prepackaged hamper that volunteers assemble. An interview with a food bank volunteer was conducted based on the prepacked hamper concept. The relevant takeaways are the pain points that users can experience during this process. The users can end up without all the desired items based on stock levels and their personal situation. Food banks sometimes offer more items than just food, personal care items can often be found within prepackaged hampers based on the need of the user. With prepackaged hampers, the user is required to fill out forms and a wish list to receive items which can sometimes present language challenges or other paperwork issues. The Food bank volunteer pointed out that there can be circumstances where the user would not be given certain items or quantities based on their paperwork showing they had less need than required for those items.

Some food bank models offer home deliveries when transportation is an issue (Monsebraaten, 2016) which helps to alleviate some cost based on less reliance on transportation. If home delivery of food bank items or grocery store delivery is not available, the user is required to carry all the purchased produce with limited carrying capacity and space due to public transport having limited personal space.

2.1.3 User Observation – Activity Mapping

Considering the food bank journey map, shown below, we can see that the lowest points of a user’s food bank experience come from the preparation and transit portions. This journey map was prepared based on two interviews conducted with Nate Dirks and with the food bank volunteer. Throughout this task many previously discussed pain points take place, preparation with paperwork and meal planning, delays waiting in lines and transit cost.

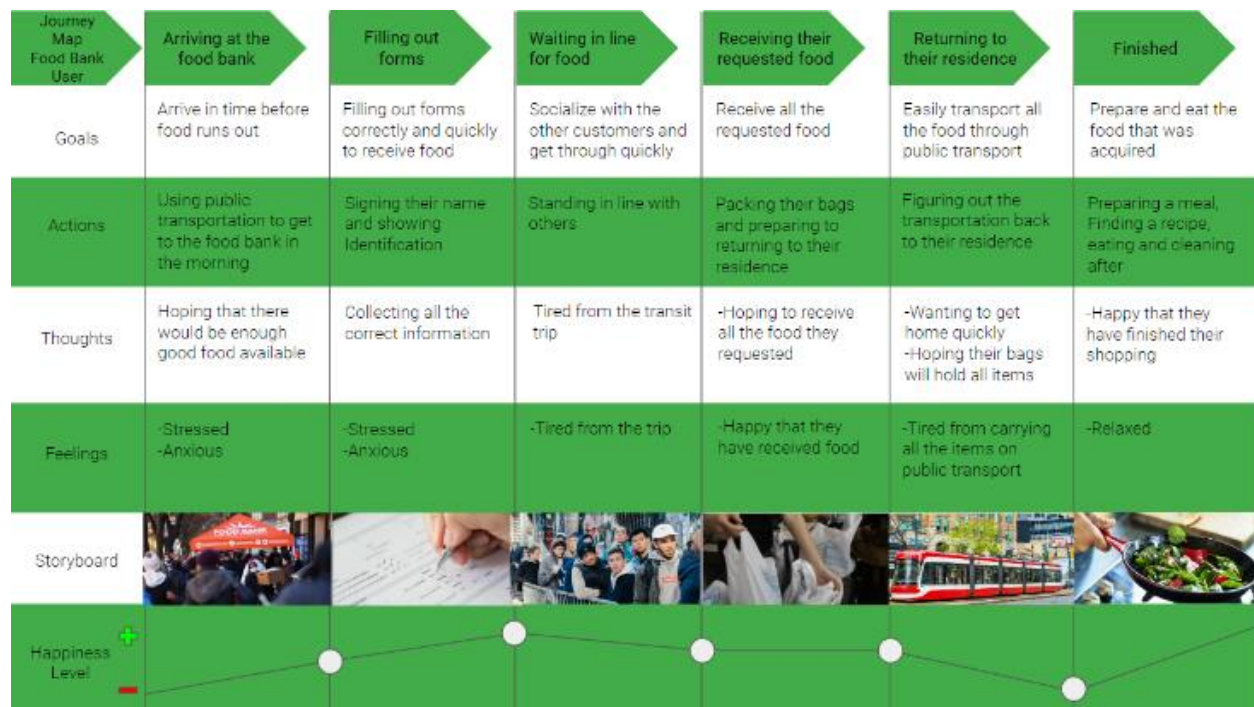


Figure 2 - Journey Map

2.1.4 User Observation – Human Factors of Existing Products

Pictured below are the produce that were compared to get a better understanding of produce transport. With a variety of features that benefit the user ergonomically and with benefits for the produce, developing future produce storage devices will benefit from this learning.

These products are from a selection of food delivery services: Sobeys, Grocery Gateway, Amazon Fresh, Uber Eats and Hello Fresh. The human interaction points consist of the handles or carrying points, zippers or latches, and lids. With the main trends being the ease

of transport, packaging that allows for stacking or latching multiple units together and touch friendly materials that promote grip and security.



Figure 3 - Product Comparison

2.1.5 User Observation – Safety and Health of Existing Products

The health and safety revolving around the transport of food has many aspects. Weight, size, and lift height are all important opportunities for improvement. Having sturdy and reliable handles that help distribute weight is a big opportunity for improvement. The profile and size of the handles were aspects that presented itself throughout the product comparison, handles that have better ergonomic factors and won't cause harm to the hands of the user are a priority. The material choice of the food carriers also impacts the user's safety as the brittle plastic of a heavy bin can dig into the hands of the user cause pain over long term. Material choice and handle profile are the prevalent opportunities in the healthy safety of the user when developing a produce bin.

2.2 Product Research

For this product comparison there were two approaches selected in order to better position the final product. Comparing storage of produce while in transit and the overall appearance of current food delivery vehicles. Researching the materials, benefits and features allows for proper study of features to include in order to best raise the quality of life of the end user.

2.2.1 Benchmarking – Benefits and Features

In this section this thesis will compare various items used to transport produce to and from supermarkets and distribution facilities. These products facilitate the easy transport of produce as a part of delivery services, yet similar products could be taken for personal use. Included with the products are the benefits that each product brings with some relationship to the delivery service they are a part of.

	Viola by Sobeys	Grocery Gateway	Amazon Fresh	Uber Eats	Hello Fresh
					
	Features				
	<ul style="list-style-type: none"> • Large format delivery • sturdy baskets • Inviting and colorful 	<ul style="list-style-type: none"> • Large format delivery • sturdy baskets • Inviting and colorful 	<ul style="list-style-type: none"> • Smaller deliveries • Easy to store bags • insulated • Carrying handles 	<ul style="list-style-type: none"> • Smaller deliveries • Easy to store bags • insulated • Carrying handles 	<ul style="list-style-type: none"> • Easily stackable • Fit well within standard trucks
Insulated	No	No	Yes	Yes	No
Need refrigerated truck	Yes	Yes	No	No	Yes
Transportation	Cart	Carry with handles	Carry with handles	Carry with handles	Cart
Unit Size	21.8 x 15.2 x 12.9"	21.8" x 15.2" x 12.9"	15"W x 15"H x 10"D	15"W x 12"H x 9.5"D	Based on contents size
Material	Rigid Plastic	Rigid Plastic	Insulated Fabric	Insulated Fabric	Cardboard

Figure 4 - Product Comparison 2

The takeaways from the product benchmarking are in relation to their form and how they treat the stored produce. Rigid packaging is beneficial as it provides more protection for the included produce. The insulated packaging assists in longer term storage and assists in keeping the freshness of produce. Built in ergonomic features like handles and large zippers assist the user with transportation and organization. The packaging is well considered for produce storage as it fits many items properly which allows for optimal space usage. These benefits highlight the need for consideration of the produce storage containers as the sizing and form is integral to their usefulness.

2.2.2 Benchmarking – Functionality of Existing Products

Exploring the functionality of produce totes shows the minimal features that make the product so effective. Combining organizational aids with insulated walls for freshness, they provide the best method of produce transportation while optimizing storage to reduce shipping costs. The rigid plastic totes require external temperature control and provide sturdy produce protection while allowing for stacking in storage. Combining the insulated and collapsibility of the fabric totes with the rigid organizational strengths of the plastic totes will be an important feature set for the final product. With the addition of comfortable ergonomic handles, this feature set will be well positioned to best meet user needs.

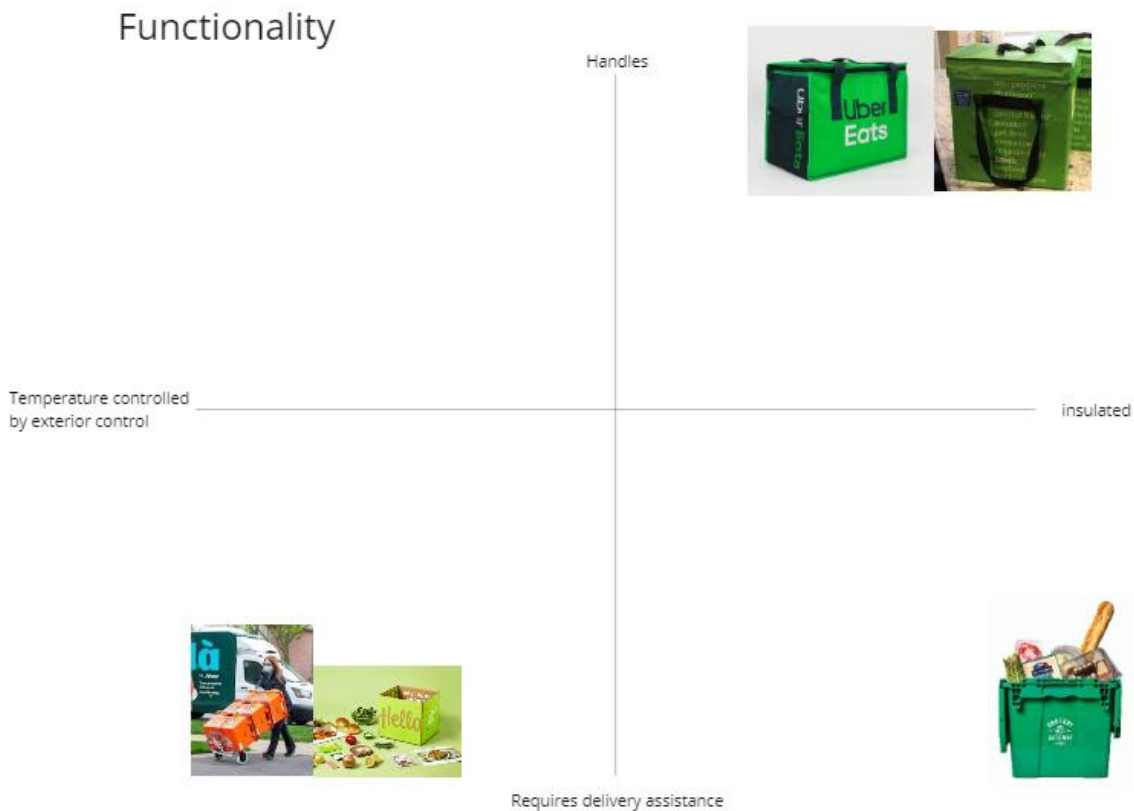


Figure 5 - Product Comparison Chart

2.2.3 Benchmarking – Aesthetics and Semantic Profile of Existing Products

Regarding the aesthetics and semantic profile, designs of current delivery trucks were conducted. The benefits of proper curb side marketing will play a large role in the success of this thesis. Overall, bright, and eye-catching displays that explain the contents of the vehicle and the benefits it provides the customer are the greatest path to success. The vehicles that were compared rely less on overall form and lean heavily on presentation of their products through billboard style advertising.



Figure 6 - Advertising Styles Mood Board – Sources available via Miro

2.2.4 Benchmarking – Materials and Manufacturing of Existing Products

Due to the contrasting material choices, there are benefits and drawbacks to the two directions that have been explored in this comparison. The benefits of rigid plastic are

stickability and organization with large quantities of totes making bulk transportation easier. These produce totes are traditionally made from polyethylene or polypropylene. These types of plastic offer rigid construction with impact resistance to offer strong support and protection to the interior contents. Canvas or fabric bags provide a layer of insulation while being able to collapse when they are not in use. The included thermal batting in the fabric tote bags offer limited impact resistance and protection but preserve the contents better in cases where there is no other thermal support. The combinations of these features extending from the material choice will greatly benefit the final output of this thesis.

2.2.5 Benchmarking – Sustainability of Existing Products

Current produce transportation products have had a recent push for environmental safety within their products. Some cooler bags use recycled plastic and other biodegradable materials in creative ways. Using recycled materials as thermal protection within the walls of bags and bins is an opportunity for development within the Flavour Fleet product. As the biodegradable aspect of produce transportation isn't always a benefit, using recycled or recyclable plastics within the development of the produce bin is a strategy that was implemented. An increasing trend is to use traditional cardboard boxes with insulation as a transportation method, this will not be applicable for the Flavour Fleet system as it is not durable for repeated use.

The transportation of produce traditionally happens within large internal combustion engine vehicles. With the increasing push to electric vehicles, electric transportation will become an option in the future.

2.3 Summary of Chapter 2

Throughout this chapter, comparisons in multiple avenues have highlighted the importance of ergonomics, material choice and advertising. The ergonomics of the final product are of the highest importance to a successful thesis. Without proper full-bodied considerations,

the features and benefits will fall flat. With the compared totes, the handles or straps and material choice factored heavily into the ergonomic considerations of the product. The material choice will impact the quality and long-term freshness of the stored produce. Combining the strength of polyethylene and polypropylene with thermal batting could be a beneficial combination to preserve freshness and reduce damage from outside impacts. The advertising choices of the compared will weigh heavily on the environment created by the final product. Having an open and inviting environment inspired by the surrounding colors will be a beneficial way to improve the user's outlook on the final product as a whole.

CHAPTER 3 Analysis

3.1 Analysis

3.1.1 Needs/Benefits Not Met by Current Products

The current solutions available for mitigating the effects of food deserts are a combination of transportation and social programming. The final product will meet the users where they are while fulfilling their latent, and immediate needs while catering to their wishes and wants. The needs that are not met by current solutions are local, low-cost healthy produce in close proximity to residents in order to not have the drawback of transporting groceries in cramped public transportation space. As discussed in 2.1.4 and 2.2.1, the compared products do not assist in longer distance transportation over public transport and live within a delivery system. The compared products would benefit from assisting users by being a shopping aid instead of assisting with deliveries. The benefits that are missing surround the distance that separates the user from fresh, healthy and nutritious meals.

3.1.2 Latent Needs

The latent needs of the user surround their health benefits and overall quality of life improvement. Good quality food can raise the user's energy level while preventing unhealthy effects that poor nutrition brings (*Health benefits of eating well 2020*). Strengthening heart health, promoting strong bones and teeth while managing weight gain (*Health benefits of eating well 2020*). Healthy eating is at the core of Maslow's hierarchy of needs with physiological needs being the base of the hierarchy. Maintaining a healthy and well-rounded diet has many positive impacts for a user's health and well-being.

3.1.3 Categorization of Needs

The immediate need of the user is to provide food for themselves for the short-term future. The thesis product will assist in fulfilling that need by providing healthy, local, and low-cost alternatives to conventional grocery stores. The psychological need is alleviated by removing the transportation barrier and planning requirements to acquire food for the next grocery shopping cycle.

The latent needs are surrounding transportation bringing the produce to them locally with greater health benefits than their previous local food options. With healthy produce being stocked their health will be improved compared to current options. The unanticipated experience is the enjoyable food that is delicious and of better quality than that of the local fast-food options.

The wants and wishes of the users are to have lower cost and higher quality options available to them locally. This is not always achievable through current means in all locations. Without these wants and wishes health can decrease and leave the user worse off.

3.2 Analysis – Usability

3.2.1 Journey Mapping

To fully understand the process that a low-income individual experiences to provide food for themselves and others, a journey map was created. To understand the timing of this map, estimates were made based on each stage, which are as follows: Arriving at the food bank: half an hour via transit, filling out required forms is roughly 10 minutes, waiting in line can vary by day but will be estimated at 20 minutes. Receiving and organizing food would be a quick event for 5 minutes, returning to the residence will take another half an hour with the organization of the produce in the residents taking 20 minutes. Adding the whole process up offers a trip time of

one hour and 35 minutes. This all varies by location and wait times within the food bank process.

In the journey map below, we can estimate the user’s happiness level throughout the process, the stress and planning required transitioning to the satisfaction of a healthy and nutritious meal. The takeaways from this map are the tired feelings and hope required to get all of the desired items from the food bank.

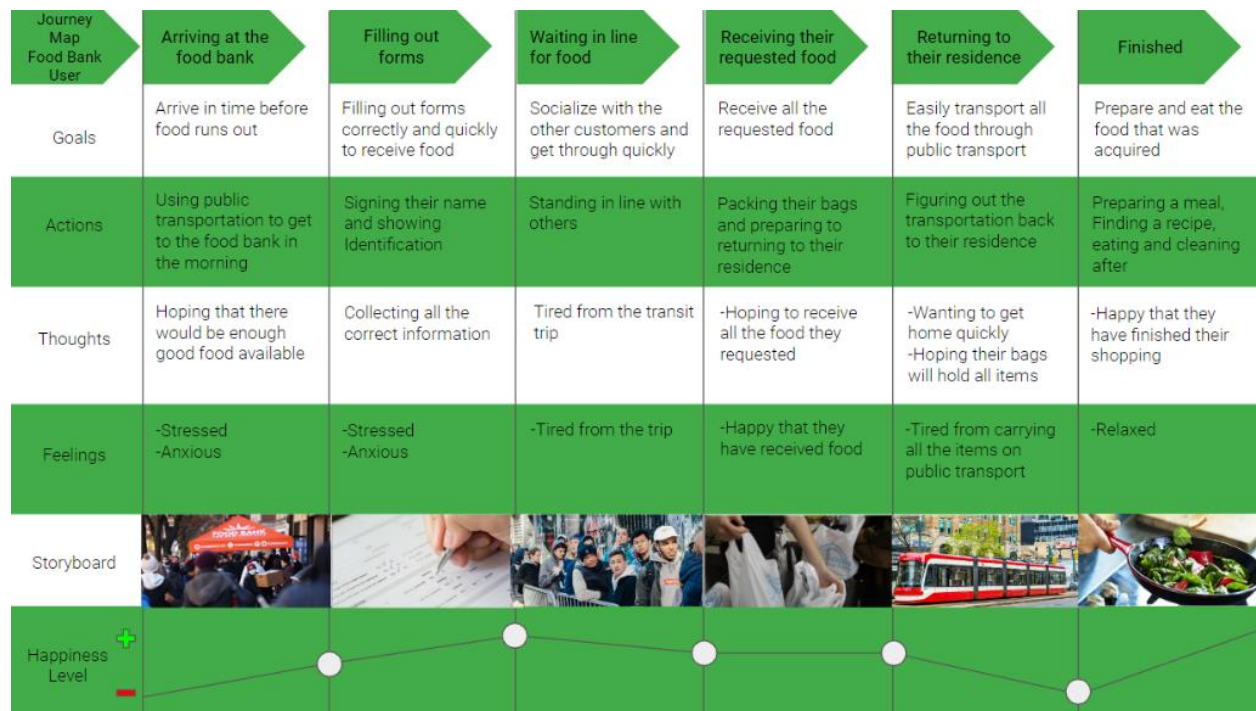


Figure 7 - User Journey Map

3.3 Analysis – Human Factors

3.3.1 Product Schematic – Configuration Diagram

To research the ergonomics of the final product, ergonomic diagrams were created to evaluate the user’s interaction with produce storage bins at various heights. Mimicking the heights of supermarkets shelves, this test prepared for a 1:1 scale buck to verify the finding of the diagram. The diagram makes use of 99th percentile male and 1st percentile female

measurements to get a broad look at usability for all possible users. These measurements were found in *The Measure of Man and Woman* (Tilley, 2002). Studying the overall height, shoulder width and viewing angles to verify the current design. With these body parts in mind, specifically this diagram explores hand reach and gripping, back strain in relation to bending over, sight lines and a drawer opening movement with the user's arms.

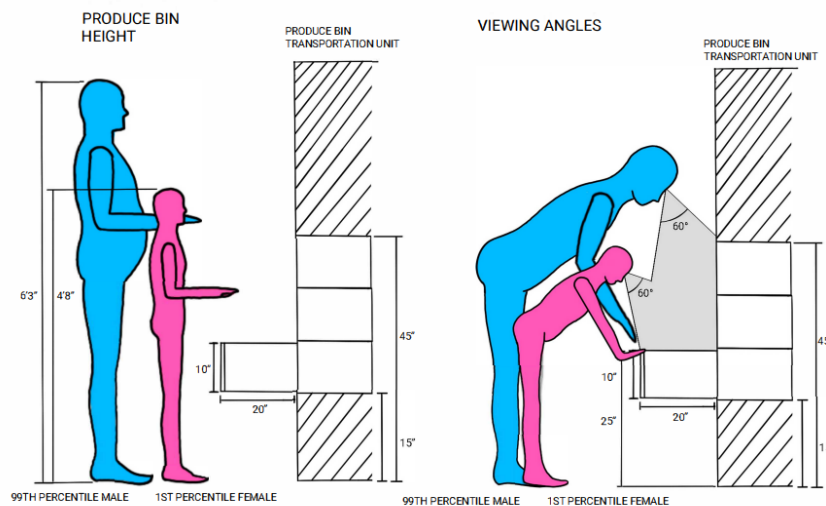


Figure 8 - Product Schematic 1

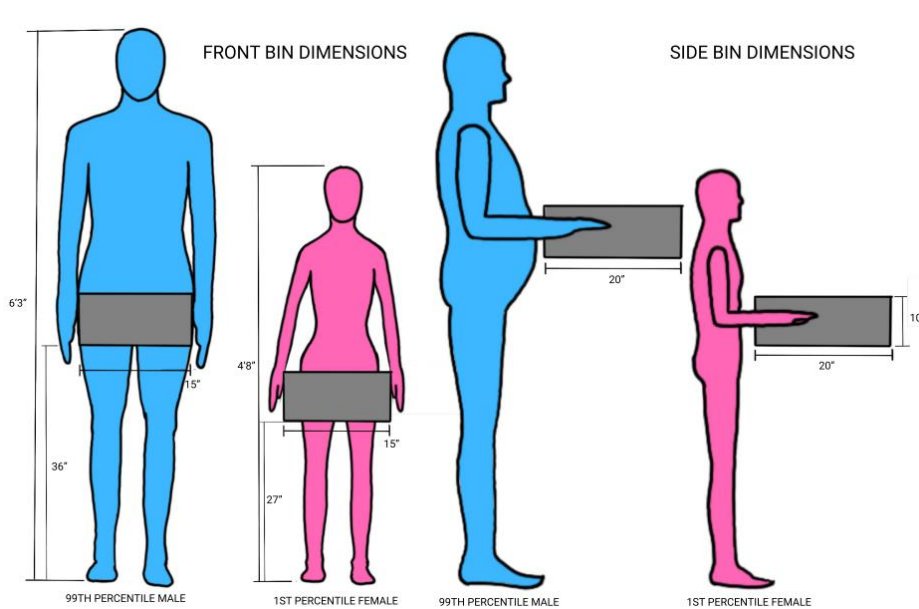


Figure 9 - Product Schematic 2

3.3.2 Ergonomic – 1:1 Human Scale Study

To fully understand the product’s ergonomic impacts, a 1:1 scale ergonomic buck was developed. This method of study explores elements not possible with a 2d diagram. Using a 95th percentile male and a 5th percentile female, this test simulated the different heights of a supermarket shelf similar to the diagram. Focusing on the hand motions and back strain specifically, this model proved the importance of the careful consideration of the height of each shelf within the final product.

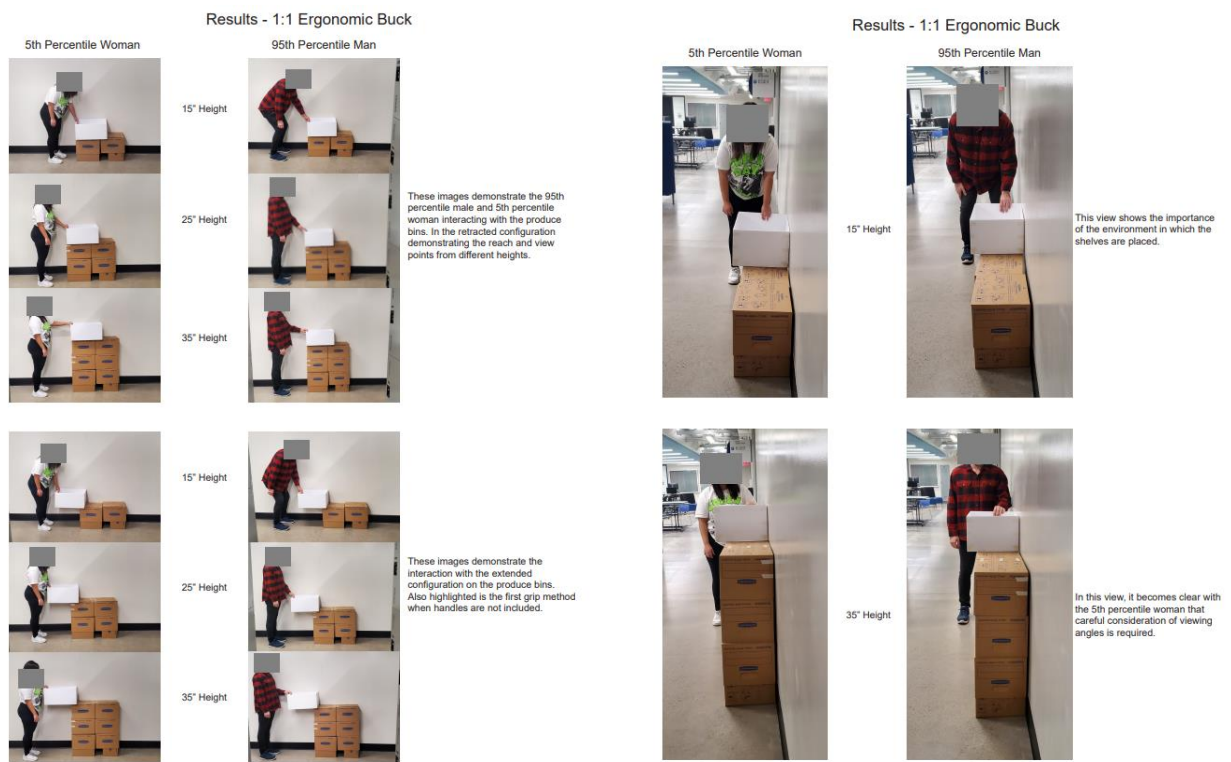


Figure 10 - Ergonomic Study 1

Figure 11 - Ergonomic Study 2

3.4 Analysis – Aesthetics & Semantic Profile

The aesthetic profile of the final concept will revolve around creating an atmosphere and environment within an open-air shopping area. One that is light and portable looking yet giving the same feeling as an established supermarket. The inspiration behind these aesthetic approaches is in the figure below. Pulling from the Peugeot food truck concept of modularity and

expandability. The same environment building feeling from the thin sun shades, and the design cues from the cockpit design and from the piano. Bringing thoughtful design and aesthetics will give the users a feeling of confidence as they are being considered within the design process.

The semantic trends showcased in the examples below highlight expandability coming from a small and light package. Leaning on flowing and curvy lines while keeping modern a modern and futuristic look.

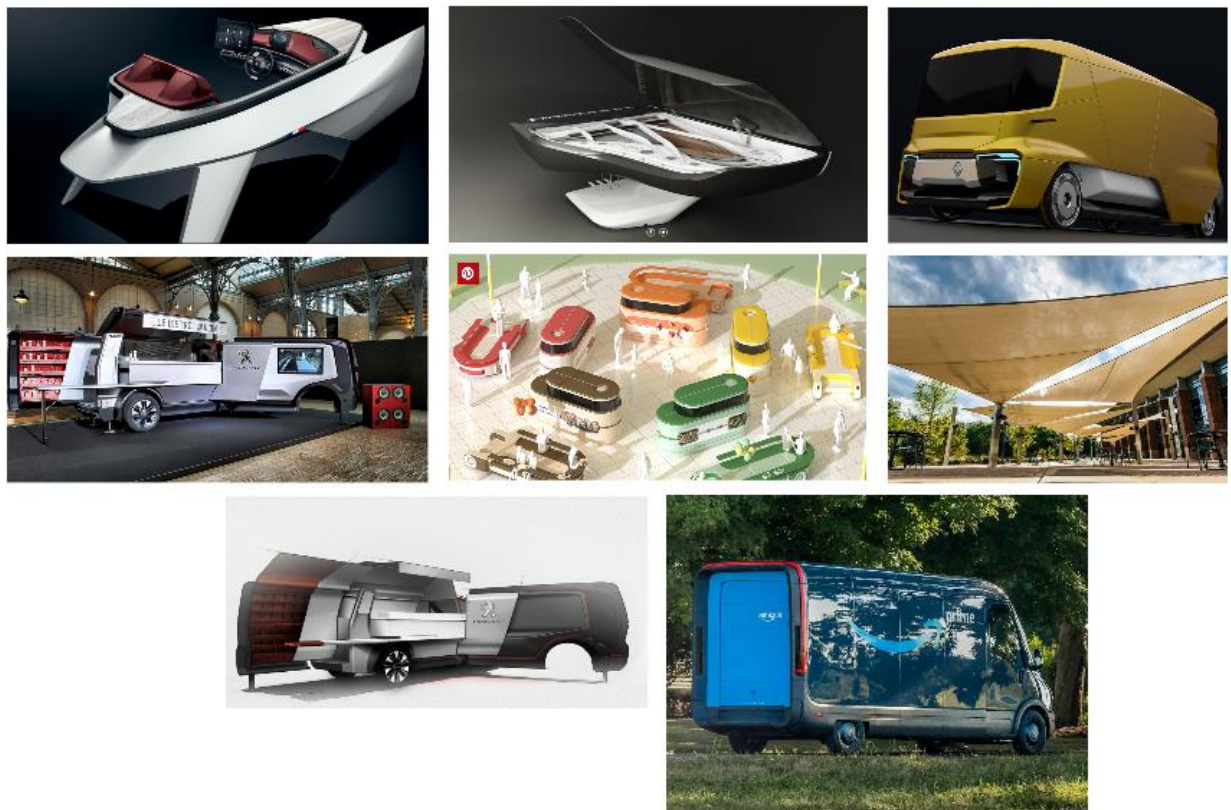


Figure 12 - Style Design Mood Board – Sources available via Miro

3.6 Analysis – Innovation Opportunity

3.6.1 Needs Analysis Diagram

To fully understand the needs of the user, a needs analysis diagram was constructed to assign value to each want or need. In this diagram quantity, quality and convenience became major elements that should be considered throughout the design process. Fully developing the user experience within the final product will be crucial to ensuring the ease of use and speed at which a user can complete their shopping without a headache.

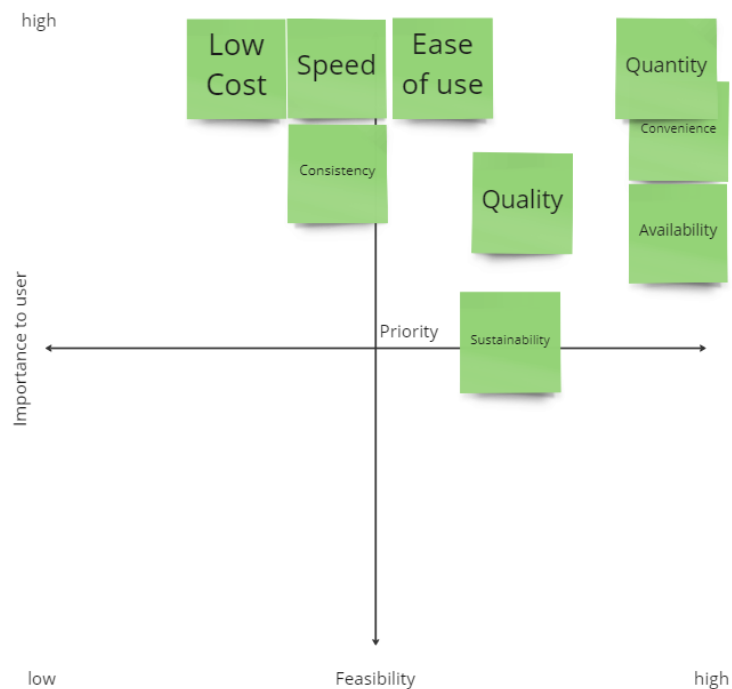


Figure 13 - Needs Analysis Diagram

3.6.2 Desirability, Feasibility & Viability

Desirability

The desirability of current products is based on necessity and how well the certain product works. Functionality based desirability is a trend that extends to the final Flavour Fleet system. Providing a well-functioning product will drive the desirability within the market. For the Flavour Fleet trailer, distributing nutritious food with efficiency and regularity will positively impact the desirability of the system.

Feasibility

The feasibility of the current product offerings is how easy it is to get the product to the customer. This extends to the manufacturing and distribution of cooler bags. As they are low cost and high-volume products they are often given away for free or very cheap if a customer is to purchase one. Manufacturing of the cloth bags is simple in design which aids in the distribution efforts.

Viability

The viability of the current food transportation products is also based on the function of the product. The viability is purely in how well it functions, meaning how long food will stay at their starting temperature. This will drive product purchases and the uptake in the market. Applying this trend to the Flavour Fleet system will be crucial to a successful offering.

3.7 Summary of Chapter 3 – Defining Design Brief

To summarize the goals of this thesis and to keep the focus on the primary user, 10 guiding statements have been outlined.

1. Remove impediments to proper nutrition and eating habits
2. Improve access to high quality ingredients in sufficient quantity
3. Improve health and wellbeing of the users by increasing the quality of their diet
4. Remove the barriers of transit to promote proper grocery shopping habits

5. Create an atmosphere of comfort to elevate the user's confidence
6. Educate the users on how to better their meal preparation
7. Ensure that users are satisfied with their shopping experience
8. Promote healthy lifestyle habits
9. Provide sustainable methods of consumption
10. Be environmentally conscious with packaging choices

Chapter 4 – Design Development

4.1 Initial Idea Generation

4.1.1 Aesthetics Approach & Semantic Profile



Figure 14 - Aesthetic Mood Board

4.1.2 Mind Mapping

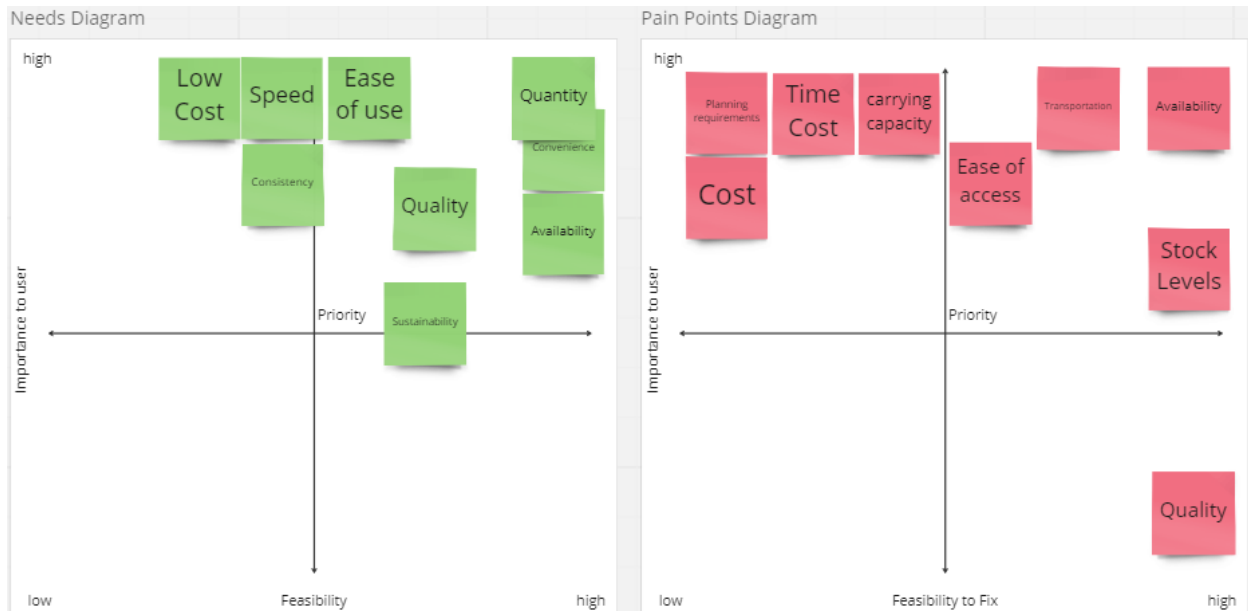
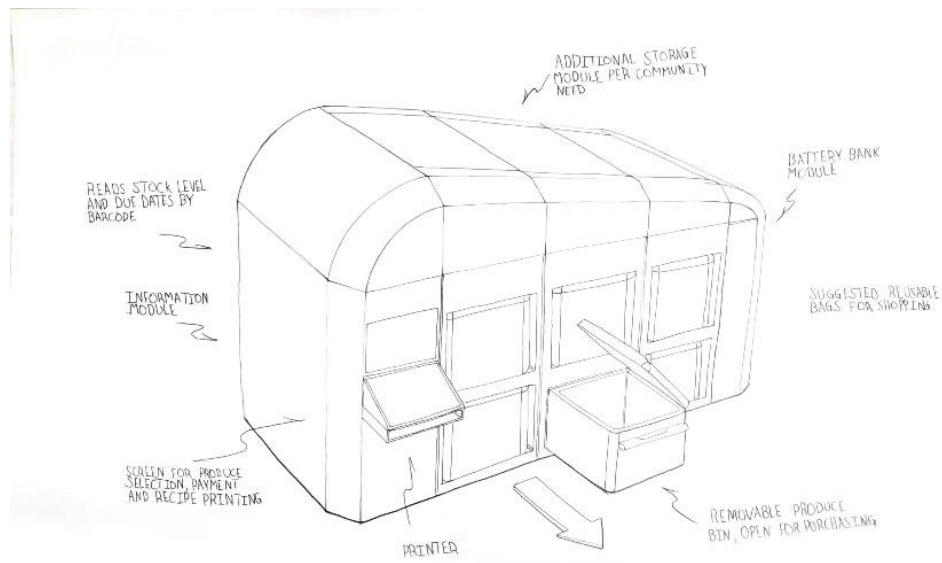


Figure 15 - Needs and Pain Points Diagrams

Two additional mind mapping diagrams were used to layout the needs and pain points that the concepts need to focus on. Highlighting low cost, ease of use and convenience for the needs and availability, stock levels and transportation for the large pain points.

4.1.3 Ideation Sketches

To focus on the details and issues surrounding this thesis topic, a brainstorming board and ideation pages were developed. The goal of the ideation phase was to find the best method of filling the gaps of current social services and supermarkets. Different approaches to use cases, product cycles, cost structures and deployment methods were all considered to best serve the end user. The ideation pages are included below.

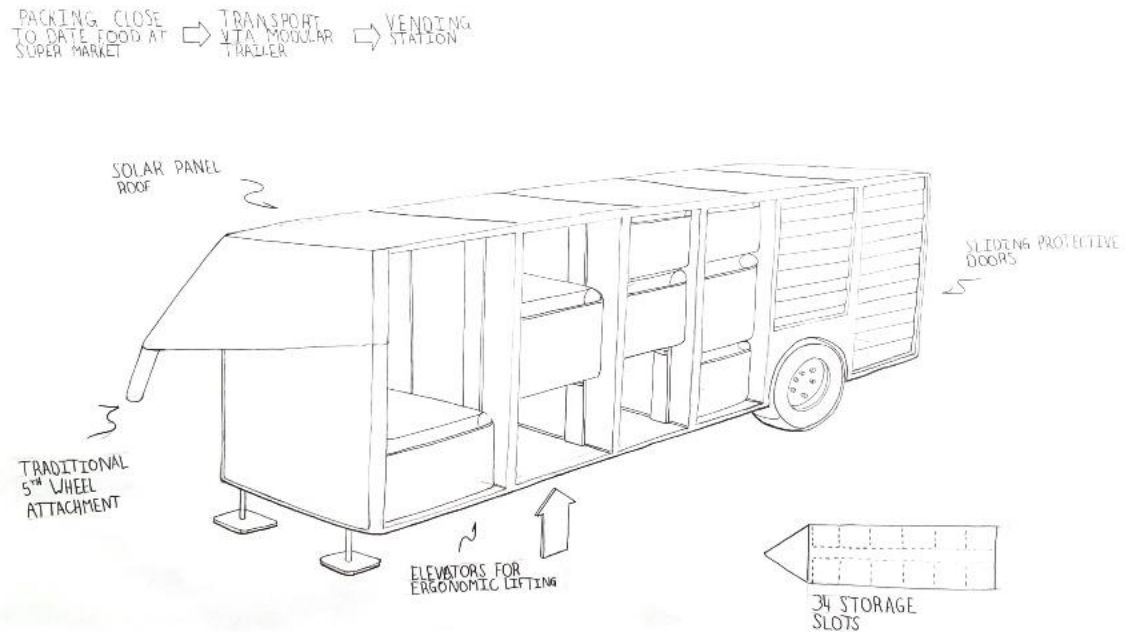


Re-Fresh - Vending Station - 1

Timothy Kraulis

Figure 16 - Ideation page 1

The Re-Fresh vending station pushes for a self-serve food distribution method. Being consistently in one place and refilled by a single local supermarket. Offering local produce to remove travel time and cost to lower the burden of high-quality produce. This included offering printed recipes to aid in educating the users.

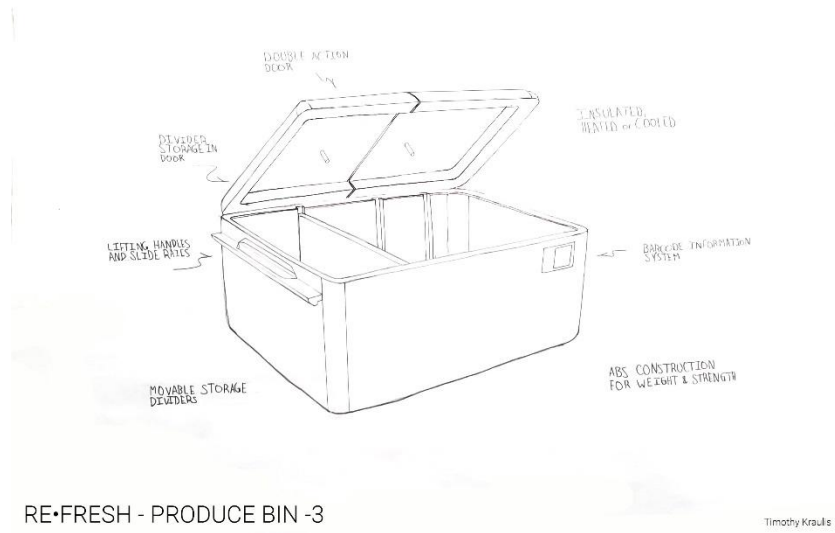


RE•FRESH - DELIVERY MODULE - 2

Timothy Kraulis

Figure 17 - Ideation Page 2

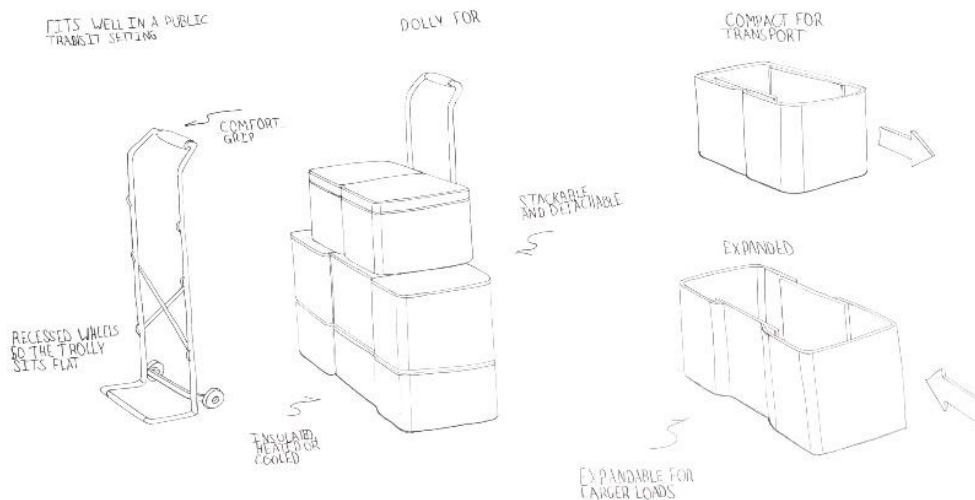
The Re-Fresh delivery trailer offers bulk food transportation intended to be set out and displayed. Offering more produce at scheduled times in a consistent local location, the delivery trailer collects from food banks and supermarket to meet the needs of underserved residents.



RE•FRESH - PRODUCE BIN -3

Figure 18 - Ideation Page 3

The Re-Fresh produce bin aids in the transportation of produce within standard vehicles without the need for custom infrastructure to support cooled or heated items. Including QR code technology to easily inform about produce quantity and expiration date.



TRANSIT TROLLEY - 4

Timothy Kraulis

Figure 19 - Ideation Page 4

The Transit Trolley offers a way for users to transport larger quantities of food from a distant supermarket to their home. Built to collapse, the transit trolley aims to be an easy addition to a transit journey without being overly bulky when it is empty. Made with insulated walls to retain the freshness of the food.

4.2 Concept Exploration

4.2.1 Concept One

RE-FRESH TRAILER

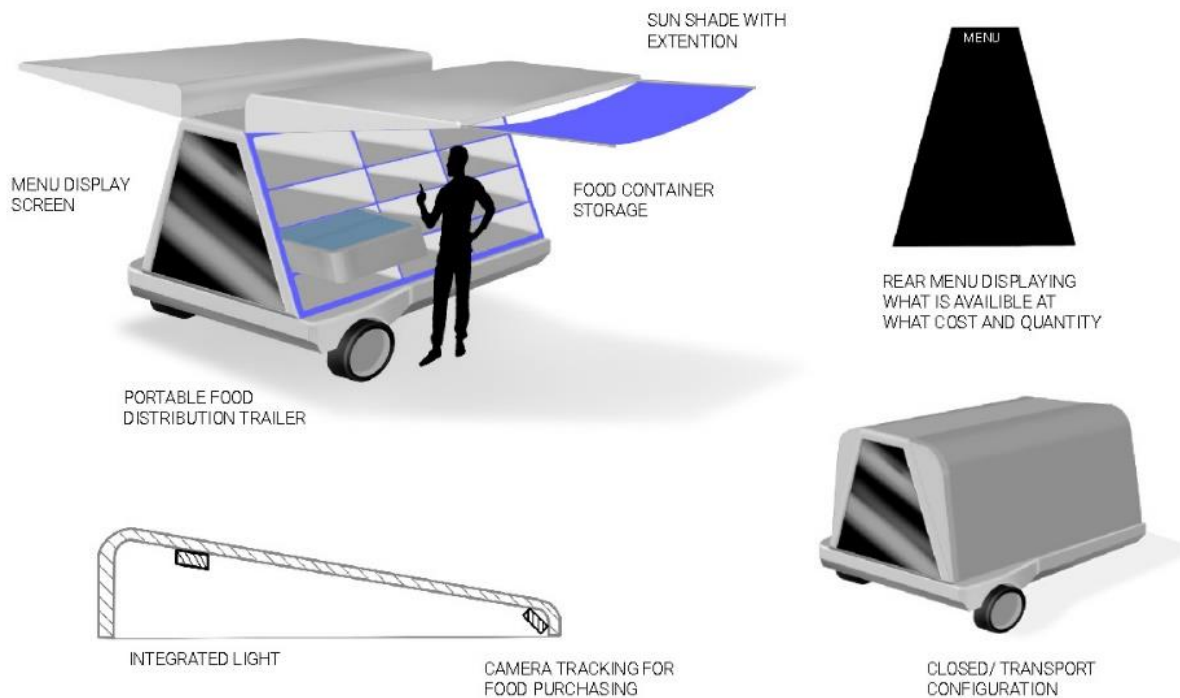


Figure 20 - Concept Development 1

The Refresh Trailer is an extension of the ideas built in the ideation phase. Key features inclusions are the use of individual storage bins, screens for item quantity display, and environment creating sunshade. This mobile solution to food insecurity will travel from a

supermarket or food bank to deliver close-to-date or excess food at a lower cost. This method also lessens the burden of travel costs to and from distant supermarkets.

4.2.2 Concept Two

RE-FRESH STORAGE BIN

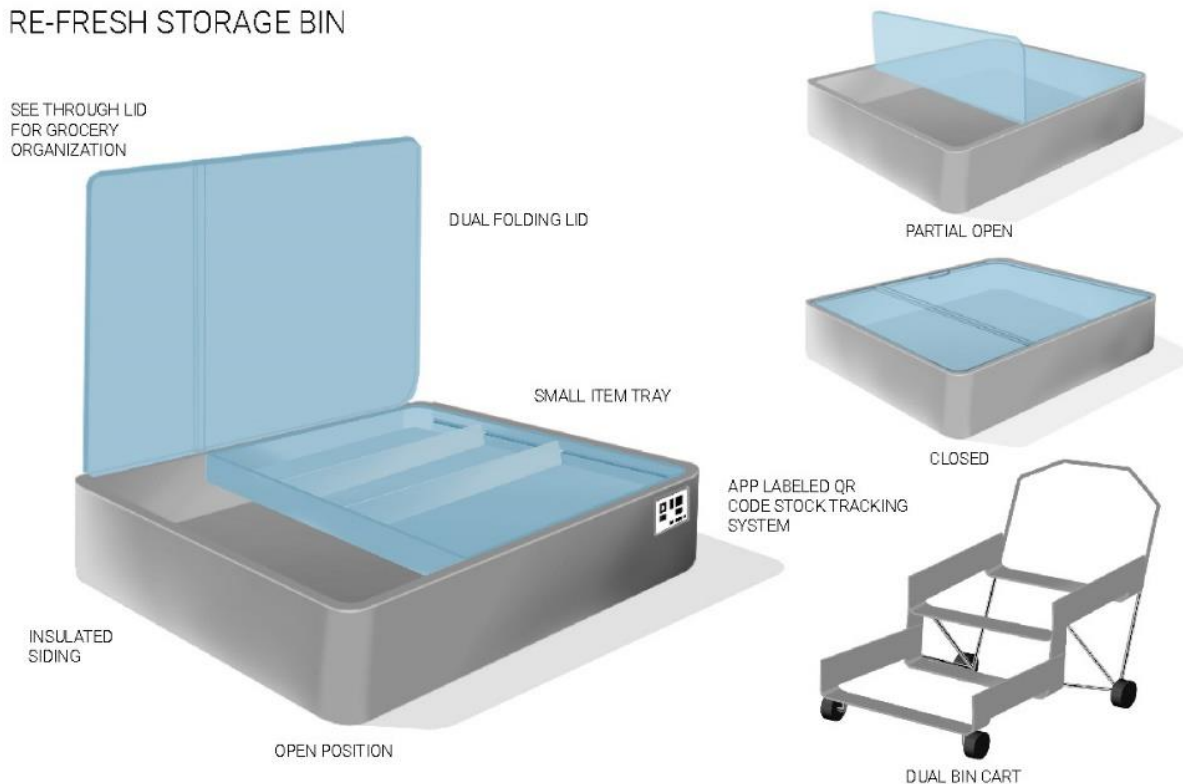


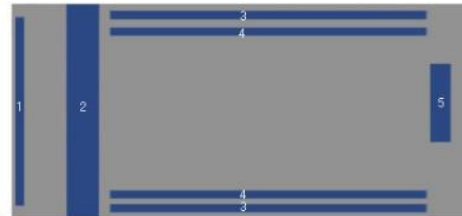
Figure 21- Concept Development 2

Concept Two provided valuable exploration into the storage and sorting of produce within the food distribution cycle. In an interview with a local food bank manager, they provided information on how to best store the food. Current solutions are open bins stored in room temperature or a freezer. Food safety zones within storage areas, “4 to 140” storage temperatures, and height of the food storage off the ground are all things taken into consideration within this concept. The interview included a tour which showed the extensive use of carts and how necessary they are within the food distribution network. The result from this exploration is built into the final concept.

4.3 Concept Strategy

4.3.1 Concept Direction & Product Schematic One

RE-FRESH TRAILER PRODUCT SCHEMATIC



BLUE: DEVICE INCLUSION

1. REAR TOUCH SCREEN
2. REAR AXEL MECHANISM
3. LIGHT BAR
4. SENSOR BARS
5. FRONT LEVELING LEG

DISTRIBUTION PROCESS

1. COLLECTION WITHIN SUPERMARKET
2. ORGANIZATION WITHIN BINS
3. COLLECTION BY RE-FRESH TRAILER
4. DISTRIBUTION TO THE COMMUNITY



GREEN: TOUCH POINTS

1. FOOD BIN HANDLES
2. REAR TOUCH SCREEN
3. LEVELING LEG

90 PERCENTILE MALE

5TH PERCENTILE WOMAN

Figure 22 - Concept Development 3

The first product schematic shows the layout of the produce bins, electronics, and other devices. Showing their relation to a 5th percentile female and a 95th percentile male showed that further study was required in order to have an ergonomic solution to the produce bin storage. This also highlighted the need for further study into placement of electronics and their form, as well as the fine details with the trailer function while in transit. The trailer hitch and support mechanism needed to be explored in more detail to fully finish this concept.

4.3.2 Concept Direction & Product Schematic Two

RE-FRESH STORAGE BIN PRODUCT SCHEMATIC

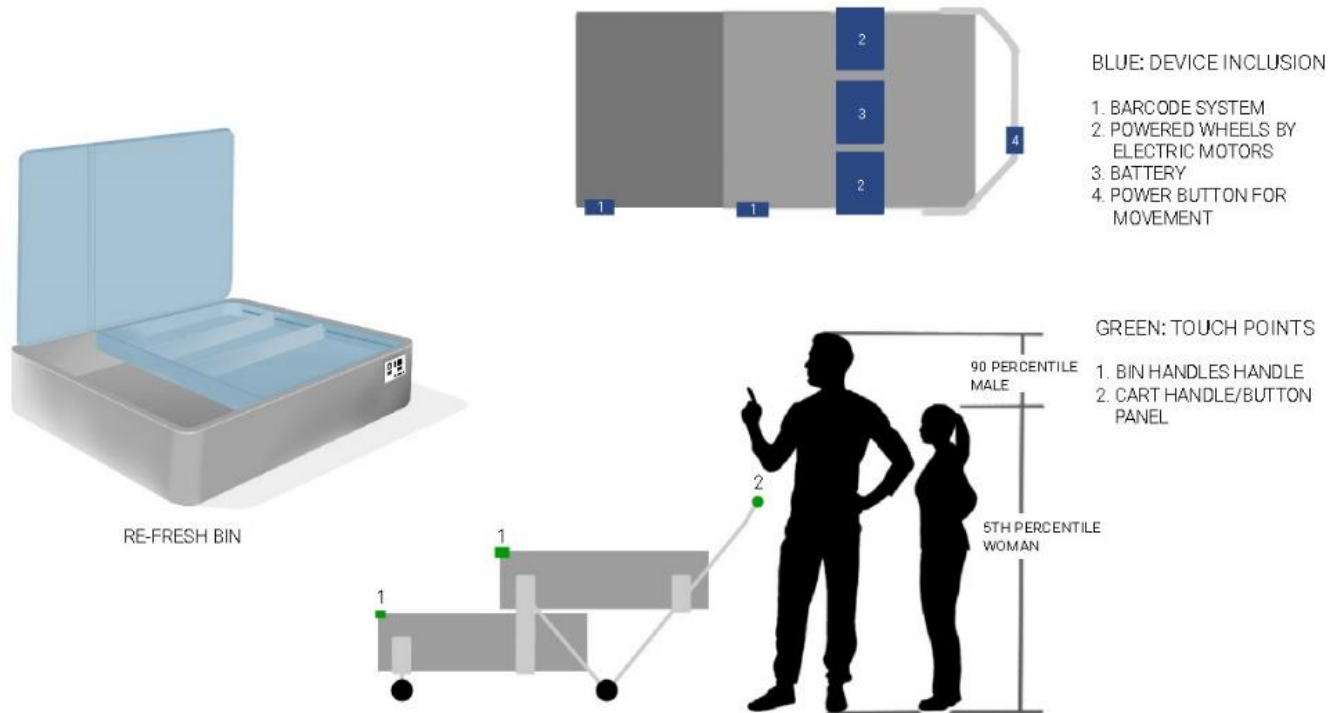


Figure 23- Concept Development 4

Concept two explored the movement and storage of the produce bins and showed the touch points of the trolley. This exploration showed that further detailing into the cart needed to be done in order to maximize ergonomic benefits and provide more features to the user. This included electronic charging and more bin storage per cart to offer a more realistic solution closer to what is currently in use at food banks and supermarkets.

4.4 Concept Refinement & Validation

4.4.1 Design Refinement

RE - FRESH DELIVERY TRAILER CONCEPT DEVELOPMENT

LOCAL FOOD HUB TO BRING
HEALTHY AND NUTRITIOUS FOOD
TO URBAN PLACES IN NEED

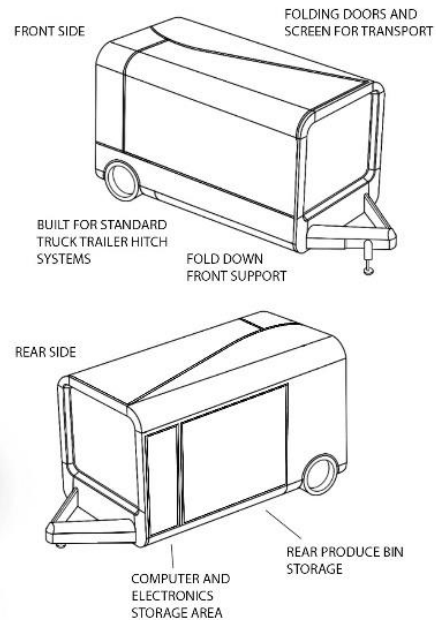
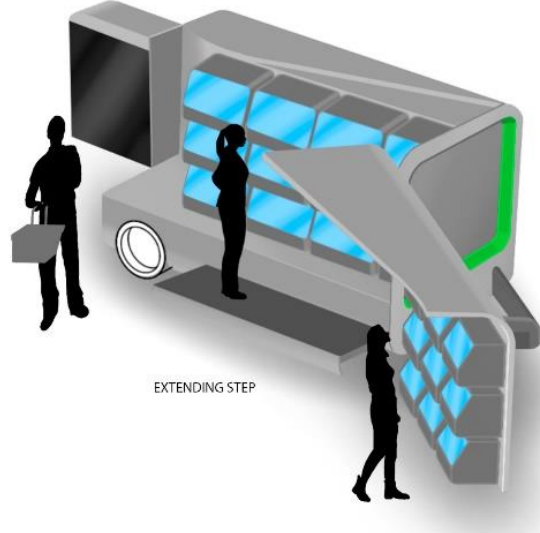


Figure 24- Concept Development 5

This concept brings together all the learning and exploration from the previous two concepts. This concept pulls from the best features of the previous concepts. The mobile solution while being on a set schedule is important for community engagement. The produce being stocked from local supermarkets and food banks to lower cost and lower transportation issues to promote larger quantities purchases without having to transport items via public transport.

Using the storage bins and reforming them to be better fitting inside the trailer and in the storage, locations was key to the concept's success. Adding more functionality and detailing to show the electronics and inner workings will be a key for the final design stage. Stacking the bins on easy-to-use slots with charging and data transfer will ease the use of the system. Being

able to check the stock levels of every bin centrally will assist the caretaker with daily stock maintenance.

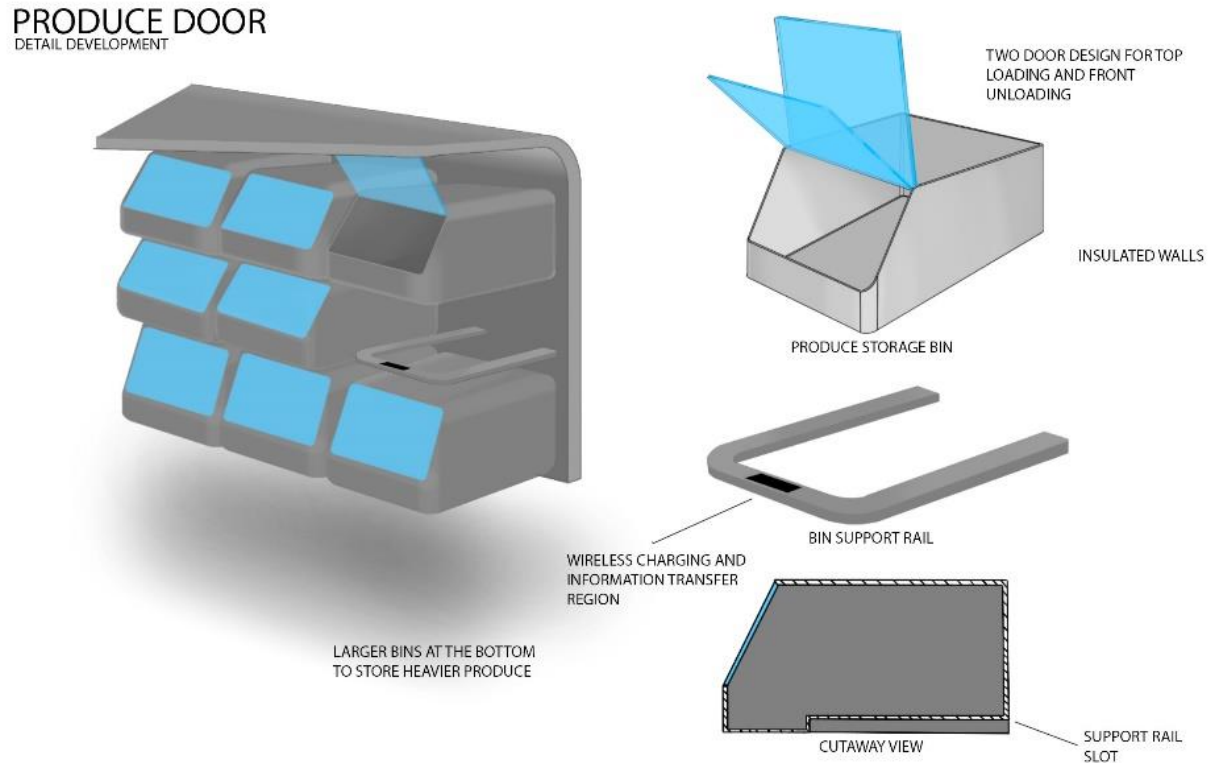


Figure 25 - Concept Development 6

4.4.2 Detail Development

Built with the learnings from the ideation and concept phase, the produce bin trolley assists the supermarkets and food banks with filling the bins and storing them in the delivery trailer. This Cart has 360-degree rotation wheels underneath and a pushing handle to assist with easy movement within tight spaces. Using the same slot system as the trailer, the bins will

get charged and share information with the cart to check stock levels and battery capacity with ease.

PRODUCE BIN STORAGE

DETAIL DEVELOPMENT

LOCAL PRODUCE STOCKED AND SOLD THROUGH MOBILE HUB BY SUPERMARKETS OR OTHER FOOD PRODUCERS

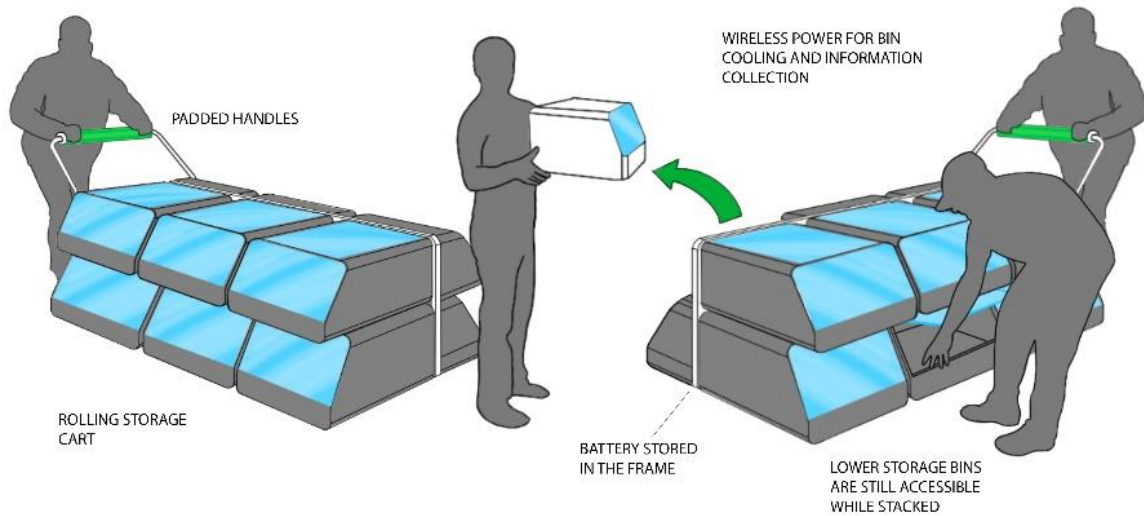


Figure 27 - Detail Development 1

INTEGRATED FEATURES

DETAIL DEVELOPMENT

SCREEN CAN DISPLAY INFORMATION ABOUT THE TRAILER INCLUDING: STORED PRODUCE, BATTERY LEVEL, DELIVERY SCHEDULE

COVERS THE PRODUCE TO REDUCE COOLING COSTS AND CREATE AN INVITING ENVIRONMENT

FOLDING SUN SHADE

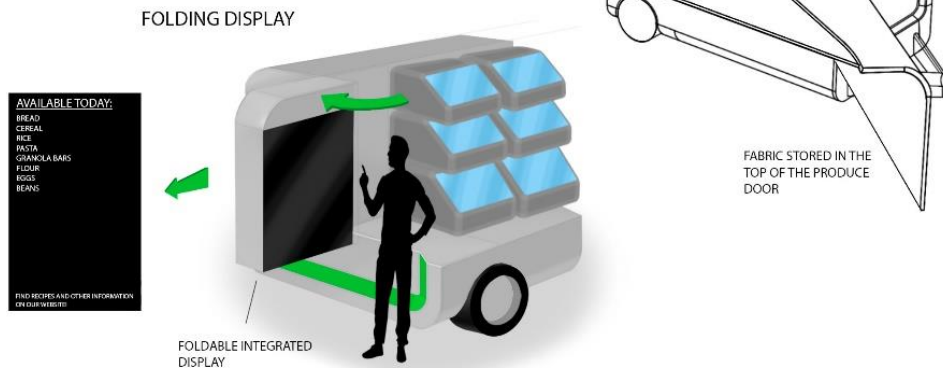


Figure 26 - Detail Development 2

To help create a shopping environment, technology and a sunshade are included. The display shows what is available for purchase and offers links to recipes that use each item. This will assist in the education aspect of low-income families in relation to food insecurity. The sunshade Offers protection for bright days with the added benefit of cooling the unit as a whole. With less energy needed to cool the bins than in direct sunlight, the operating cost will be lowered.

4.4.3 Refined Product Schematic & Key Ergonomics

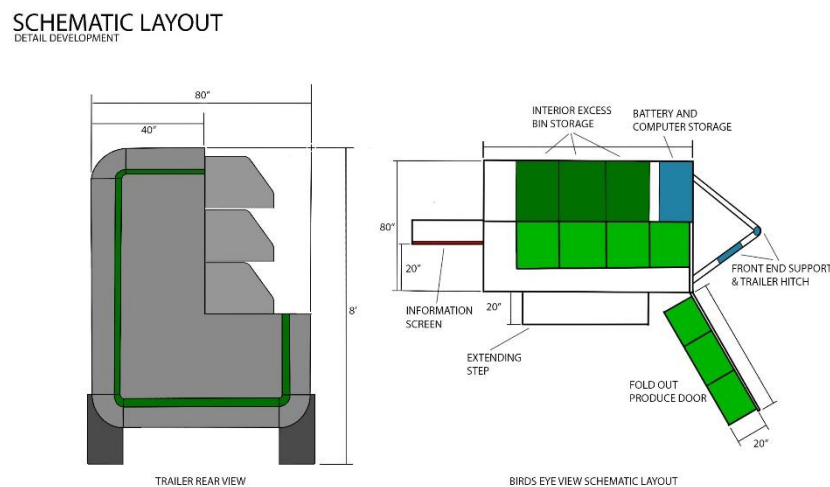


Figure 28 - Schematic 1

The schematic layout explores the layout and ergonomic functionality of the delivery trailer. These dimensions are important to consider as they are make or break for the usability of the final product. Developing the step, opening mechanism and other doors will be key in ensuring that the product does not cause any undue harm during use.

4.5 Concept Realization

4.5.1 Design Finalization

The final concept took many iterations and tweaks in order to reach the final form and feature set. The design retained the major features throughout, including the information screen, large swinging door to reveal produce and removable produce bin format. Figure 29 shows the design iterations of the main trailer assembly. The main requirements of the folding door were to best utilize the trailer's interior space while creating a unique shopping experience.

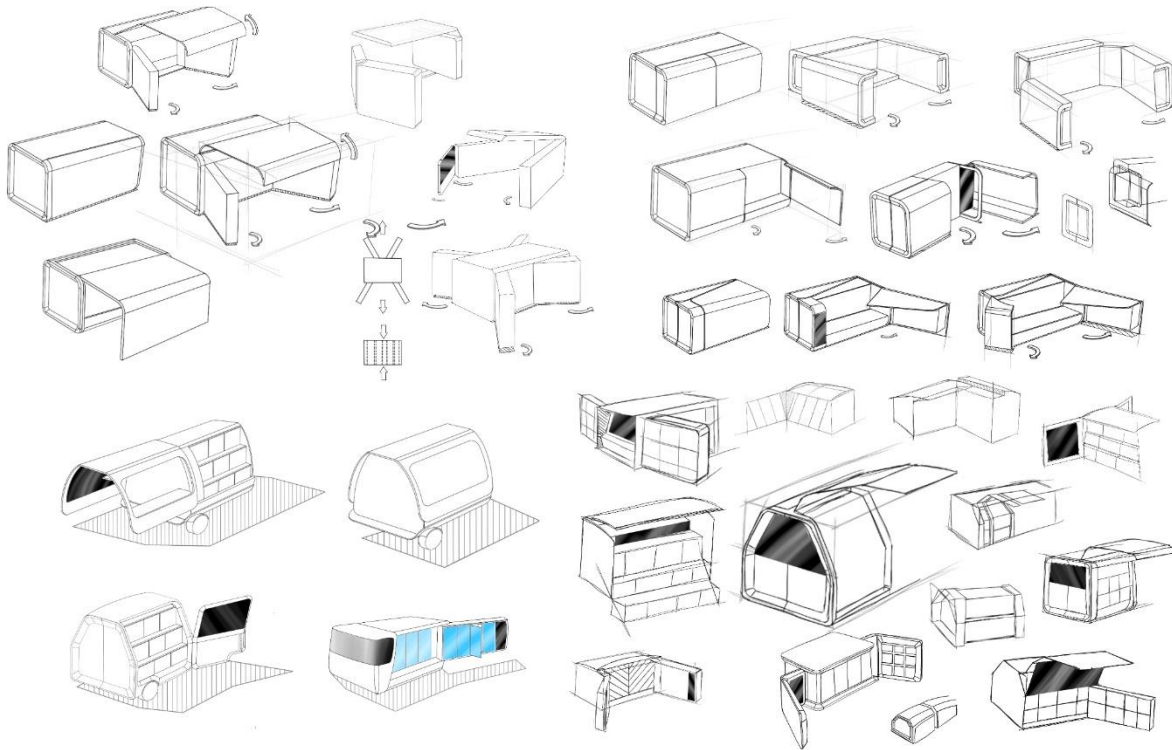


Figure 29 - Ideation Page

These design iterations assisted in developing the final form through the operation of the folding door. Studying how the environment was created around the user and how the shopping experience would flow. Environment creation was a key consideration throughout the design

process to make a comfortable experience for the users. This prompted the addition of the sunshade in order to protect the user and give the feeling of an in-store shopping experience.

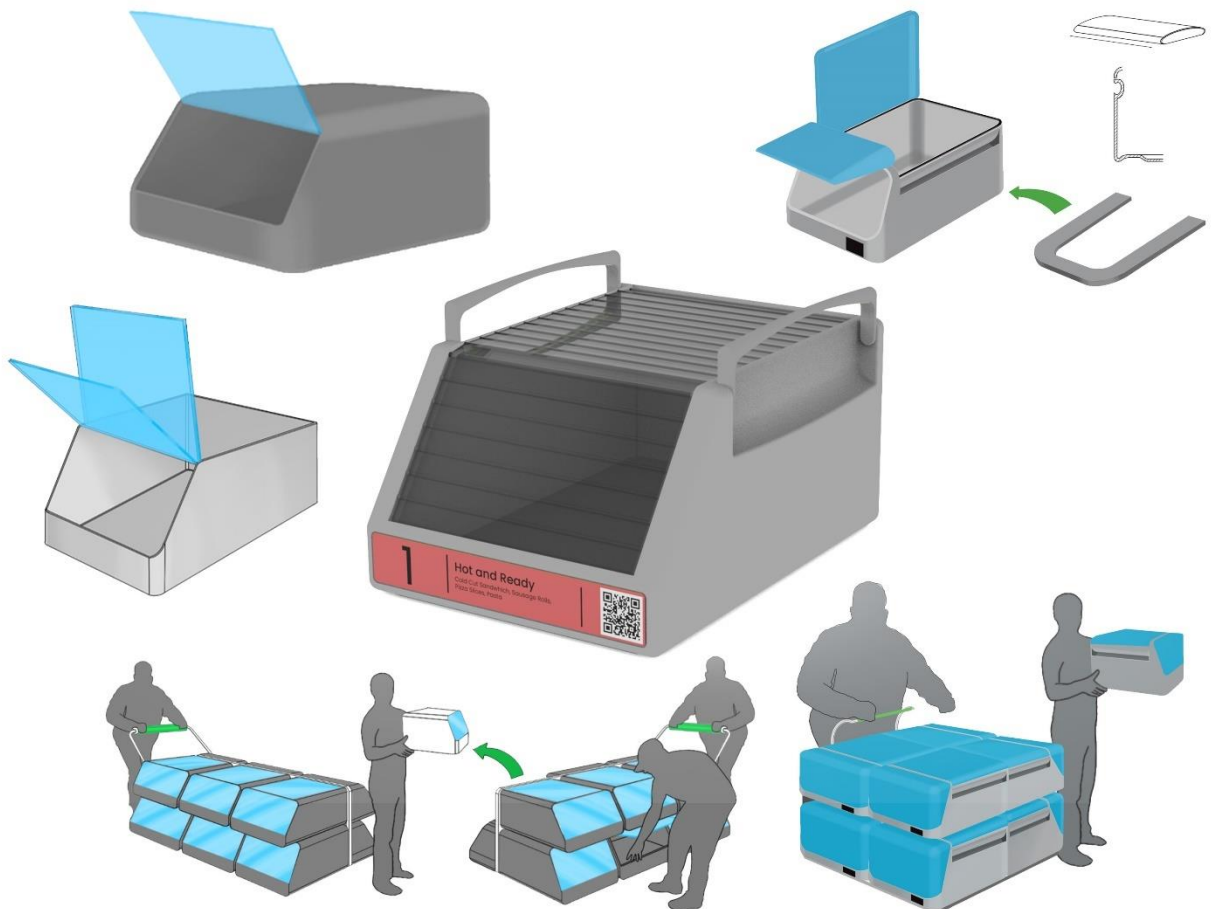


Figure 30 - Bin Ideation

The produce bin also flowed through many different iterations. With the main requirements being easy use in each use case. Top loading for grocery store staff to stock the bins in a cart without having to bend very much to reach inside the bin and front unloading for customers to take from when shopping. This promotes ergonomic use of the produce bin throughout the cycle for each user.

Once the physical form was worked out, graphics were created for the produce bin display and general information screen. These are key elements of the design as they assist in wayfinding and assist the user with meal planning.

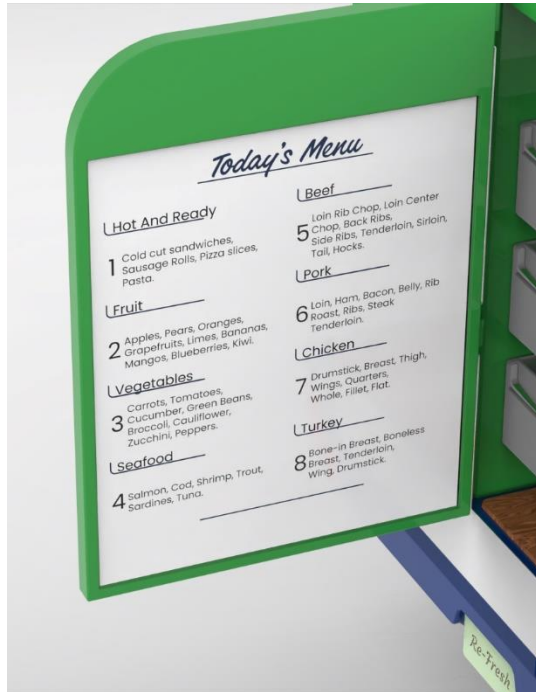


Figure 31 - Information Screen



Figure 32 - Produce Bin Graphics

4.5.2 Physical Model Study

The learning outcomes from the initial study model were critical to the final model development. Looking at the scale and proportions of certain elements pushed forward the design language of the entire model. Expanding the size of the wheels, shortening the length of the trailer, and reducing the amount of stocked produce bins provided for a more cohesive final product.

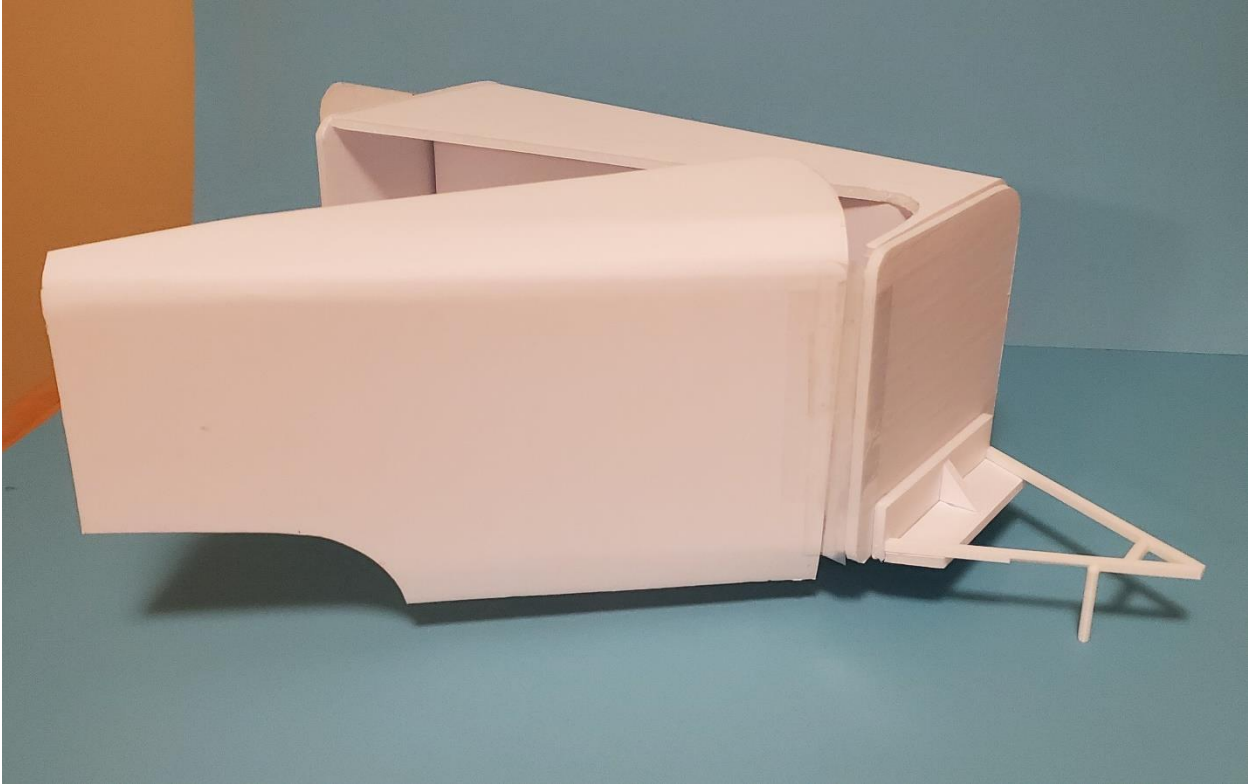


Figure 34 - Sketch Model 1



Figure 33 - Sketch Model 2

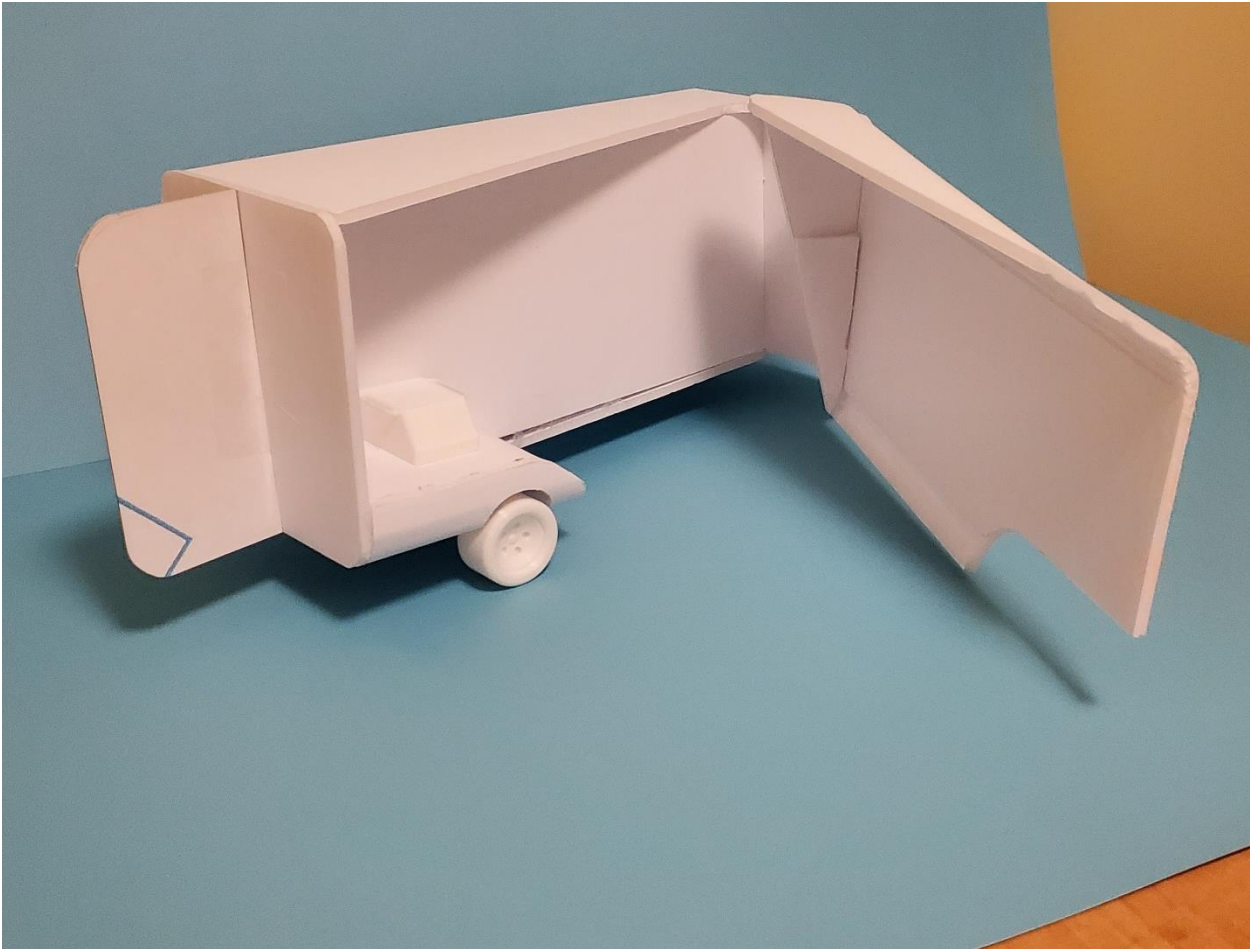


Figure 37 - Sketch Model 3

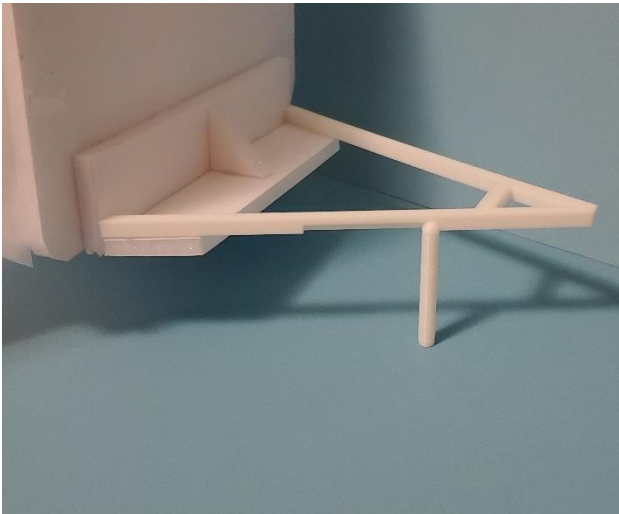


Figure 36 - Sketch Model Hitch



Figure 35 - Sketch Model Produce Bin

4.6 Design Resolution

After the completion of the initial sketch model, there were some changes to assist the design language. Increasing the size of the wheel breaks up the side profile and makes the wheel feel more like a considered element in the profile. Making it a statement piece that adds to the design instead of being a break. Additionally, the integration of colours into the wheel extends the design language to all parts of the Flavour Fleet trailer.



Figure 38 - Final Render Wheel

The final design of the Flavour Fleet trailer system focused heavily on the whole business model to address the needs of everyone from start to finish. At the start of the cycle, the staff of a supermarket use the included cart to fill and load the produce bins into the trailer. Then it is hooked up to a truck and transported to a distribution location in a low-income and/or a food desert. At this location the produce bins are easy to open and close and are at different

heights to serve different users. With minimal setup and tear down required there is little strain for the attendant, so they can focus on the customer experience.

4.7 Cad Development

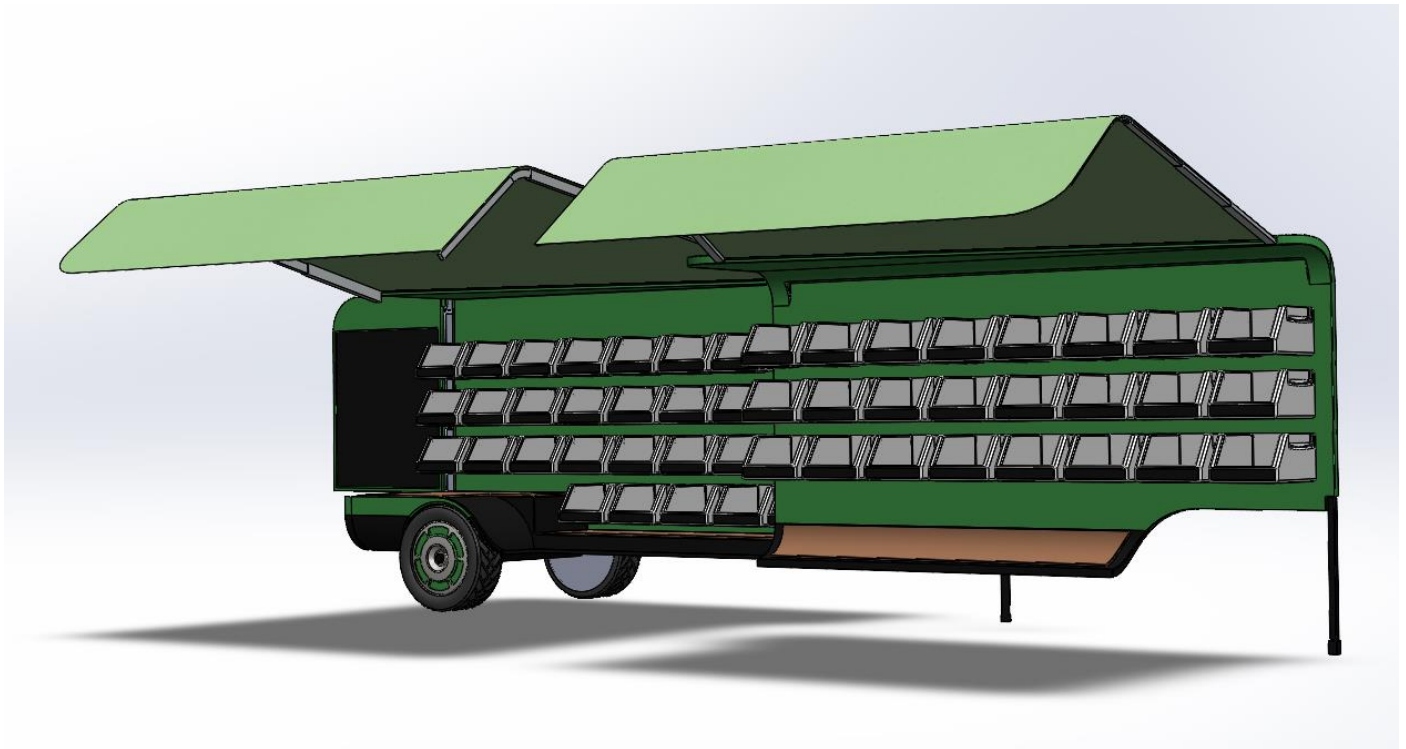


Figure 39 - Cad Development 1

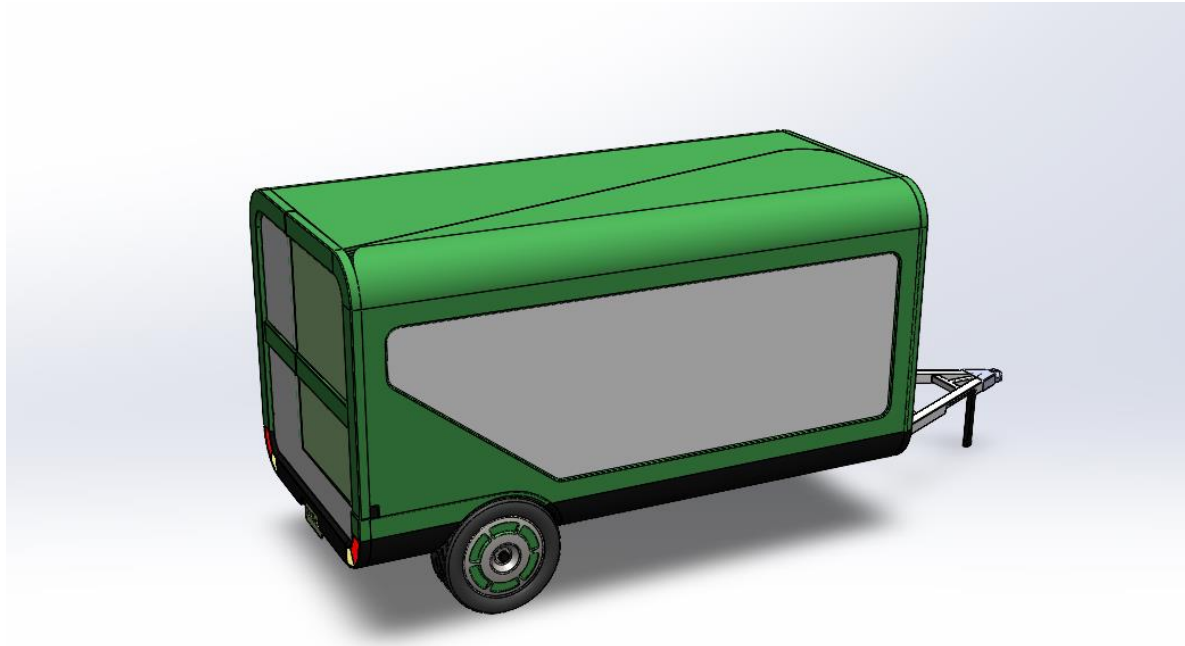


Figure 40 - Cad Development 2

The cad development went through three cycles to arrive at the final product. An initial file was created to explore the form and push forward the design and to resolve smaller details. The second revision of the CAD was developed in order to prepare for rendering and detail preparation for the physical model. The third cad model was prepared for 3D printing at a scale of 1:12, with smaller details changed in order to be better represented at the smaller format.

Multiple advanced methods were used in the creation of this CAD file. For example, configurations were extensively used in order to switch between states of the model. This was especially helpful because of the closing door. Transportation mode, customer mode without the sunshade and with the sunshade.

The Cad development was split between SolidWorks and rendered in KeyShot with decals made in Adobe Illustrator. The use of Keyshot was instrumental in the production of the realistic in-situation renders to represent the Flavour Fleet Trailer.



Figure 41 - Keyshot Screen Capture

Keyshot is a powerful tool with an extensive material library that allows for easy editing of colours and materials which was useful in the development of the colour palette. The animations were developed with the tools within KeyShot using various solids as axis for rotation.

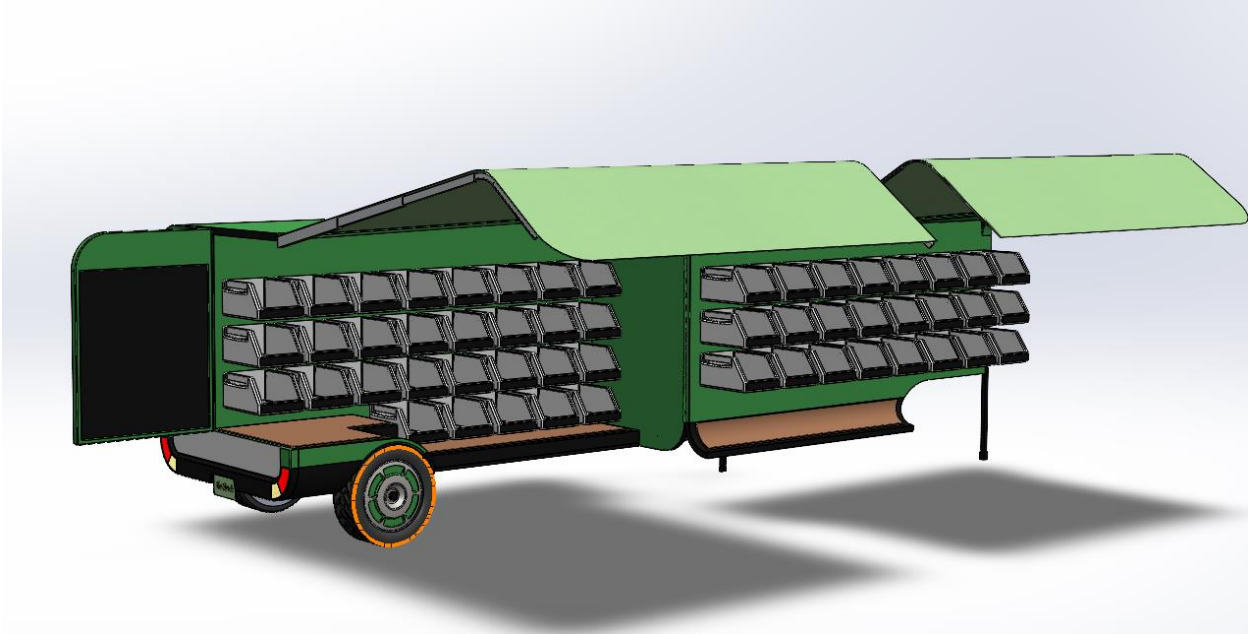


Figure 42 - Cad Development 3

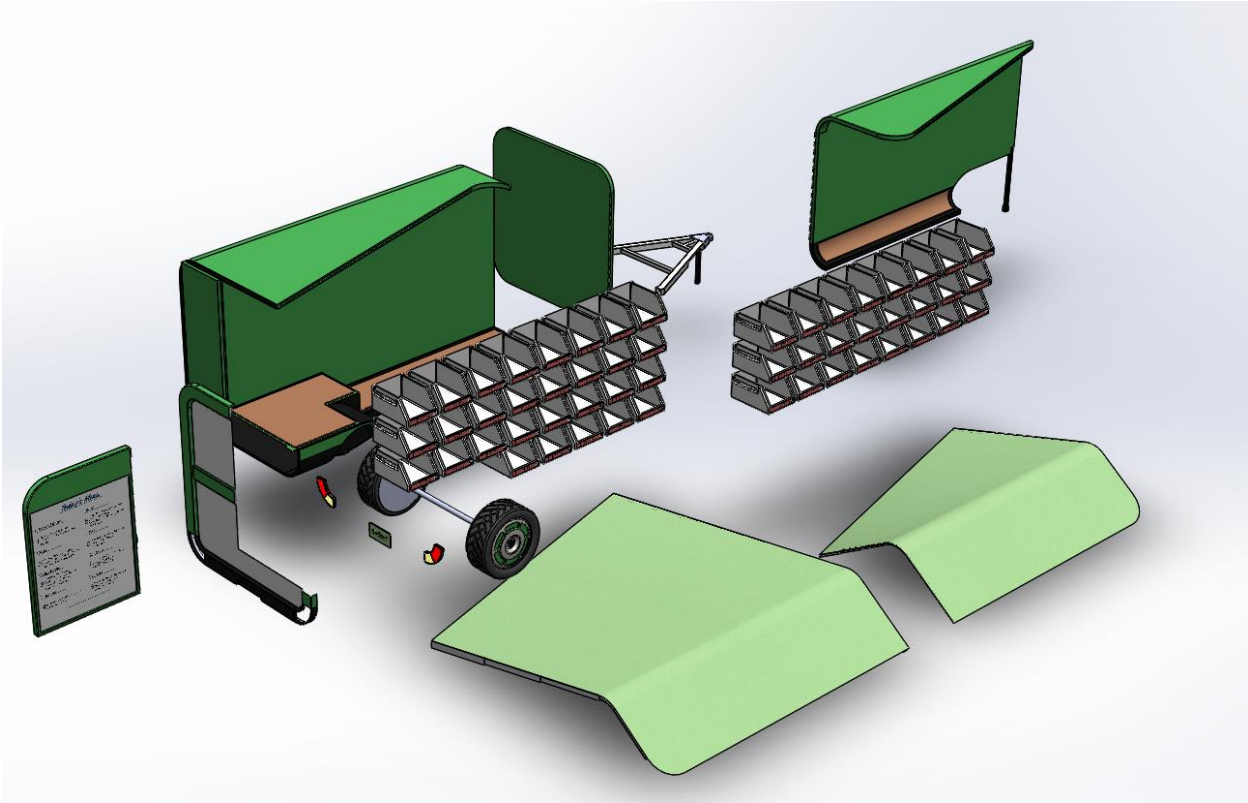


Figure 43 - Cad Development 4

The internal frame was modeled to ensure accuracy of the exterior panels. The frame is made of welded recyclable steel and has threaded holes for fastening the exterior aluminum panels.



Figure 44 - Cad Development 5

4.8 Physical Model Fabrication

The physical model started following the completion of the CAD phase as the entire model was 3D printed. With the majority of the model being 3D printed with hobby grade printers supplemented by commercial 3D printing for the high volume and delicate parts.



Figure 45 - Early Final Model Picture

The main body of the trailer was the first part to get printed, and in the end was to be finished to represent shiny anodized aluminum. The parts that came from the hobby printers required extensive work to achieve the final desired surface finish. As the main body had a printing error one day and 17 hours into the print, the final part had to have body filler and extensive sanding to reduce the effects of the error. After the main body was sanded flat, multiple coats of filler primer before the final colour coats. Using Bahr filler paint, the final part required multiple finish coats with sanding in between. The order of operations was altered from traditional printing preparation as gluing was the final operation. Using superglue to connect all of the pieces together for final model.



Figure 46 - Produce Bin 3D Print

The produce bins were printed through Agile manufacturing inc. This was a time saving measure as the bins, 53 in total, would have been finished individually. While working with Agile, the addition of a rear plate allowed for cost reduction and processes reduction as the bins were ready for final paint out of the box. The bins were printed using stereolithography (SLA) format which reduced the layer line visibility in the final product.

To support the produce bins, labels were created to display the contents.



Figure 47 - Produce Bin Lineup

Multiple coats of paint were required on all parts due to the specifications of the spray paint. The glossy green paint was temperamental and was difficult to achieve a consistent finish. Without a proper grey primer base coat, the paint finished with different levels of gloss and sometimes cracked when it did not adhere correctly.



Figure 48 - Freshly Painted Door

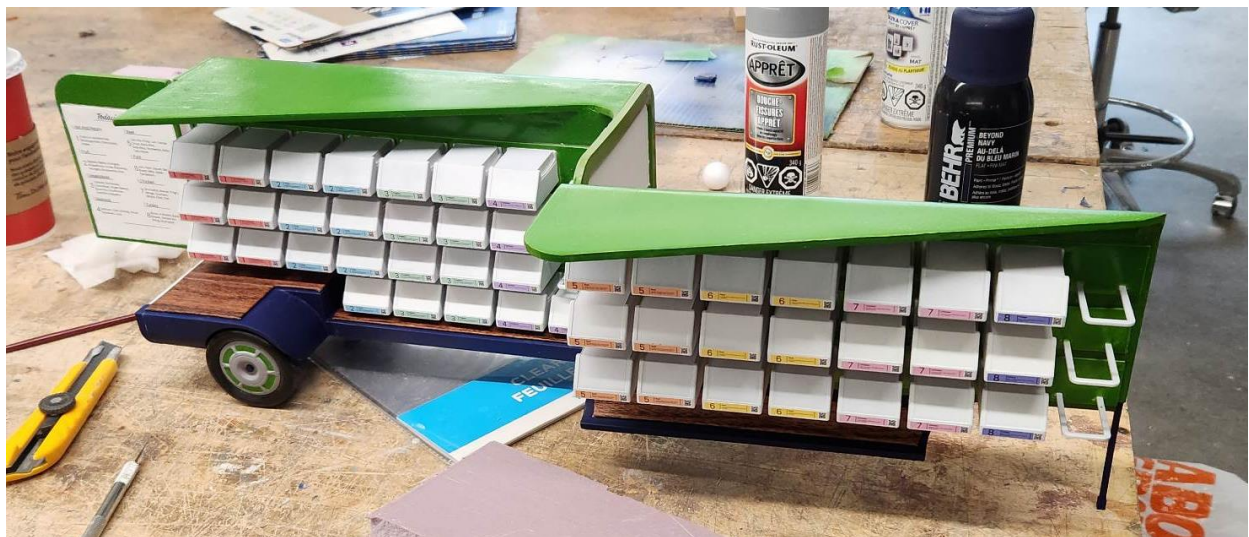


Figure 49 - Final Model Progress

Chapter 5 – Final Design

5.1 Design Summary

The Flavour Fleet trailer system is a distribution platform that allows sponsors to display their branding while aiding low-income areas with access to healthy and nutritious food.

Reducing the effects of food deserts and food swamps that are too prevalent.

Food deserts lower the quality of life of residents and increase their cost of living due to the increased challenges that come with increasing distance to a supermarket. Living within a food desert increases transportation costs, especially prevalent when a resident does not have access to a vehicle. Fast food is often available more frequently which can lower the quality of a resident's diet. Education can also be a challenge within food deserts as cooking knowledge is a barrier to at home cooking.

Flavour fleet aims to reduce the effects of these challenges by meeting low-income communities where they are. Improving access to educational outlets, access to nutritious food and reducing the need for transportation are the core elements of the Flavour Fleet trailer system. Leveraging the marketing budgets of large supermarkets and distributing food to low-income communities offers value to all involved in the Flavour Fleet system.

5.2 Design Criteria Met

5.2.1 Full Bodied Interaction Design

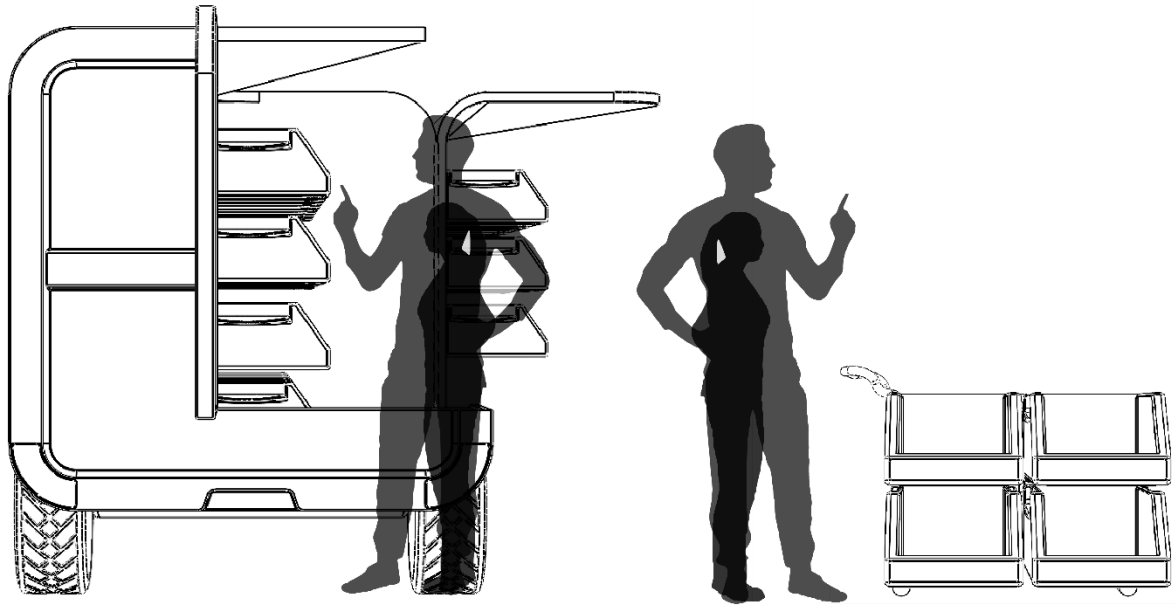


Figure 50 - Human Scale Comparison

Human interaction with the Flavour Fleet trailer system is centered around the produce bins, produce bin cart, and the trailer itself. The produce bins have soft touch handles to improve grip as the bins have the possibility of getting heavy depending on the loaded produce. The produce bin cart has a curved and straight handle to give the user a choice based on what feels best for them with the weight of the bins.

The trailer has many touch points including the various elements that unfold. The large door, information screen and extending supports for the trailer all happen automatically but could be done manually if electricity is not available.

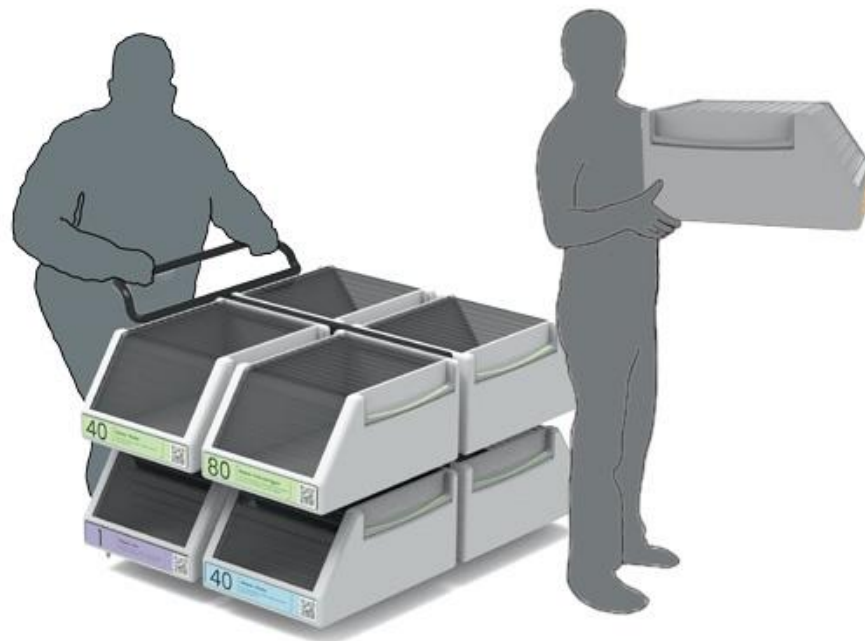


Figure 51 - Scale Reference for Produce Bins

5.2.2 Materials, Processes and Technology

Materials

Focusing on the use of recyclable and long-lasting materials, environmental impact was an important aspect in the design of the Flavour Fleet trailer. The exterior being weather resistant anodized aluminum covering a steel frame. Steel has a large environmental impact in the manufacturing process but offers extensive recyclability and long-lasting durability for the life span of the Flavour Fleet trailer. Produce bins are made from HDPE which offers high durability for the life of the bins while being low cost to manufacture. The transparent lid of the produce bins offers limited thermal protection that is offset by the heating and cooling of the bin itself.

Processes

The manufacturing process of the Flavour Fleet trailer would be very similar to existing trailer manufacturing processes. Welding the steel frame and mounting the aluminum panels with fasteners. The fasteners are all standard quarter inch bolts that are evenly spaced

throughout the panels. The OLED panel and controlling computer on the folding section of the trailer would also be mounted with fasteners as it may need to be removed for repair. The OLED panels for the produce bins would be mounted in a similar fashion and powered by batteries that are wirelessly charged by the stands that the bins sit on.

Technology

The OLED panels are key to the success of the Flavour Fleet trailer. Using minimal power compared to alternative displays, the OLED panels are used extensively throughout the design to improve wayfinding and adapt to changing offerings from the operator of the trailer.

5.2.3 Design Implementation

The bill of materials breaks down the total cost of each element or subgroup. The price points are competitive to current off the shelf components and sheet goods. The Flavour Fleet trailer will be available to purchase or rent based on the client's needs. Based on the client's marketing needs, a short-term option would be available with rental terms. Applying labels and brand guidelines to the display screens and produce bin labels offers options to promote brand identity in communities that are unreached by current offerings. Another option is for disaster relief missions, allowing cities or communities to rent the Flavour Fleet system to assist in humanitarian efforts in the aftermath of disaster events. The purchasing of produce can be included when renting a Flavour Fleet trailer or by the client, with an average stocking price of a convenience store being 60 thousand dollars, scaling the produce quantity to the trailer size would result in a fee of roughly 20 thousand dollars. A trailer attendant would be required to take payment, to operate the trailer and to transport it from food distribution centers to the distribution destination.

Bill of Materials						
Component	Material	Quantity	Description	Colour	Manufacturing Method	Cost
Main body panels	Aluminum	40	Sheet coverings of the internal frame	Green, Blue	Stamped and bent sheets, anodized weather coating	\$ 3,600.00
Trailer frame	Steel C channel	4	Internal frame and A frame trailer connections	Silver	Stamping, Bending	\$ 8,000.00
Tires	Rubber, Steel	2	Mounted to steel rim with aero cover	Black	Off the shelf component.	\$ 1,000.00
Axel	Steel	1	Mounted to drive train assembly	Silver	Off the shelf component.	\$ 1,200.00
Drive Train	Steel	1	Leaf Springs, Bearings, Fasteners. Unpowered system, Brake system	Silver	Off the shelf components, welded and fastened to frame	\$ 3,000.00
OLED Display	Display Panel	1	Menu information display	Black	Electronics	\$ 2,000.00
Produce Bin	HDPE	48	Food safe plastic bin, easily cleaned	Light Grey, clear	Injection Molding	\$ 4,800.00
Sun Shade	Fabric	2	Collapsing sun shade to protect the shopping environment	Green	Cut to size, bolted to aluminum frame with steel eyelets	\$ 500.00
Sun Shade Frame	Aluminum	2	Anodized aluminum frame		Cut to length, welded to frame with bending joints	\$ 1,000.00
Lighting units	LED lights, HDPE Housing	2	Bolted to rear trailer frame	Red, Orange	Injection molded lighting housing, clear cover to assist in lighting projection	\$ 200.00
Basket Surfaces	Walnut wood	3	Accent colour for safe surface	Dark brown	Steam bending wood, flat sheet joinery	\$ 1,000.00
Total						\$ 26,300.00

Business Model Cost		
Item	Purchase	Rental
Trailer	\$ 26,300.00	\$ 50.58
Supplying produce and food items	\$ 20,000.00	Supplied by renter
Trailer Attendant	Supplied by renter	20/hr
Truck Rental + Gas	Supplied by renter	50/day
Total	\$ 46,300.00	\$ 300.58

Table 1 - Bill of Materials and Business Model Cost

5.3 Final Cad Renderings



Figure 52 - In Situ Render



Figure 53 - Studio Render



Figure 54 - Produce Bin in Situ



Figure 55 - Produce Bin



Figure 57 - Information Screen



Figure 56 - Information Screen 2

5.4 Physical Model

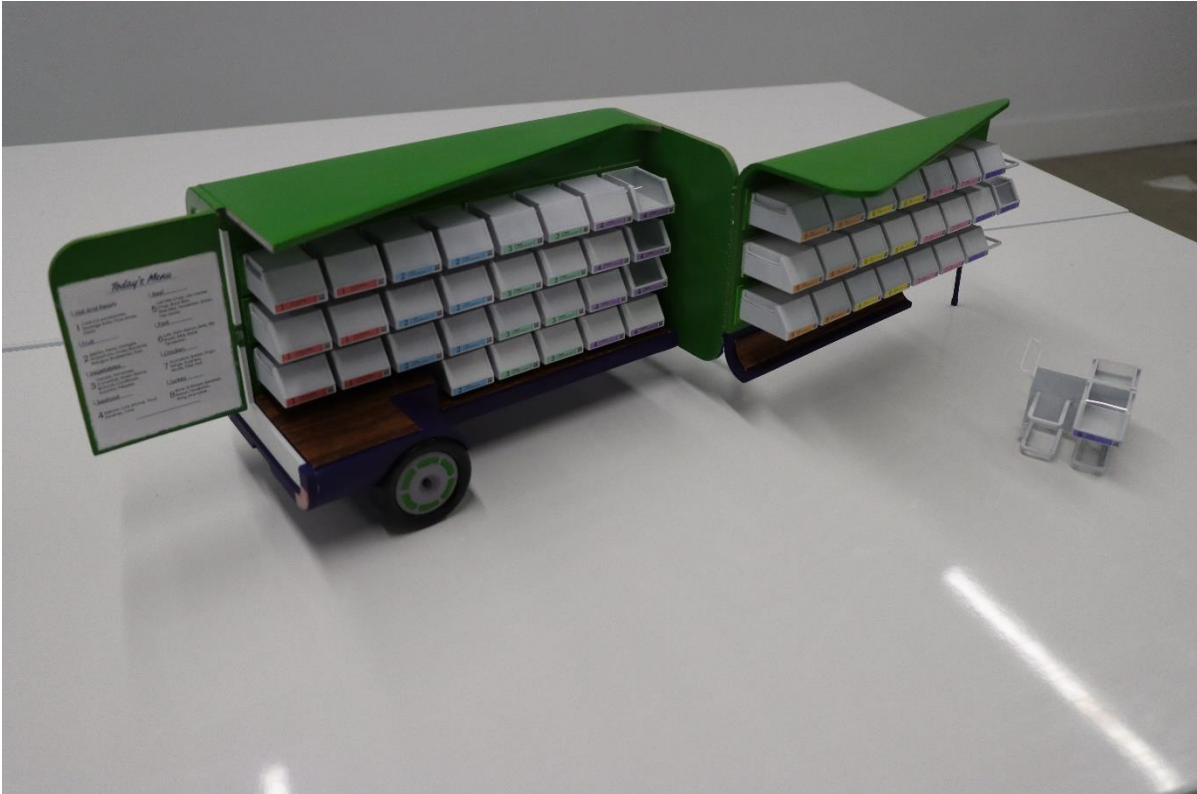


Figure 58 - Physical Model 1



Figure 59 - Physical Model 2



Figure 61 - Model Front View

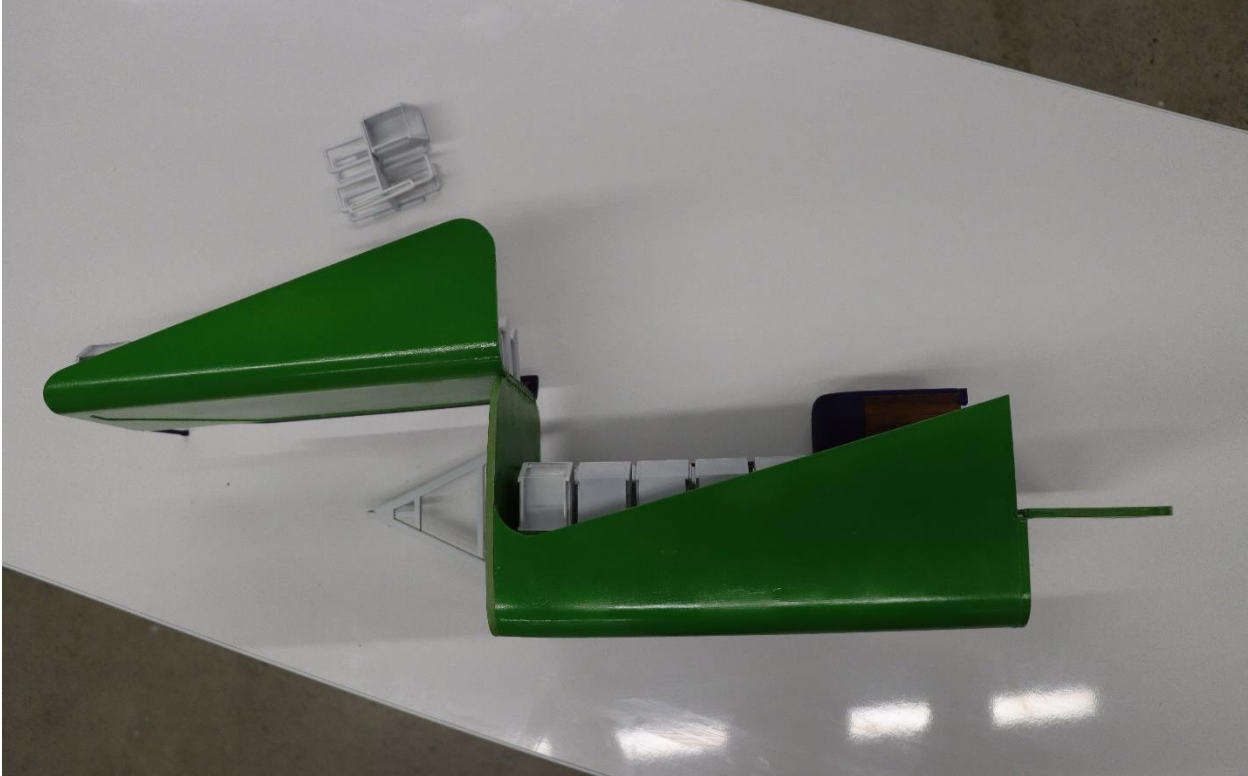


Figure 60 - Model Top View



Figure 62 - Rear 3/4 View



Figure 63 - Left Side View

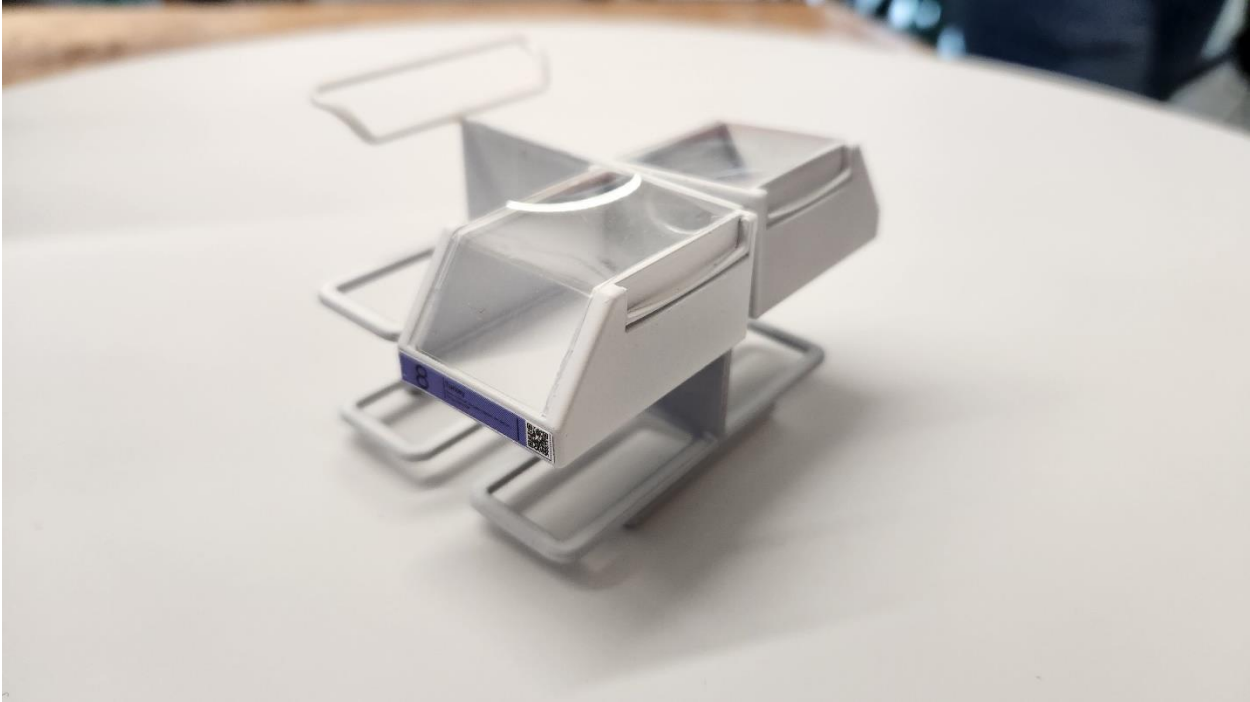


Figure 64 - Produce Bin Cart

5.5 Technical Drawings

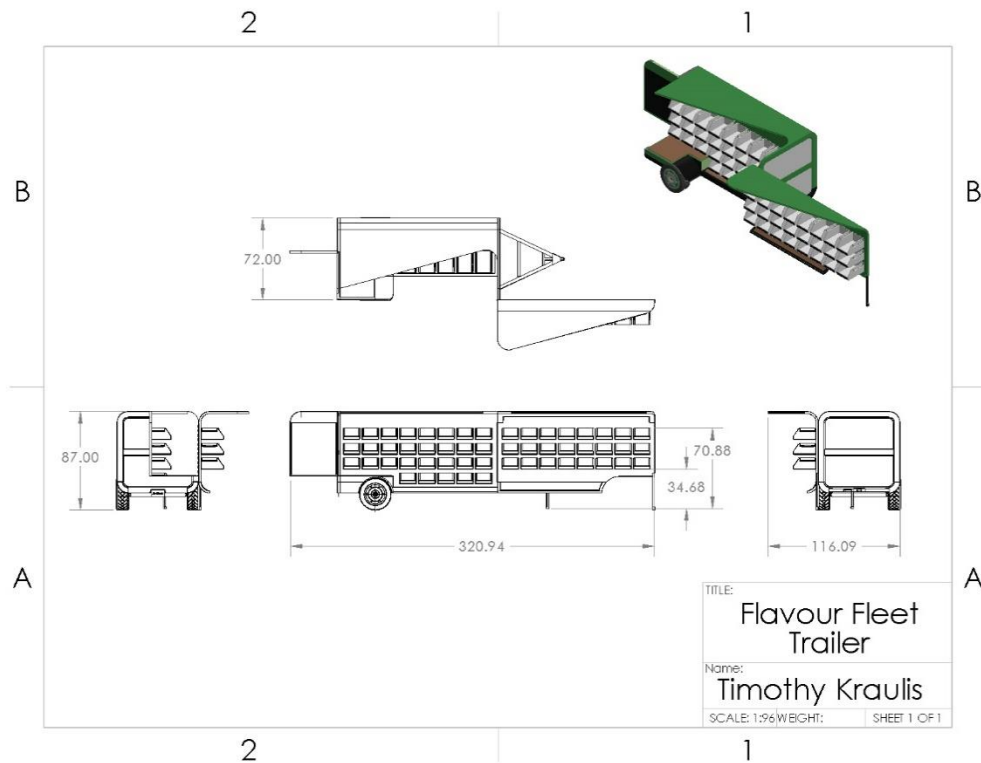


Figure 66 – Trailer Technical Drawing

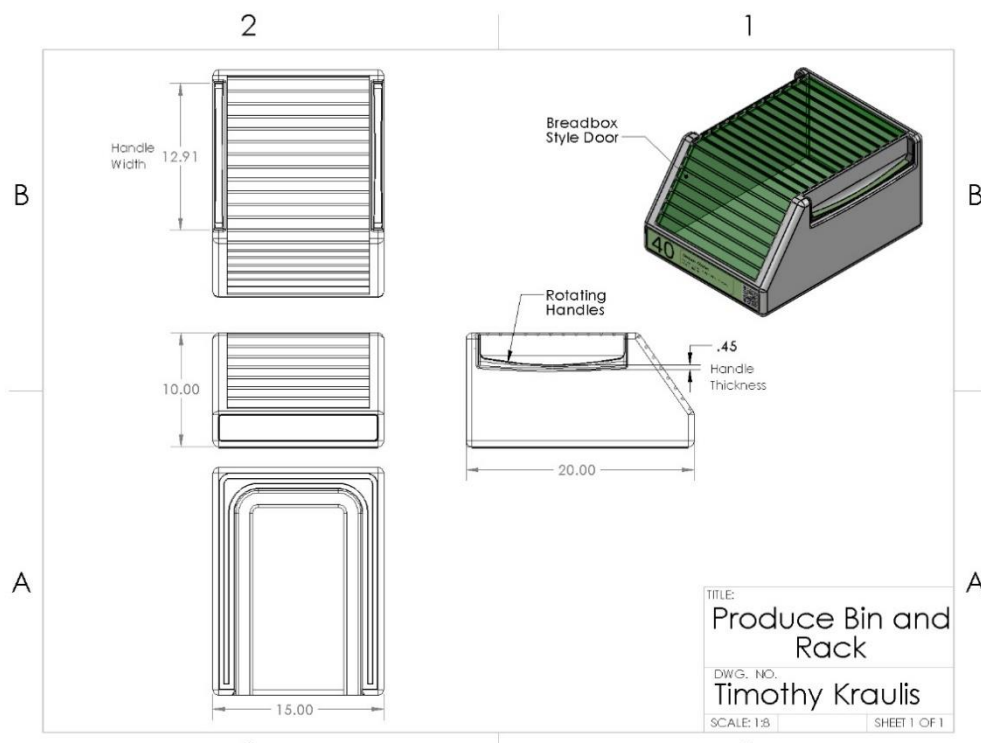


Figure 65 - Produce Bin Technical Drawing

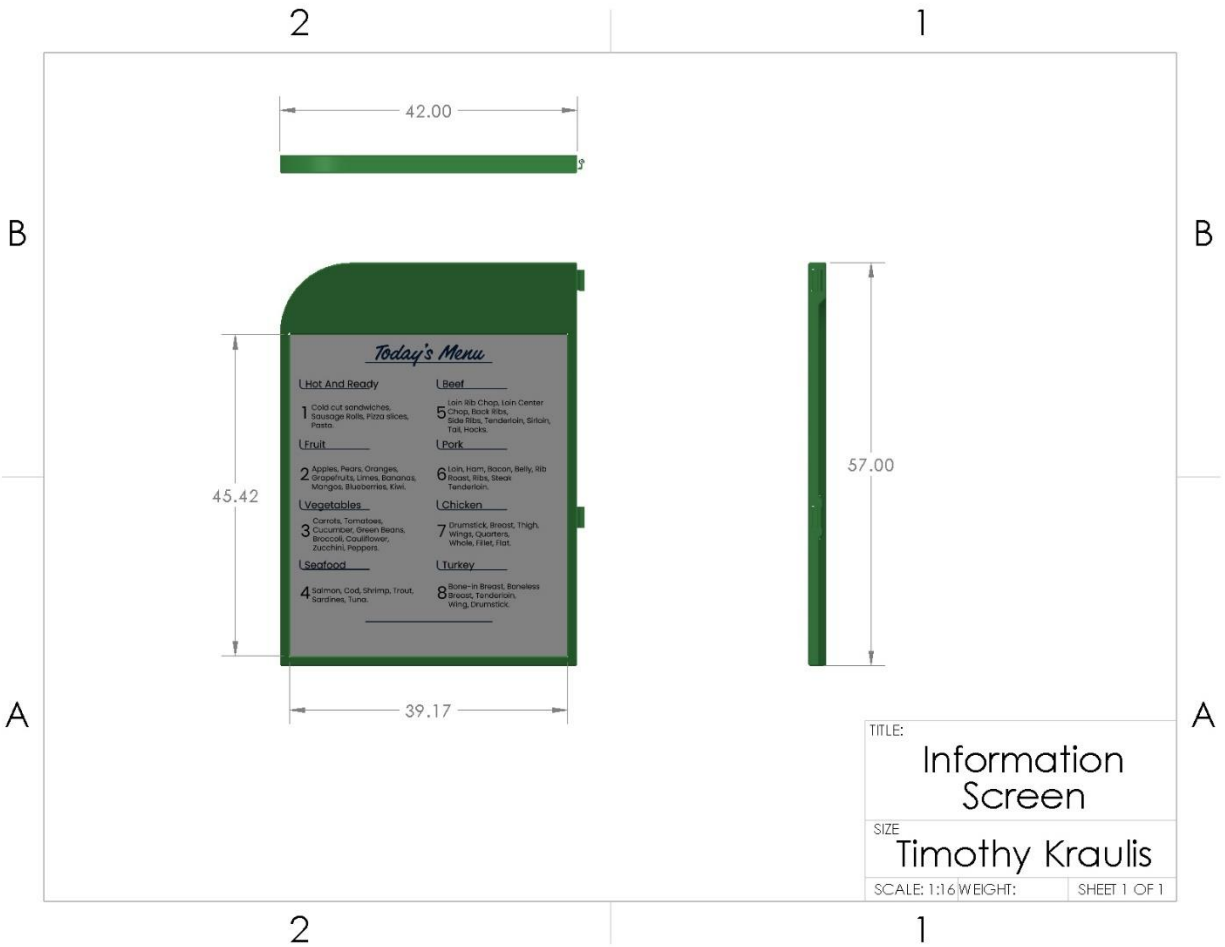


Figure 67 - Information Screen

5.6 Sustainability

Using sustainable construction and operational techniques allowed for the most respect for the environment throughout the use cycle of the Flavour Fleet system. Lowering waste output during manufacturing while ensuring longevity without toxic coatings was key to the sustainability of the trailer as a whole. Anodization is used to support long-lasting aluminum to reduce the replacement of exterior panels in any weather. Lowering the output of non-recyclable plastics and using the long-lasting metals ensure that the environmental impact will be as low as possible during the use cycle of the Flavour Fleet System.

Chapter 6 Conclusion

Low-income communities often face issues of access to healthy food within traveling distance by transit often labeling the area as a food desert. The Flavour Fleet trailer system is at the core of the food desert issue and aims to solve it through distribution of healthy food in the areas that are forgotten by supermarkets by increasing access, education, and transportation of low-income communities. The Flavour Fleet system offers healthy diet options to low-income communities to elevate their quality of life while reducing traditional barriers.

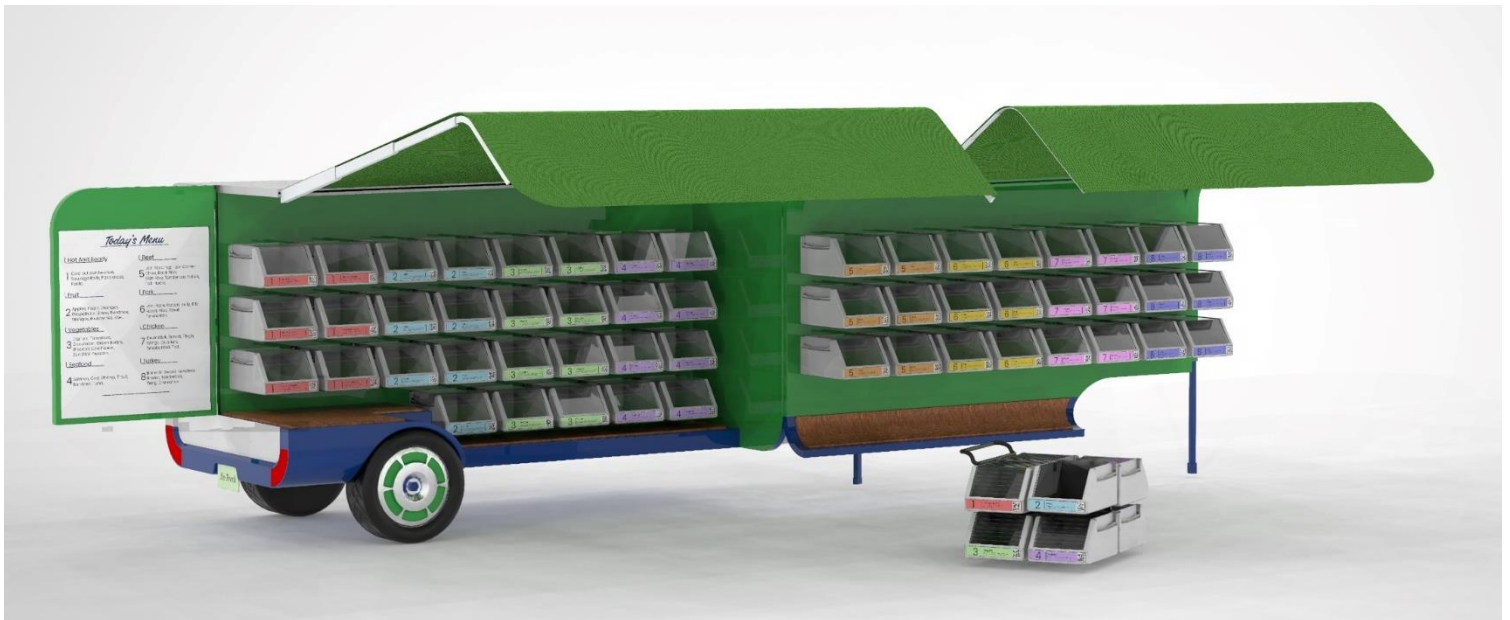


Figure 68 - Flavour Fleet Trailer Render

Appendix

Appendix A - Discovery

“Disparities and access to healthy food in the United States: A review of food deserts literature”

Walker, R. E., Keane, C. R., & Burke, J. G. (2010). Disparities and access to healthy food in the United States: A review of food deserts literature. *Health & Place*, 16(5), 876–884. <https://doi.org/10.1016/j.healthplace.2010.04.013>

Abstract

Increasingly, studies are focusing on the role the local food environment plays in residents’ ability to purchase affordable, healthy and nutritious foods. **In a food desert, an area devoid of a supermarket, access to healthy food is limited.** We conducted a systematic review of studies that focused on food access and food desert research in the United States. The 31 studies identified utilized 9 measures to assess food access. Results from these studies can be summarized primarily into four major statements. Findings from other countries offer insight into ways, in which future research, policy development and program implementation in the U.S. may continue to be explored.

Summary Statements:

1. Poor supermarket access is directly related to increased exposure to energy-dense food, “empty calorie” food. Fast food and convenience store food.
2. The expansion of larger grocers have reduced the number of local options forcing transportation costs to become a barrier
3. A shift in income in inner-cities decreased the amount of supermarkets by one half in select cities
4. Fragmentation of property makes large supermarkets difficult in large cities

“Food Deserts”

Food deserts*. Food Empowerment Project. (n.d.). Retrieved September 11, 2022, from <https://foodispower.org/access-health/food-deserts/>

Summary Statements:

1. Items not being directly priced can be more expensive than larger retailers by 3 to 37%, price being decided at the counter is also an issue as it can be abused with those who are unaware
2. Special dietary or cultural requirements may be difficult to accommodate with limited selection
3. Food deserts contribute to long term health issues because managing healthy food options is challenging
4. Unhealthy eating because of economic challenges cause long term issues

Appendix B – Contextual Research

“Neighborhood supermarket access and childhood obesity: A systematic review”

Zhou, Q, Zhao, L, Zhang, L, et al. Neighborhood supermarket access and childhood obesity: A systematic review. *Obesity Reviews*. 2021; 22(S1):e12937. <https://doi.org/10.1111/obr.12937>

Abstract

Childhood obesity is one of the most pressing public health issues nowadays. The environmental factors have been identified as potential risks for obesity, as they may influence people's lifestyle behaviours. Lack of access to supermarkets that usually provide healthy food

options has been found to be a risk factor for childhood obesity in several studies. However, findings remained inconclusive. We aimed to systematically review the association between access to supermarkets and childhood obesity. A literature search was conducted in the Cochrane Library, PubMed, Web of Science, and Embase for studies published before 1 January 2019. Twenty-four studies conducted in four countries were identified, from which data on the basic characteristics of studies and participants, [measures of access to supermarkets, and associations between access to supermarkets and weight-related behaviours and outcomes were extracted](#). The median sample size was 1858 participants. Half of the included studies indicated a negative association, one fourth reported a positive association, and the remaining one fourth did not find a significant association. Better designed studies are necessary to achieve a robust understanding of this epidemiological relationship in the future.

Summary Statements:

1. Child obesity is a pressing public health issue
 - a. No access to supermarkets is a risk factor for children
 - b. Childhood obesity increases type 2 diabetes, cardiovascular disease, psychological disorders
2. Half of the studies conducted indicated a negative association between access to supermarkets and weight related behaviours and outcomes

“FOOD DESERTS: WHAT THEY ARE AND WHAT CAUSES THEM”

Walsh, O. (2022, February 22). FOOD DESERTS: WHAT THEY ARE AND WHAT CAUSES THEM. [Thehumaneleague.org](https://thehumaneleague.org). Retrieved September 19, 2022, from <https://thehumaneleague.org/article/food-desert>

Abstract

In the United States, a staggering 42% of adults are affected by obesity, while 10.5% of all residents are food insecure. The two phenomena might seem like complete opposites—one associated with too much food, and the other too little—but they’re more connected than you might expect. Researchers think that the link comes down to location and access. People who live where good, hearty food is available and inexpensive tend to have very different diets from people who live where high-quality food is either unavailable or too expensive—otherwise known as a “food desert.”

Walsh, O. (2022, February 22). FOOD DESERTS: WHAT THEY ARE AND WHAT CAUSES THEM. [Thehumaneleague.org](https://thehumaneleague.org). Retrieved September 19, 2022, from <https://thehumaneleague.org/article/food-desert>

Summary Statements:

Contributing factors

- a. No transportation
- b. Lower income can require other bills to take precedence over healthy food

Food deserts vs food swamps

- a. Food swamps have access to healthy food but are flooded with unhealthy options with convenience stores and fast food
- b. Food deserts lack healthy food options

Current solutions

- a. Community gardens
- b. Co-ops
- c. Smaller grocers

Facts

- a. More than 500,000 residence of Chicago live in a food desert
- b. 400,000 residence live in grocery store sparse areas
- c. All of the top 10 biggest us cities contain food deserts

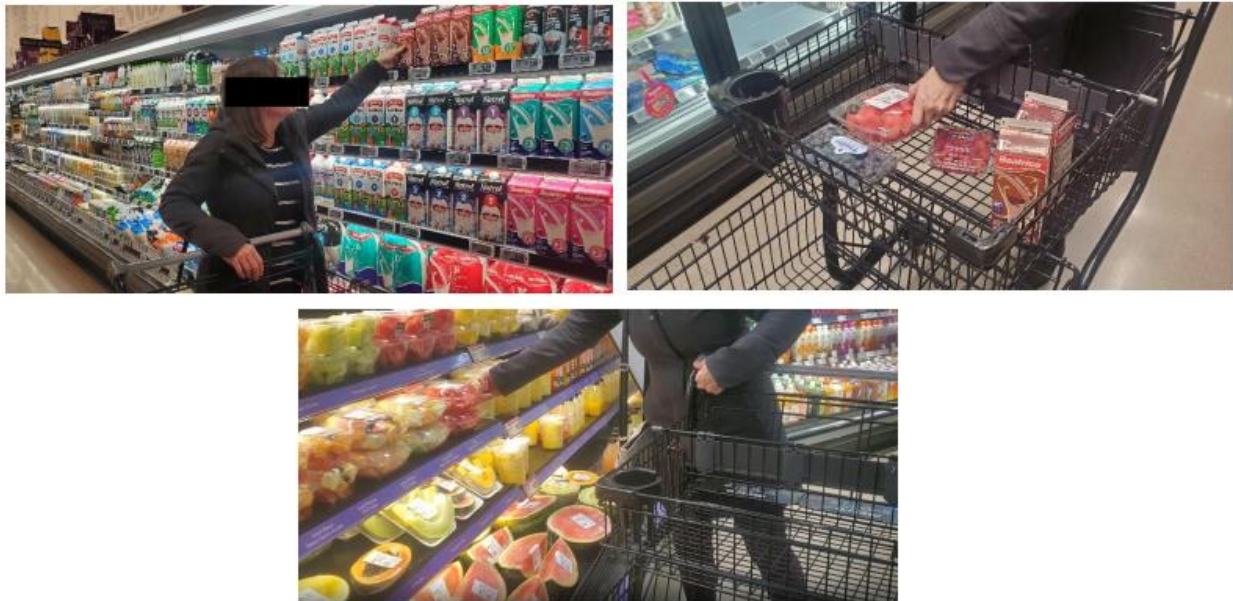
Appendix C – Field Research

Figure 69 - User Testing of Store Shelves

On site interview notes with current methods.

- The size and shape of the bins can be challenging with the grocery carts
- The sizing does not match the cart as best as it could
- The grocery bins being larger at the top provide a challenge for square items with the bins being tapered aggressively
- The shopping carts require careful planning in order to use effectively
- Placement of the bins needs to be optimal to fit as many as the user owns
- Reorganizing happens regularly throughout the shopping experience in order to fit all desired items in the cart
- Larger shopping trips require more planning with more items
- Large item storage is easy but can take some effort to place on lower levels of the cart
- Large quantities of items can be challenging to transport to the residence

Appendix D – Results Analysis

Summary: How current produce procedure effects further design

- Gains: Food is collected for the week/meal and is ready to be prepared.
- Pains
 - Frustration with large quantity transportation to residence
 - Organization during the shopping experience
 - Size and shape of shopping bins can be challenging
 - Frustration with shopping cart design
- Usability and Ergonomics
 - Bending to lower shelves and reaching to upper shelves can be challenging
- Efficiency
 - Preparing for the task at hand can be time consuming and mentally straining. With the planning of meals and groceries required and finding those items (if they are in stock), is often a time-consuming task weekly.
- Interaction
 - Interaction with the shopping bins and grocery carts needs to be studied carefully in order to justify the function of the system.
- Satisfaction
 - Satisfaction of the developed product will be achieved through the lack of transport required and the lowered cost.

Appendix E – Cad Development

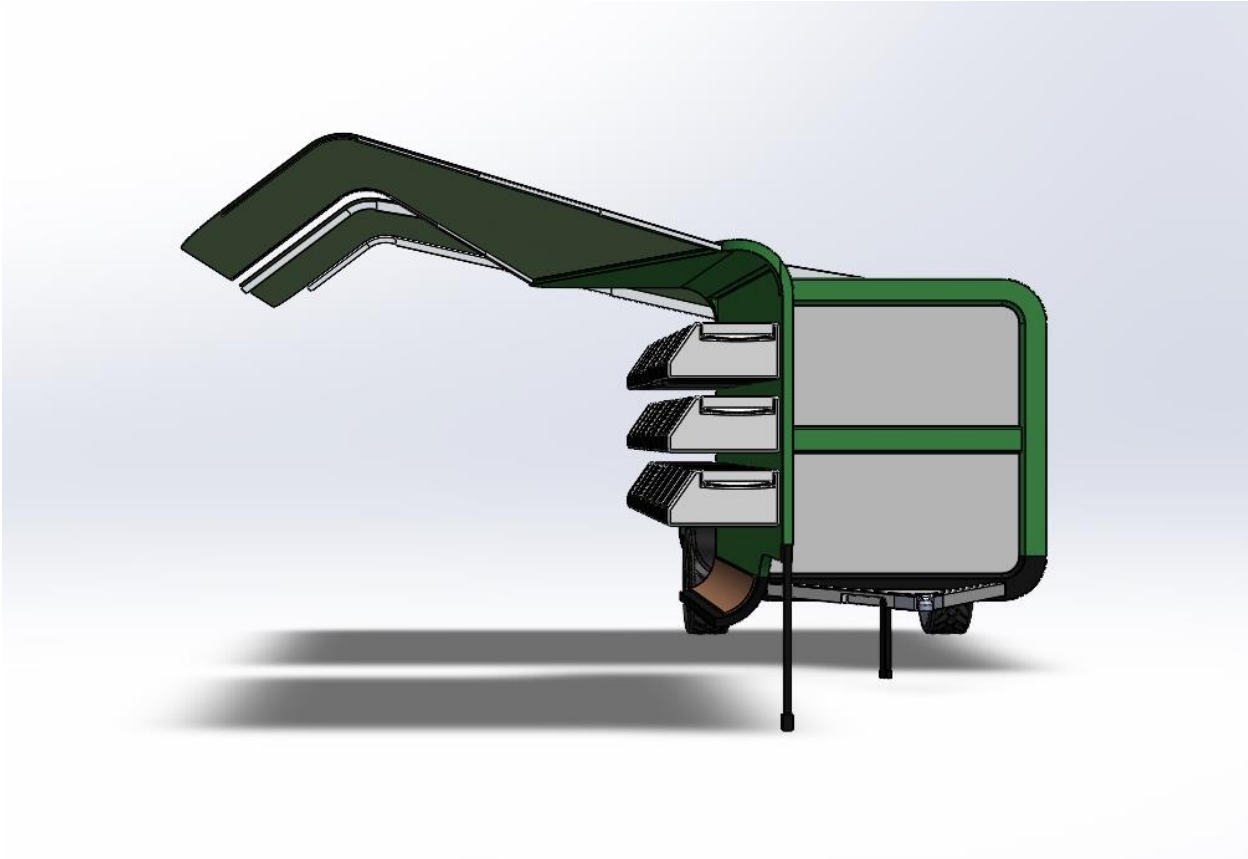


Figure 70 - Cad Development Screenshot 1

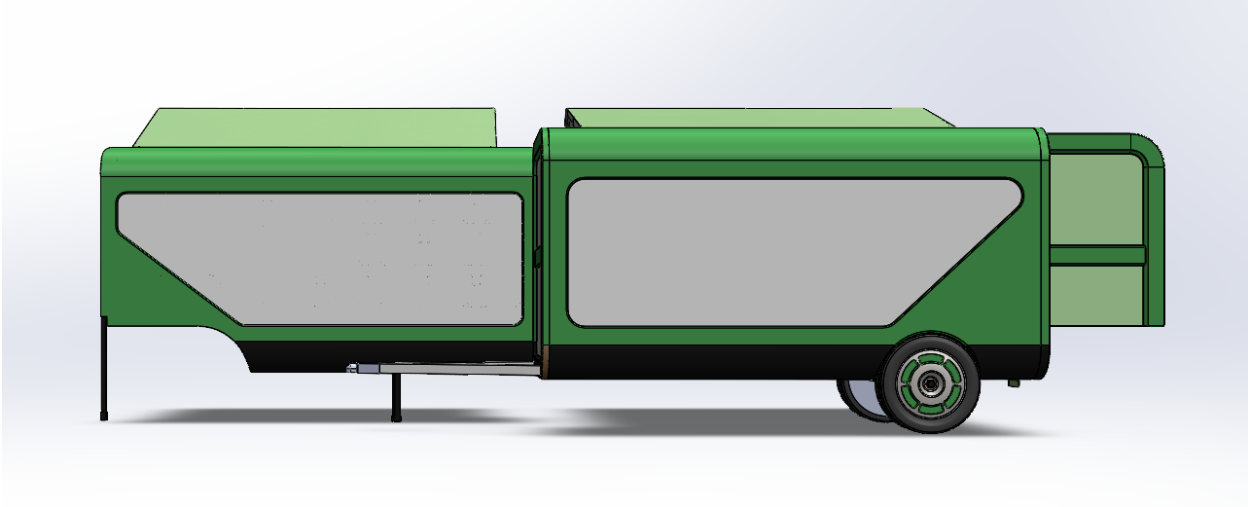


Figure 71 - Cad Development Screenshot 2

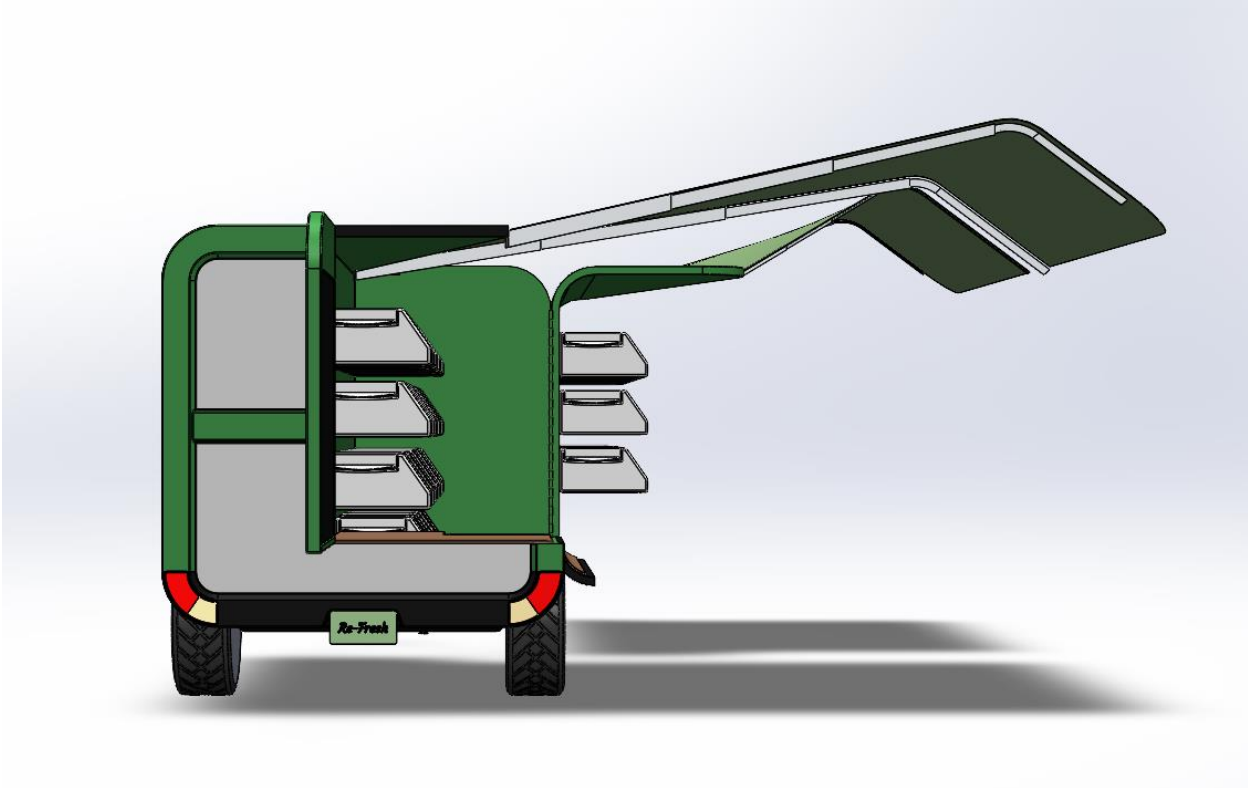


Figure 73 - Cad Development Screenshot 3

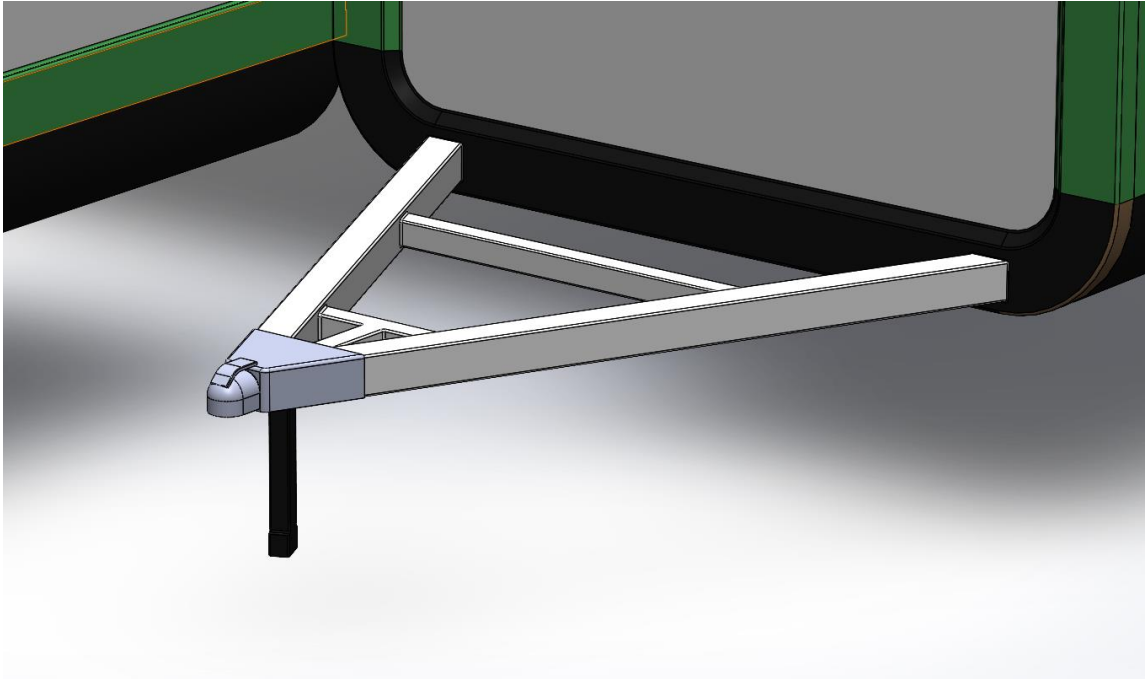


Figure 72 - Cad Development Screenshot 4

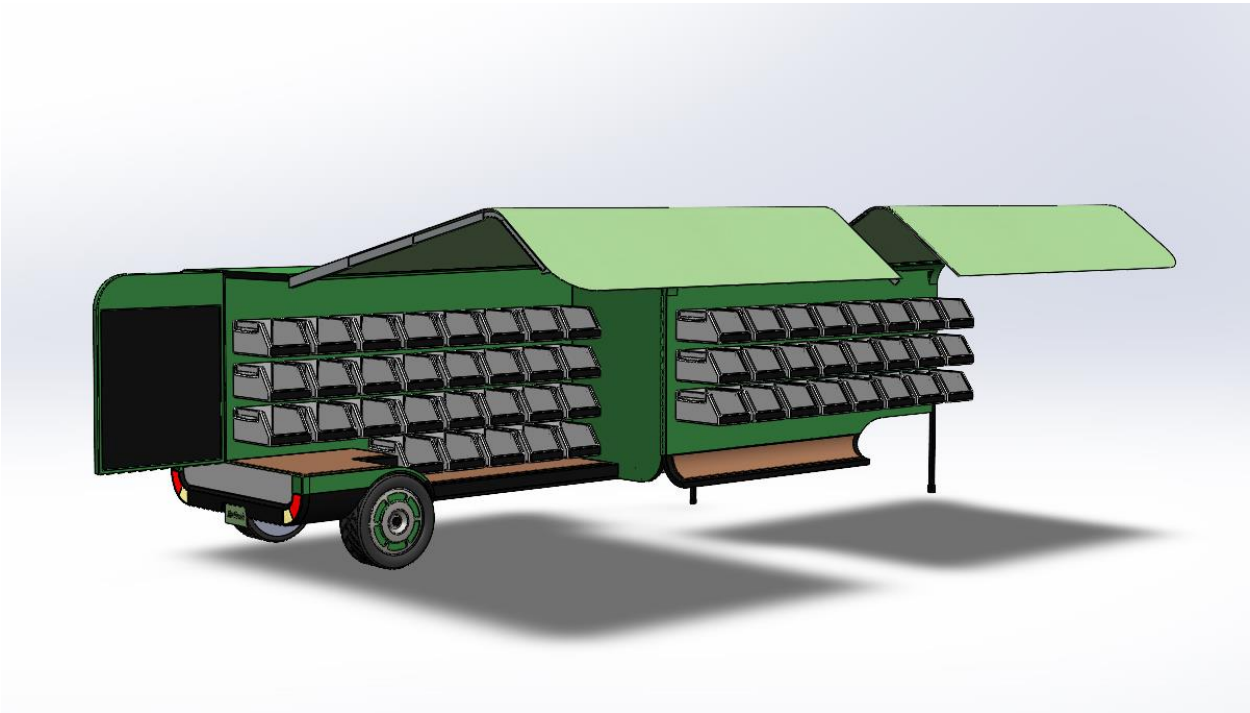


Figure 74 - Cad Development Screenshot 5

Appendix F – Physical Model Photos



Figure 75 - Produce Bins



Figure 76 - Produce Bin Views



Appendix G – Technical Drawings

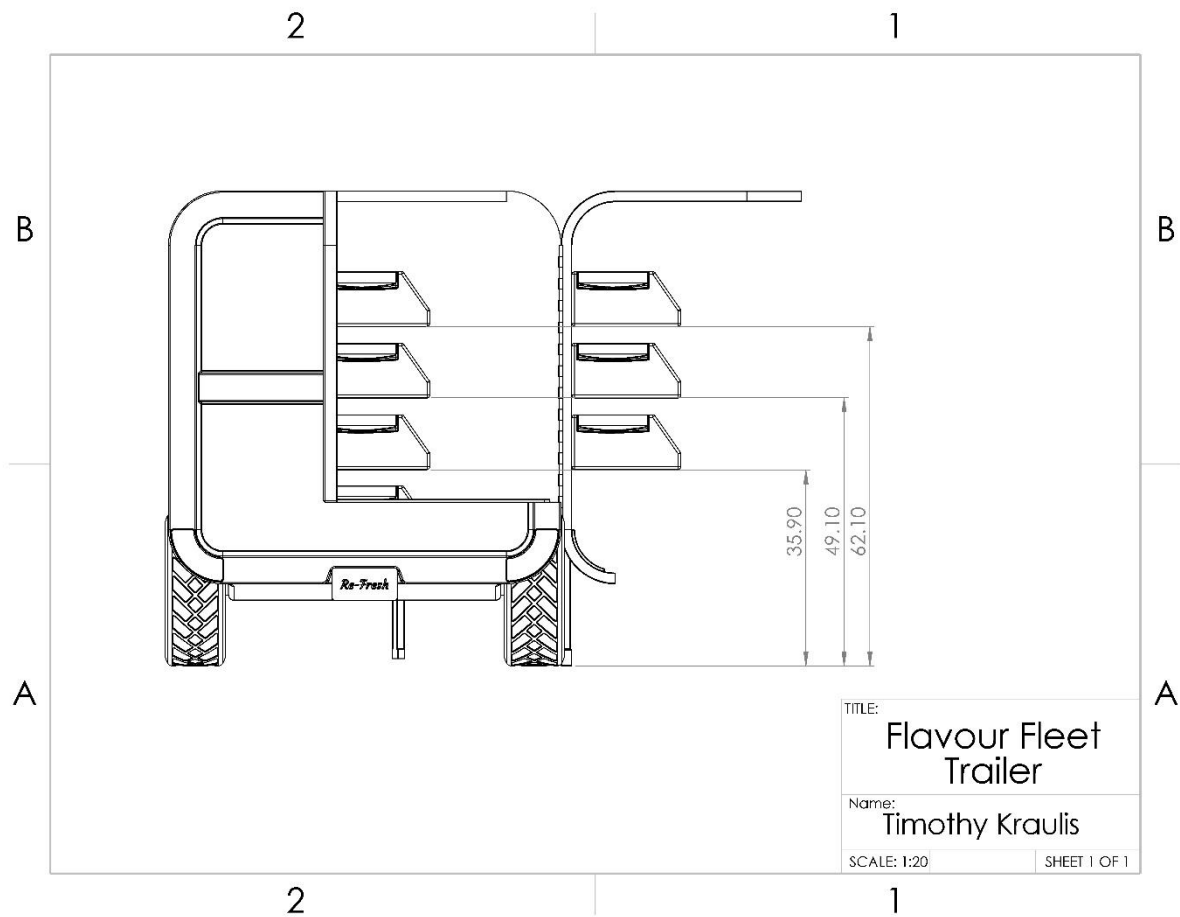


Figure 77 - Produce Bin Height Technical Drawing

Appendix H – Bill of Materials

Bill of Materials						
Component	Material	Quantity	Description	Colour	Manufacturing Method	Cost
Main body panels	Aluminum	40	Sheet coverings of the internal frame	Green, Blue	Stamped and bent sheets, anodized weather coating	\$ 3,600.00
Trailer frame	Steel C channel	4	Internal frame and A frame trailer connections	Silver	Stamping, Bending	\$ 8,000.00
Tires	Rubber, Steel	2	Mounted to steel rim with aero cover	Black	Off the shelf component.	\$ 1,000.00
Axel	Steel	1	Mounted to drive train assembly	Silver	Off the shelf component.	\$ 1,200.00
Drive Train	Steel	1	Leaf Springs, Bearings, Fasteners. Unpowered system, Brake system	Silver	Off the shelf components, welded and fastened to frame	\$ 3,000.00
OLED Display	Display Panel	1	Menu information display	Black	Electronics	\$ 2,000.00
Produce Bin	HDPE	48	Food safe plastic bin, easily cleaned	Light Grey, clear	Injection Molding	\$ 4,800.00
Sun Shade	Fabric	2	Collapsing sun shade to protect the shopping environment	Green	Cut to size, bolted to aluminum frame with steel eyelets	\$ 500.00
Sun Shade Frame	Aluminum	2	Anodized aluminum frame		Cut to length, welded to frame with bending joints	\$ 1,000.00
Lighting units	LED lights, HDPE Housing	2	Bolted to rear trailer frame	Red, Orange	Injection molded lighting housing, clear cover to assist in lighting projection	\$ 200.00
Basket Surfaces	Walnut wood	3	Accent colour for safe surface	Dark brown	Steam bending wood, flat sheet joinery	\$ 1,000.00
Total						\$ 26,300.00

Business Model Cost			
Item	Purchase		Rental
Trailer	\$	26,300.00	\$ 50.58
Supplying produce and food items	\$	20,000.00	Supplied by renter
Trailer Attendant		Supplied by renter	20/hr
Truck Rental + Gas		Supplied by renter	50/day
Total	\$	46,300.00	\$ 300.58

Table 2 - Bill of Materials Cont.

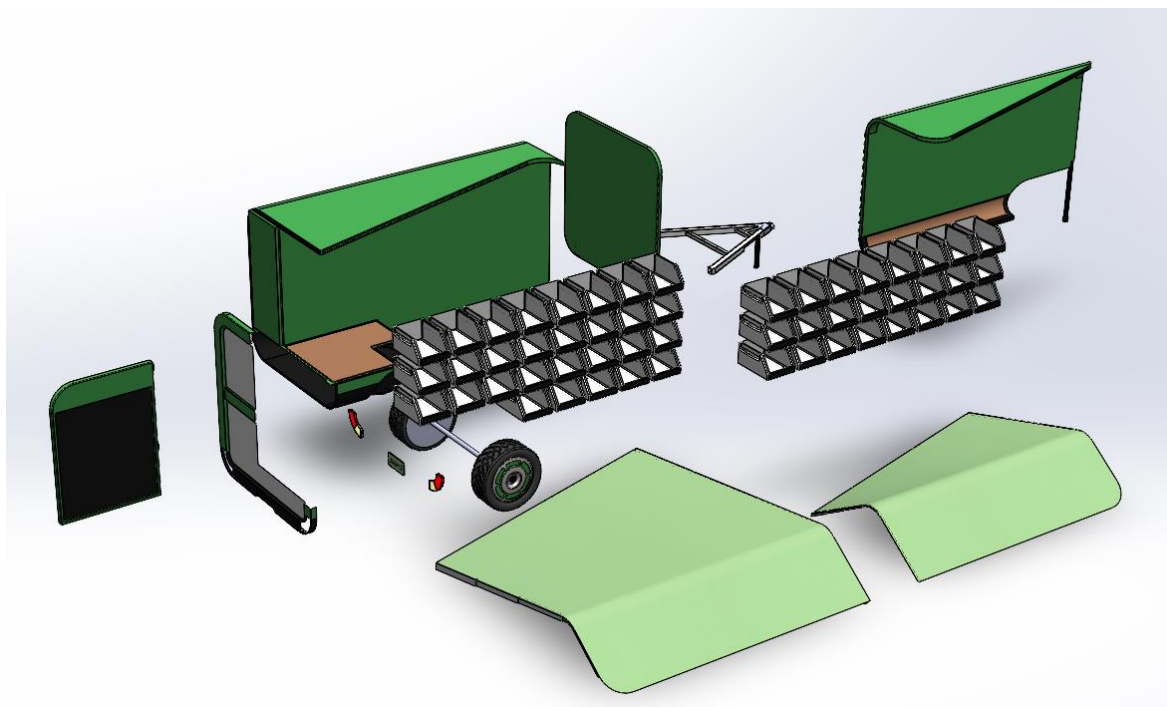



Figure 78 - Exploded View

Appendix I – Sustainability info

Anodizing is the most sustainable surface treatment for aluminum (Svendsen, 2022). With the protection benefits that this treatment offers it is a long-term solution that will stay elegant, clean, and protected for a long period of time. The recommended cleaning rate for anodized aluminum is half that of a painted aluminum sheet (Pearce, 2019), reducing the use of harmful cleaning solutions. Anodized aluminum carries the benefits of being scratch resistant and weatherproofed for long periods of time compared to paint finishes.

Within the mobile food truck industry, there are many initiatives based around reduction of waste and lowering electricity consumption (McGrath, 2020). The focus on reducing waste is not only about organic waste, but packaging as well. Utilizing recyclable packaging and cutlery is a strong start to a sustainable mobile food operation. Finding the most efficient appliances, energy star rated, reduces the overall carbon footprint of the vehicle, and can reduce the operating costs (McGrath, 2020). While current applications focus on food trucks, this method can be applied by using energy efficient lights, information screens and other electronic elements.

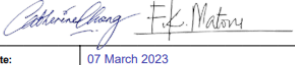
Appendix J – Approval Forms

IDSN 4002 SENIOR LEVEL THESIS ONE		Humber ITAL / Faculty of Applied Sciences & Technology Bachelor of Industrial Design / FALL, 2022 Catherine Chong / Frederic Matovu	
THESIS TOPIC APPROVAL:			
Student Name:	Timothy Kraulis		
Topic Title:	How may we improve nutrition value and promote steady food supply?		
TOPIC DESCRIPTIVE SUMMARY (PRELIMINARY ABSTRACT)			
<p>Within many communities there exists a gap in their food supply, these gaps in food supplies are called food deserts and food swamps. When there is a gap in supermarket access, there is a major impact on the health, wellbeing and finances of the local residence. Currently residence rely on a mix of local options that often lack full nutritional value or use transportation that increases the impact of their time and budgets. Soup kitchens and social programming are available, but they do not exist as a complete solution to the problem that lower income families face. Budgeting and education play a role in their situation. Nutritious food often takes a back seat to other bills while waiting for fresh income. Education for preparing food with what is available also presents a challenge. User studies based on the daily food habits of residence of a food desert will include interviews and surveys to show an in-depth look at the impacts of difficult supply situations. A one-to-one scale model will be developed in order to prove the full-bodied ergonomic solution and to validate the design as a whole. The solution will improve the lifestyle and wellbeing of the residents of food deserts by improving their access to nutritious diet options.</p>			
Student Signature(s):	Instructor Signature(s): 		
Date: 27/09/22	Date: 29 September 2022		

17

Chong, Kappen, Thomson, Zaccolo

Figure 80 – Thesis Topic Approval

IDSN 4502 SENIOR LEVEL THESIS TWO		Humber ITAL / Faculty of Applied Sciences & Technology Bachelor of Industrial Design / WINTER 2023 Catherine Chong / Frederic Matovu	
CRITICAL MILESTONES: APPROVAL FOR CAD DEVELOPMENT & MODEL FABRICATION			
Student Name:	Timothy Kraulis		
Approved Thesis Title:	Food Supply to Lower Income Communities		
THESIS PROJECT – DESIGN APPROVAL FORM			
Design is reviewed and approved to proceed for the following:		<input checked="" type="checkbox"/> CAD Design and Development Phase	
Comment: Continue design refinement in CAD development, need to iron out detailing and product's features, pay attention to surfacing, components and assembly methods for design feasibility. Viable holistic design thinking in conjunction with considerations into sustainability aspects. CAD development must be at least 75% complete for review before approval for fabrication.			
Design is reviewed and approved to proceed for the following:		<input checked="" type="checkbox"/> Model Fabrication Including Rapid Prototyping / 3D Printing and Model Building Phase	
Comment: Waiting for CAD development review (as of Feb-21). Good progress with CAD, design completed, continue detail refinement, once refined, fabrication of model can begin.			
Instructor Signature(s):			
			
Date:		07 March 2023	

1

Chong, Kappen

Figure 79 - Cad Approval



Figure 81 - TCPS 2 Certificate of Completion

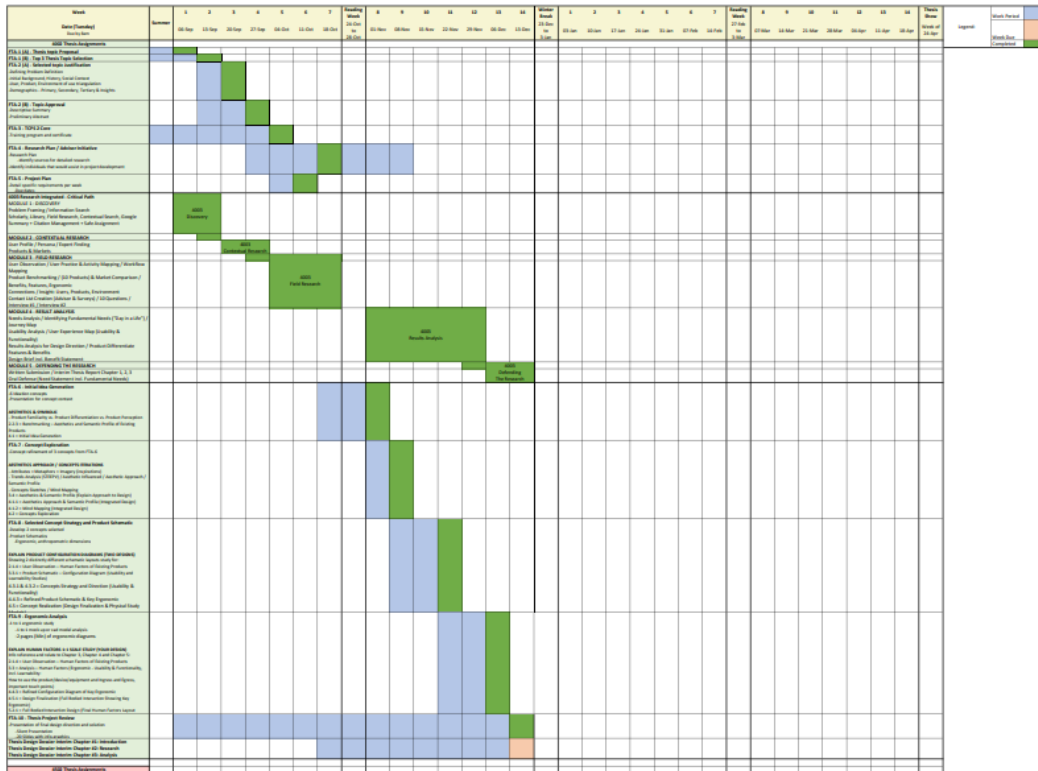


Figure 83 - FTA Schedule

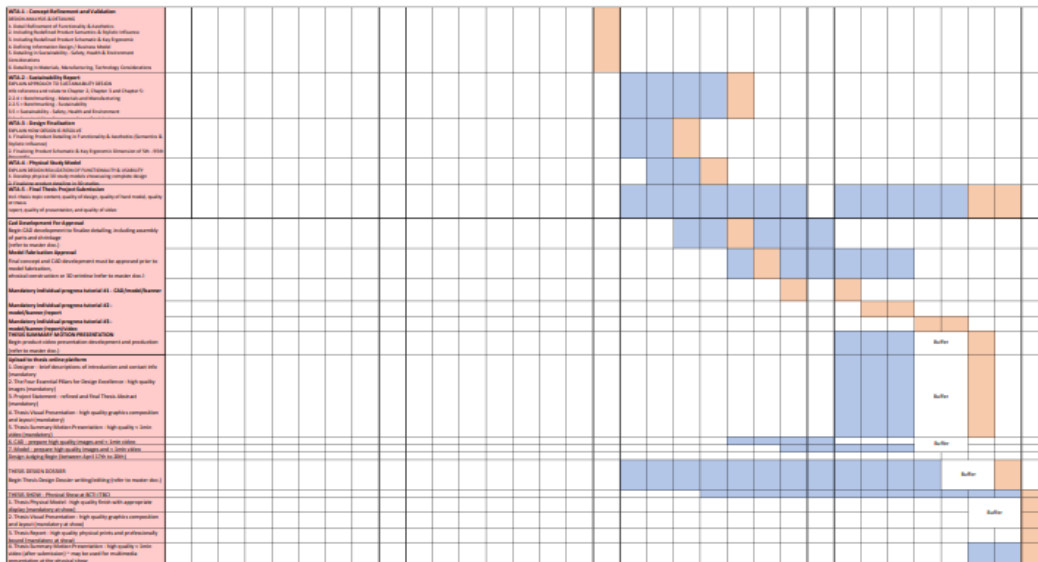


Figure 82 - WTA Schedule

Research Plan – Natasha Thuemler

Introduction

The goal of this research plan is to support and advance the development of the final product through various research formats including written resources, interviews and user from the perspective of a resident of a food desert. The research will focus on the problem of improving nutritional value and promoting steady food supply.

Research Plan

The elements of this research include product benchmarking and system analysis for the usage and supply of food banks and other related solutions for food deserts. Research will be conducted through 3 different avenues. One on one interviews with an advisor and users, a multiuser survey open to online forums and internet resources found through the Humber library and other scholarly sources. Advisors and stakeholders have been contacted through mutual connections and access to the Humber library has been granted through student status. Preliminary Product research and benchmarking, user observation videos and initial interviews with stakeholders have been held as of week 7 (14/10/22). An initial interview to take place week 8 (31/10.22) pending advisor availability. From week 8 and onwards, collaboration with advisors will continue throughout the project. Depending on the results of an initial interview with Natasha Thuemler, additional advisors will be contacted week 8 (31/10.22).

Survey Questions – Low Income Shopper (Completed as of 10/10/22)

1. Are healthy meal options a top priority when you are shopping?
2. Where do you do you mainly get your meals from?
3. What are the methods that you use provide healthy meal options for yourself or others?
4. How do you choose the groceries you purchase?
5. Does transportation affect your grocery shopping habits?
6. How frequently do you cook for yourselves or others?
7. Do you feel that you have a wide variety of meals you know how cook?
8. Do you have experience living in a food desert? What do you do to deal with that situation?

Interview Based Questions – Food Bank Volunteer (Completed as of 10/10/22)

1. How did you get connected with the food bank you volunteered at?
2. What position did you assist with? What tasks did you do in that position?
3. How long were you involved with the food bank?
4. What was the most challenging part of your work?
5. Did you have any interaction with the customers? What did you learn from those experiences?
6. Did the food bank provide any cookbooks or instructions?
7. Do you have any thoughts on improvements for the food bank you were a part of?

Advisor initiative

Currently contacted is Natasha Thuemler from Indwell housing. Indwell is a charity that focuses on affordable community housing focusing on supporting people with health and wellness. The chosen problem definition aligns with their goals and current actions within the communities they are a part of. Additional advisors from initial stages of interviews will be contacted in the event they are needed.

Advisor: Natasha Thuemler (Unconfirmed)

Contact info: 866-529-0454 x499, nthuemler@indwell.ca

Interviews to be scheduled after week 8 (31/10/22)

Initial questions for advisor – Regional manager at Indwell, supporting food security operations

How does having secure housing impact food security?

Despite having secure housing, do people still have problems getting food?

What strategies exist within the indwell communities are there to help with food insecurity?

Can you see any gaps that Indwell would like to fill with respect to food insecurity?

Conclusion

Throughout the thesis project, the conducted research will be carefully revised in order to best serve the end users. With the input from advisors and research, the resulting product will be well informed and provide a solution to the problem definition of improving nutritional value and promoting steady food supply.

Appendix K – Advisor Meetings & Agreement Forms

Advisor Certificate – Nathan Dirks

IDSN 4002 /4502
SENIOR LEVEL THESIS ONE & THESIS TWO

HUMBER
Faculty of Applied Sciences & Technology
Bachelor of Industrial Design / FALL 2022 & WINTER 2023

PARTICIPANT INFORMED CONSENT FORM

Research Study Topic: Improving nutritional value and promoting steady food supply
Investigator: Timothy Kraulis, Timothy@Kraulis.com, 416-807-8169
Courses: IDSN 4002 & IDSN 4502 Senior Level Thesis One & Two

I, Timothy Kraulis, have carefully read the Information Letter for the project [Click or tap here to enter text.](#), led by Timothy Kraulis. A member of the research team has explained the project to me and has answered all of my questions about it. I understand that if I have additional questions about the project, I can contact Timothy Kraulis at any time during the project.

I understand that my participation is voluntary and give my consent freely in voice recording, photography and/or videotaping, with the proviso that my identity will be blurred in reports and publications.

Consent for Publication: Add a (X) mark in one of the columns for each activity

ACTIVITY		YES	NO
Publication	I give consent for publication in the Humber Library Digital Repository which is an open access portal available to the public.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Review	I give consent for review by the Professor	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Privacy
All data gathered is stored anonymously and kept confidential. Only the principle investigator/researcher, « insert student Name here » and Prof. Catherine Chong or Prof. Frederick Matovu may access and analyze the data. All published data will be coded, so that visual data is not identifiable. Pseudonyms will be used to quote a participant (subject) and data would be aggregated.

I also understand that I may decline or withdraw from participation at any time, without negative consequences.

I understand that I can verify the ethical approval of this study, or raise any concerns I may have by contacting the Humber Research Ethics Board, Dr. Lydia Boyko, REB Chair, 416-675-6622 ext. 79322, Lydia.Boyko@humber.ca or « insert student Name /Phone Number /Email Address ».

Verification of having read the Informed Consent Form:
 I have read the Informed Consent Form.

My signature below verifies that I have read this document and give consent to the use of the data from questionnaires and interviews in research report, publications (if any) and presentations with the proviso that my identity will not be disclosed. I have received a copy of the Information Letter, and that I agree to participate in the research project as it has been described in the Information Letter.

[Click or tap here to enter text.](#) Nathan Dirks 2022-11-28
Participant's Name Participant's Signature Date

Figure 85 - Advisor Certificate 1

IDSN 4002 /4502
SENIOR LEVEL THESIS ONE & THESIS TWO

HUMBER
Faculty of Applied Sciences & Technology
Bachelor of Industrial Design / FALL 2022 & WINTER 2023

INFORMATION LETTER

Conditions of Participation

- I understand that I am free to withdraw from the study at any time without any consequences.
- I understand that my participation in this study is confidential. (i.e. the researcher will know but will not disclose my identity)
- My identity will be masked.
- I understand that the data from this study may be published.

I have read the information presented above and I understand this agreement. I voluntarily agree to take part in this study.

[Click or tap here to enter text.](#) Nathan Dirks 2022-11-28
Participant's Name Participant's Signature Date

Project Information
Thank you very much for your time and help in making this study possible. If you have any queries or wish to know more about this Senior Level Thesis project, please contact me at the followings.
Phone: 416-807-8169
Email: Timothy@Kraulis.com
My supervisor is:
Prof. Catherine Chong, catherine.chong@humber.ca

Figure 84 - Advisor Certificate 2

Interview Certificate – Margaret Lennox


 Humber Institute of Technology
 & Advanced Learning
 NORTH CAMPUS
 205 Humber College Blvd.
 Toronto, ON M9W 5L7
 humber.ca
 FACULTY OF
 APPLIED SCIENCES & TECHNOLOGY

Timothy Kraulis, Timothy@Kraulis.com, 416-807-8169

October 9, 2022

Thesis Project

Thesis Project Consent Form

I, (please print) Margaret Lennox, have carefully read and understood the Information Letter for the Thesis project, led by Timothy Kraulis. A member of the research team has explained the project to me and has answered all of my questions. I understand that if I have additional questions about the project, I can contact Timothy Kraulis at any time during the project. I understand that my participation is voluntary and give my consent freely. I also understand that I may decline or withdraw from participation at any time, without any penalty or any explanation. I understand that I can verify the ethical approval of this study, or raise any concerns I may have by contacting the Humber Research Ethics Board (Dr. Lydia Boyko, REB Chair, 416-675-6622 ext. 79322,

lydia.boyko@humber.ca), or Timothy Kraulis.

[Note: If participant has the option of participating in one, or more than one, activities in the research project, the Consent Form should list them clearly. Each activity should have a Yes/No option so that the participant knows they have a choice in which activity they are consenting to participate in.]

My signature below verifies that I have received a copy of the Information Letter, and that I consent to participate in this study:

Margaret Lennox
Participant's Name (printed)

M Lennox
Participant's Signature

Oct. 10/22
Date



Figure 86 - Participant Certificate

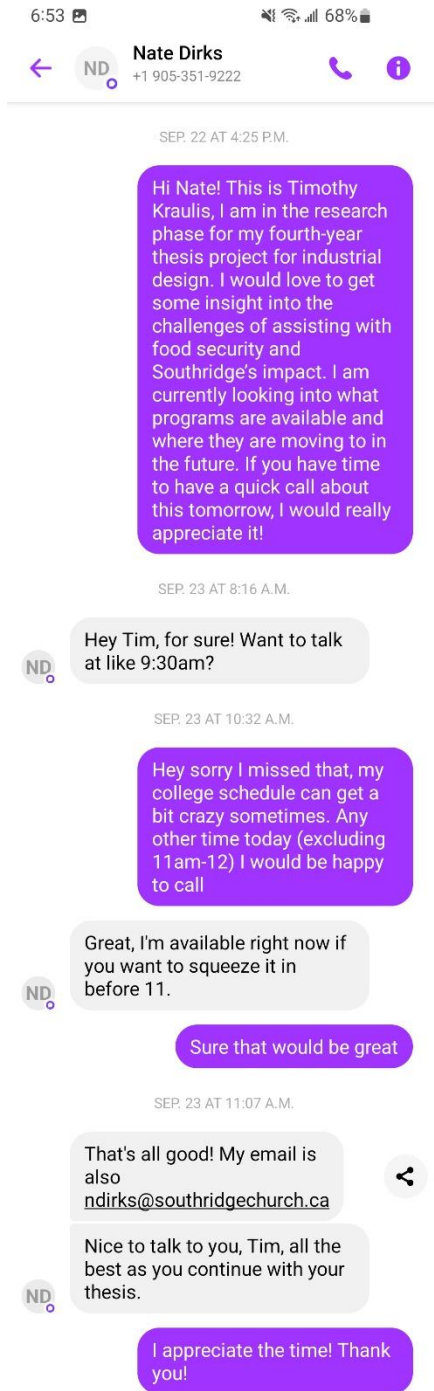


Figure 87 - Advisor Communication

References

- Food Banks Canada. (2022, October 27). *Hungercount*. Food Banks Canada. Retrieved December 16, 2022, from <https://foodbanksCanada.ca/hungercount/>
- Government of Canada. (2022, March 23). *Low income statistics by age, sex and Economic Family Type*. Statistics Canada. Retrieved December 16, 2022, from <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1110013501>
- Table: 11-10-0135-01
- Monsebraaten, L. (2016, September 19). *Food Bank users increasingly older, better educated*. thestar.com. Retrieved December 16, 2022, from <https://www.thestar.com/news/gta/2016/09/19/food-bank-users-increasingly-older-better-educated.html#:~:text=The%20education%20level%20of%20food,college%20diplomas%20or%20university%20degrees.>
- NHS. (2020, April 30). *Health benefits of eating well*. Food and nutrition | NHS inform. Retrieved December 16, 2022, from <https://www.nhsinform.scot/healthy-living/food-and-nutrition/eating-well/health-benefits-of-eating-well>
- Tilley, A. R. (2002). *The measure of man and woman: Human factors in design*. Wiley.
- USDA . (2022, October 20). *Food Access Research Atlas*. USDA ERS - Documentation. Retrieved December 16, 2022, from <https://www.ers.usda.gov/data-products/food-access-research-atlas/documentation/>

Walsh, O. (2022, February 22). *FOOD DESERTS: WHAT THEY ARE AND WHAT CAUSES THEM*. The humane league. Retrieved December 16, 2022, from <https://thehumaneleague.org/article/food-desert>

Walker, R. E., Keane, C. R., & Burke, J. G. (2010). Disparities and access to healthy food in the United States: A review of food deserts literature. *Health & Place*, 16(5), 876–884. <https://doi.org/10.1016/j.healthplace.2010.04.013>

Zhou, Q, Zhao, L, Zhang, L, et al. Neighborhood supermarket access and childhood obesity: A systematic review. *Obesity Reviews*. 2021; 22(S1):e12937. <https://doi.org/10.1111/obr.12937>