FINAL PRESENTATION

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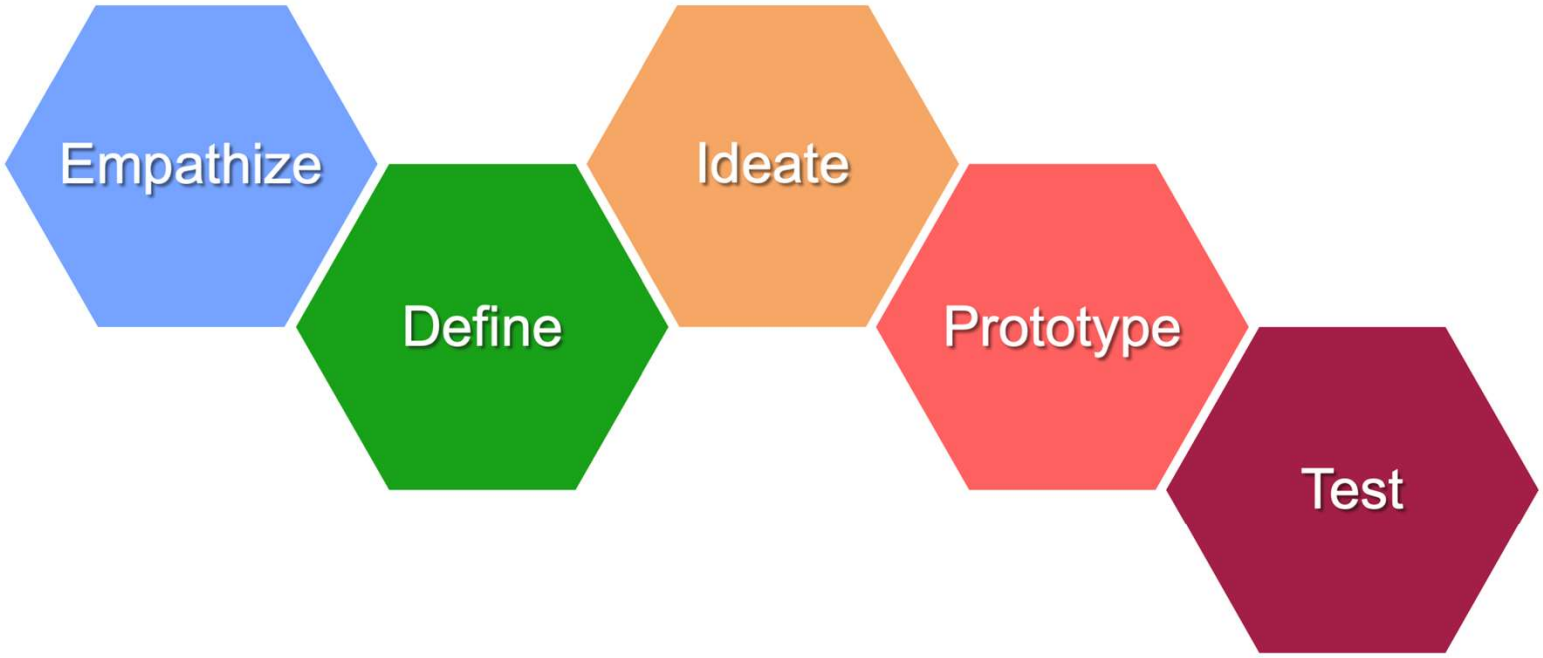
uOttawa

FOLLOWING THE DESIGN PROCESS



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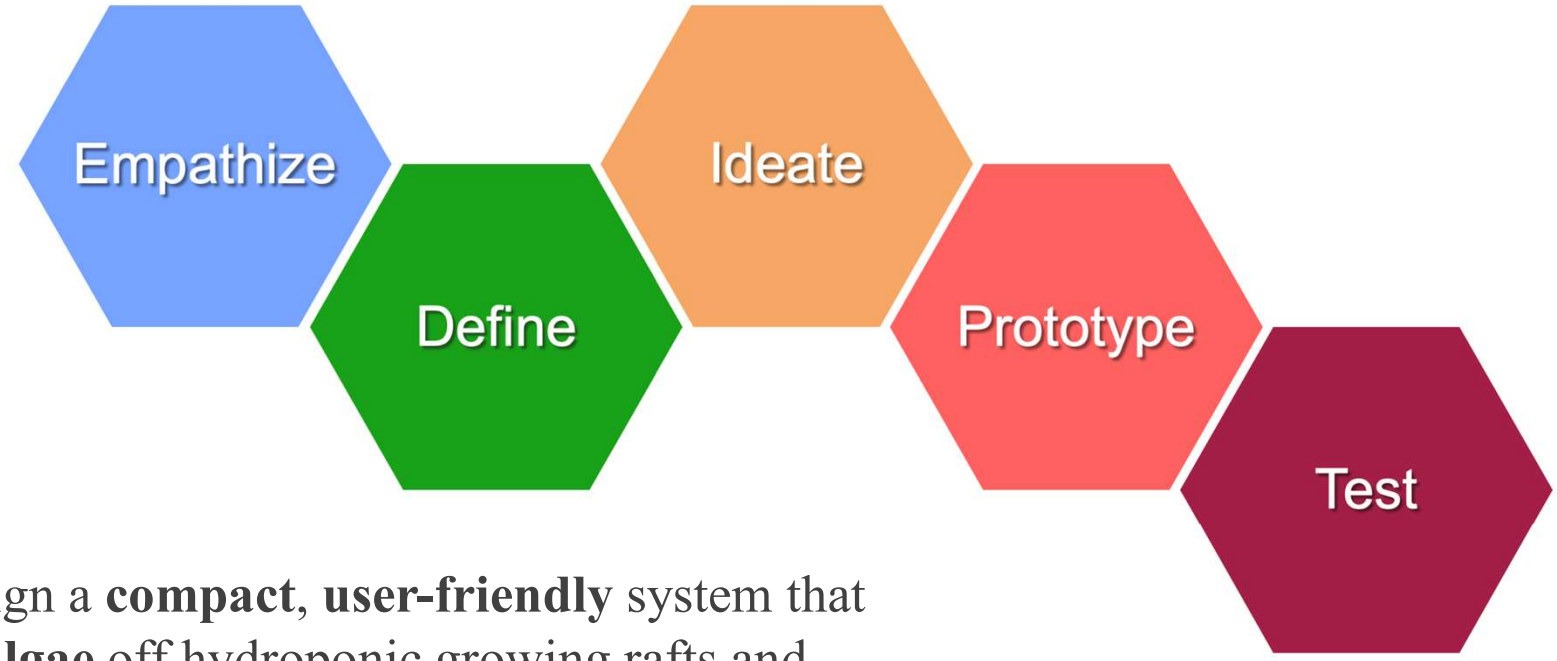
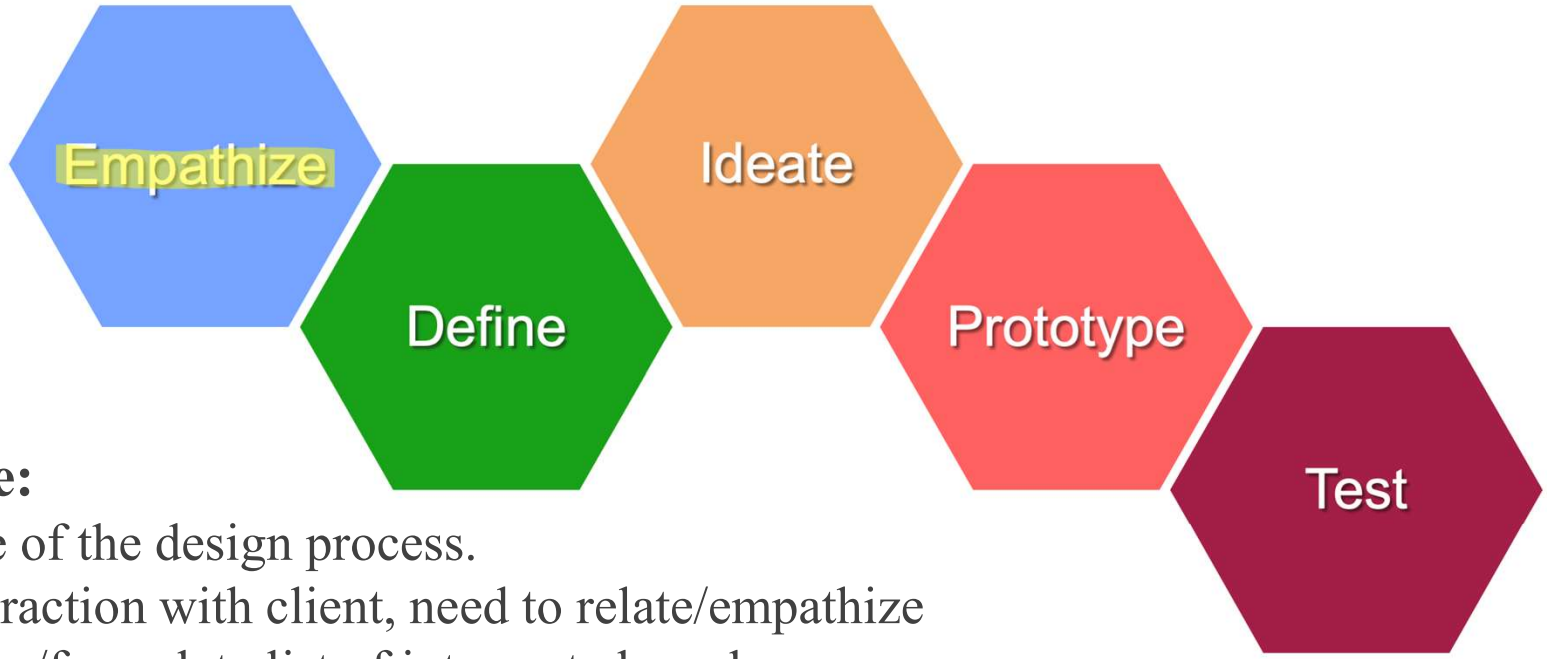


Goal: Design a **compact**, **user-friendly** system that **cleans all algae** off hydroponic growing rafts and requires **little manual labour.**

FOLLOWING THE DESIGN PROCESS

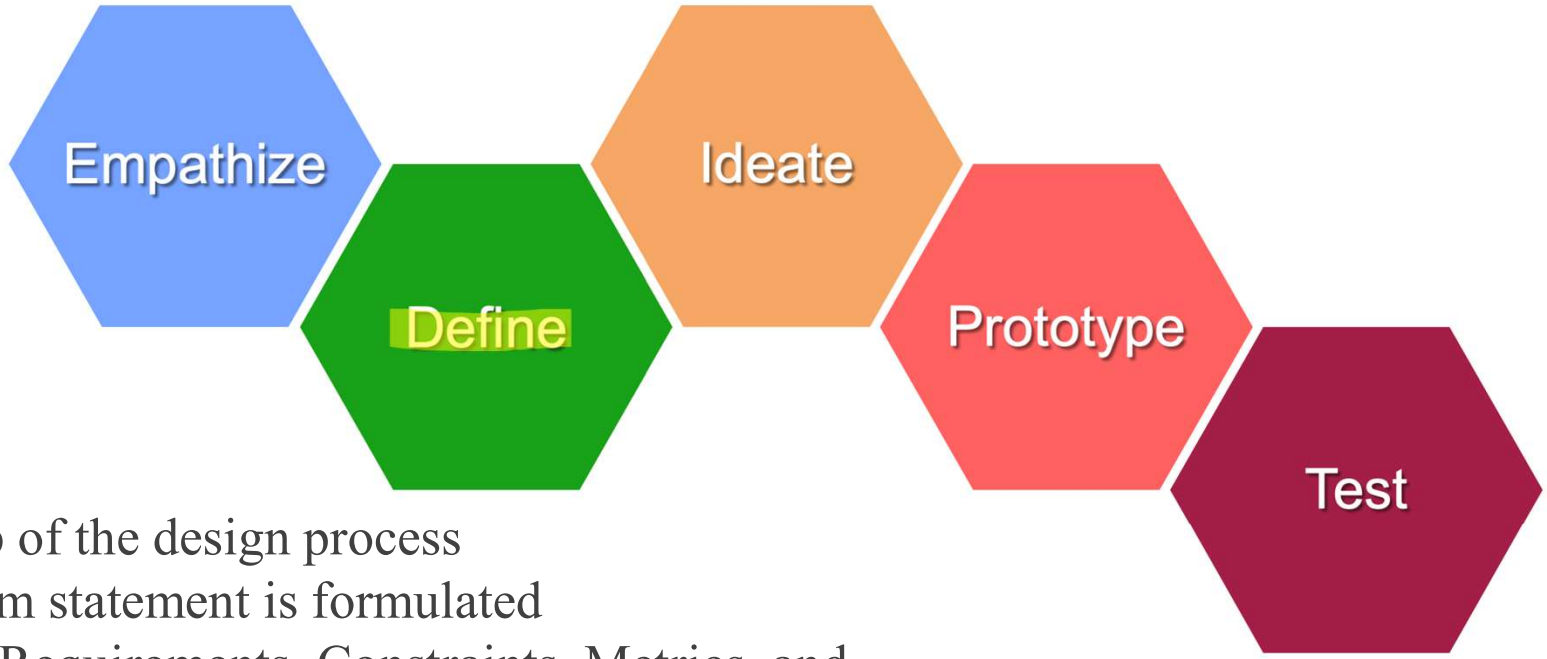


Empathize:

Initial Stage of the design process.

- First interaction with client, need to relate/empathize
- Determine/formulate list of interpreted needs

FOLLOWING THE DESIGN PROCESS

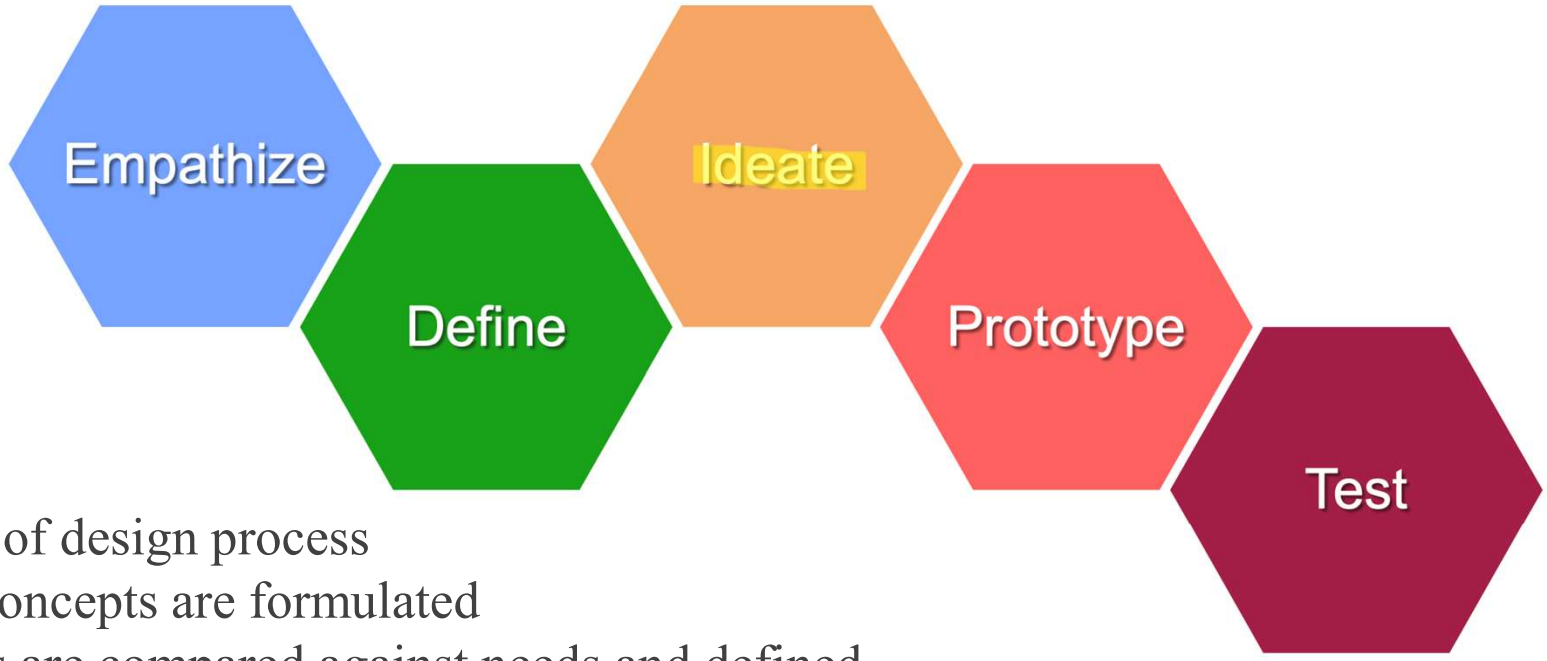


Define:

Second step of the design process

- A problem statement is formulated
- Criteria, Requirements, Constraints, Metrics, and Specifications defined.
- User benchmarking is done

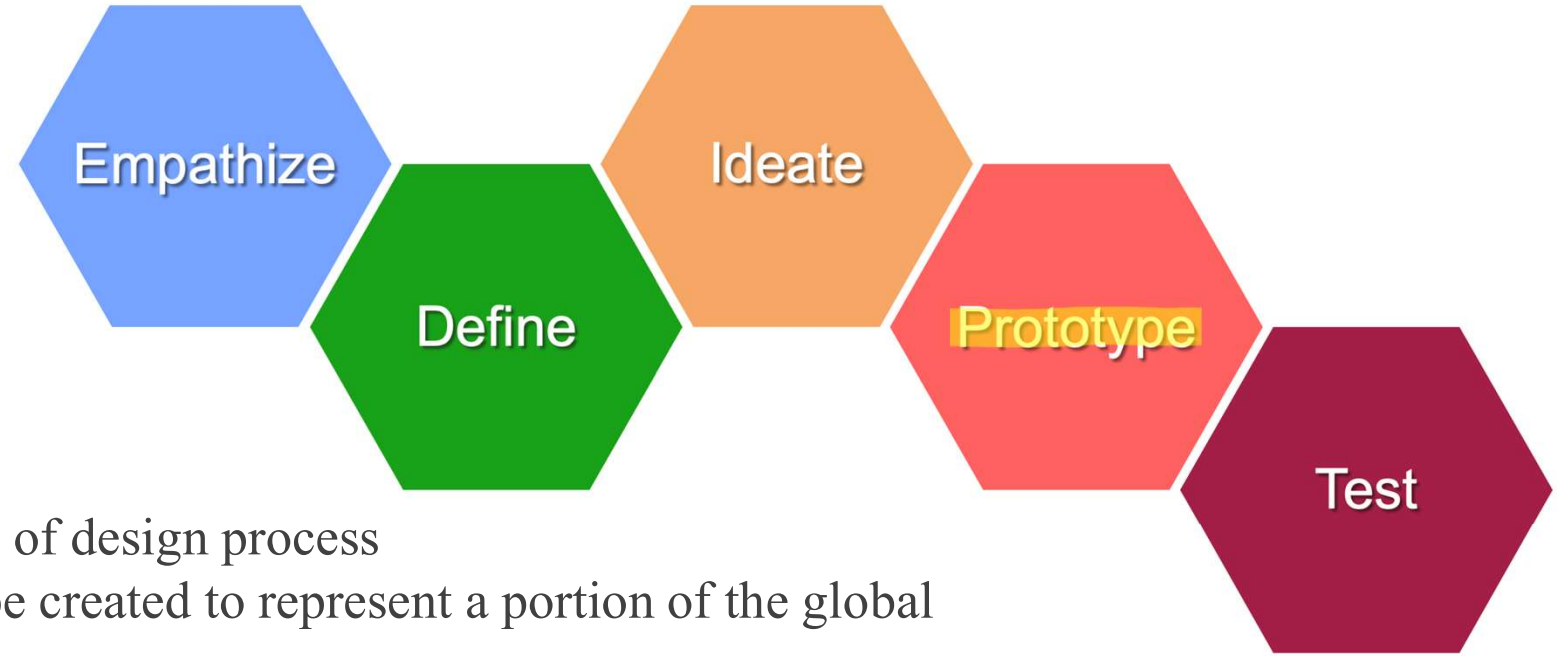
FOLLOWING THE DESIGN PROCESS



Ideate:
Third stage of design process

- Design concepts are formulated
- Concepts are compared against needs and defined characteristics
- Global concepts formed

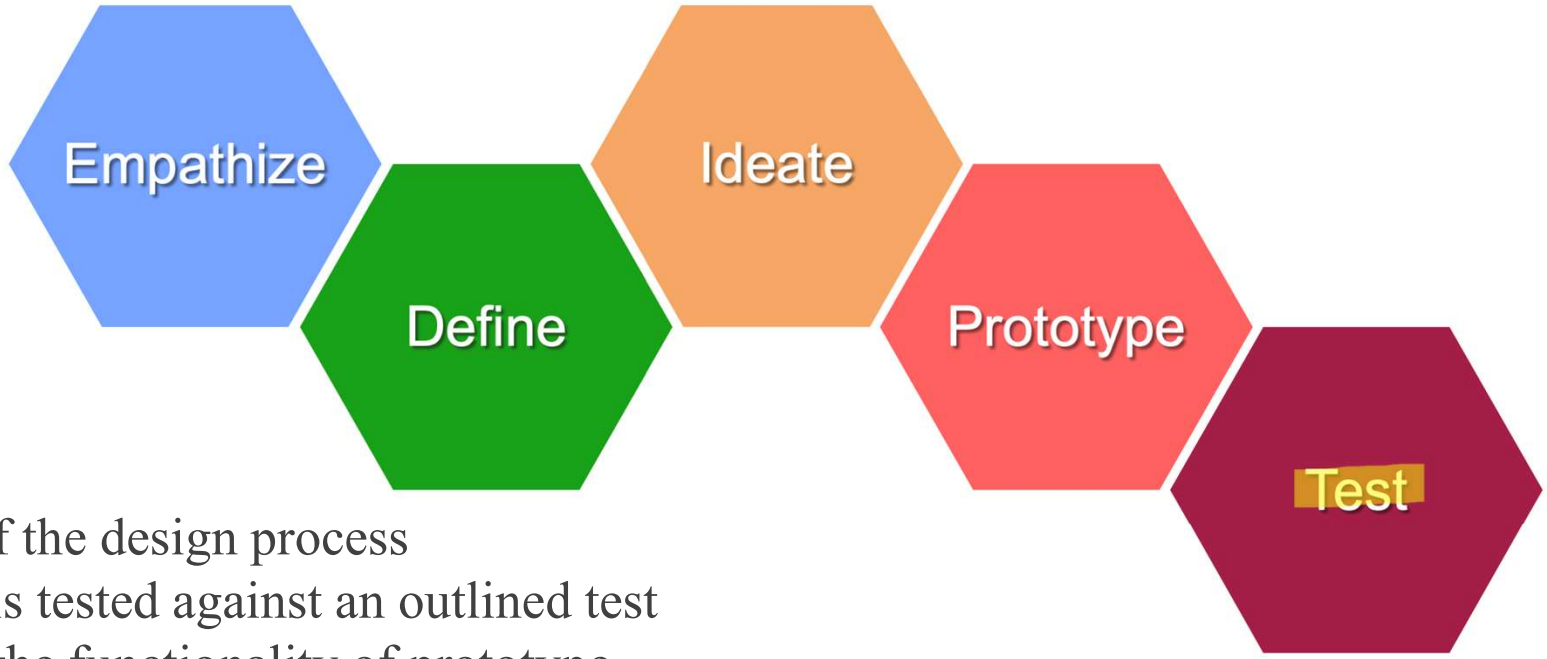
FOLLOWING THE DESIGN PROCESS



Prototype:
Fourth step of design process

- Prototype created to represent a portion of the global concept
- Fulfills a specific task

FOLLOWING THE DESIGN PROCESS

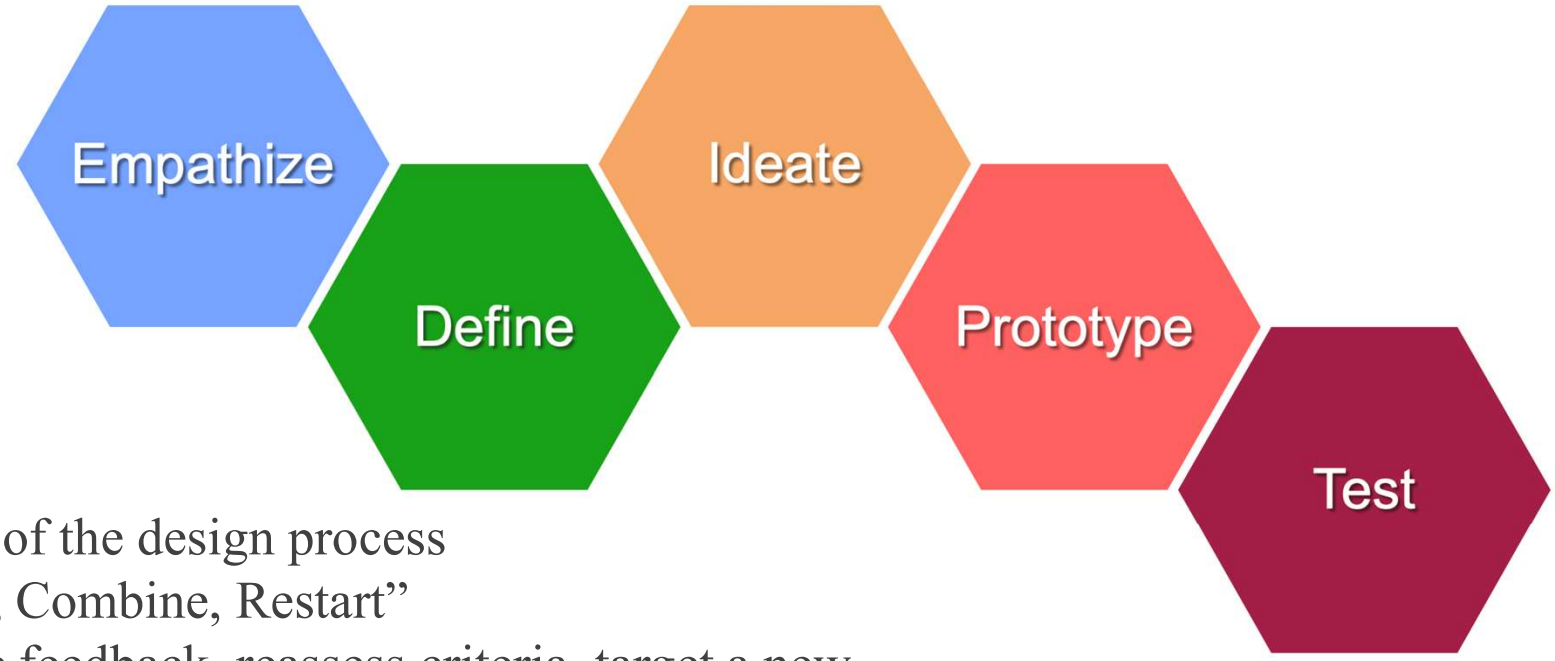


Test:

Fifth step of the design process

- Protype is tested against an outlined test
- Proving the functionality of prototype

FOLLOWING THE DESIGN PROCESS



Iterate:

Final stage of the design process

- "Evolve, Combine, Restart"
- Integrate feedback, reassess criteria, target a new solution
- Restart design process

BACKGROUND

Client Meeting I

Empathize

- **Impact on Specifications**
- **Determination of Importance**
- **List of Needs**

PROGRESSING

Empathize

Functional Requirements

(DO) The device must: **Ordered from most to least important*

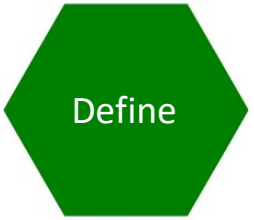
1. Clean all visible algae from grow boards
2. Significantly reduce manual labour time of cleaning for user
3. Automatically clean grow boards
4. Clean one or multiple grow boards at a time
5. Use little water
6. Completely dry the boards
7. Indicate to the user what stage the product is in the cleaning/drying cycle

Non- Functional Requirements

(BE) How the system must perform: **Ordered from most to least important*

1. User friendly (be able to operate with little to no technical knowledge)
2. Able to fit in designated location
3. Wall mounted or table mounted
4. Easy to repair or replace

PROGRESSING



Problem Statement:
Design a **compact**, **user-friendly** system that **cleans all algae** off hydroponic growing rafts requiring **little manual labour.**

Define:
Characteristics were defined based on identified client needs and given metrics/specifications

Ex. Maximum dimensions, required functionalities

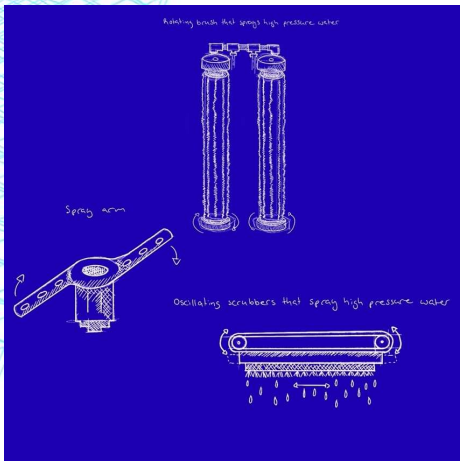
Benchmarking:
We performed user benchmarking against products with similar functions

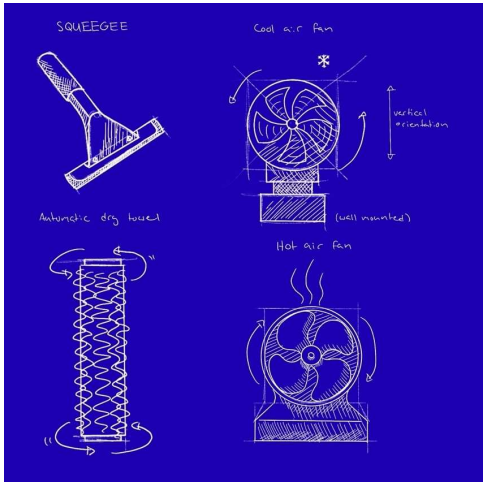
- Dishwasher
- Electric Toothbrush
- Electric Scrubbers

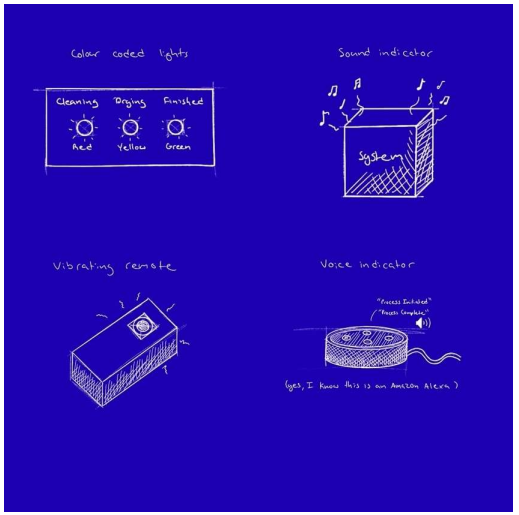
Giving us ideas for how to design our solutions

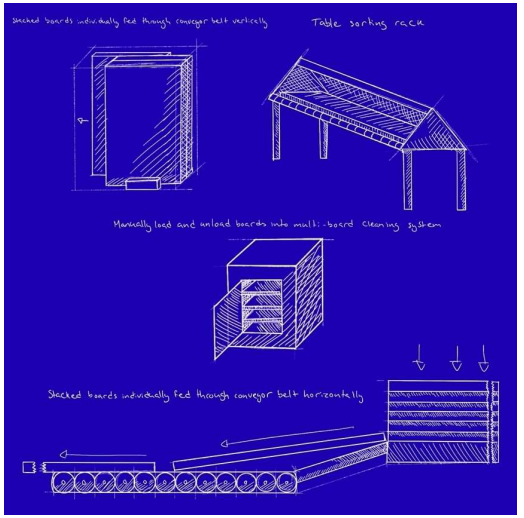
Ideate

DEVELOPING IDEAS







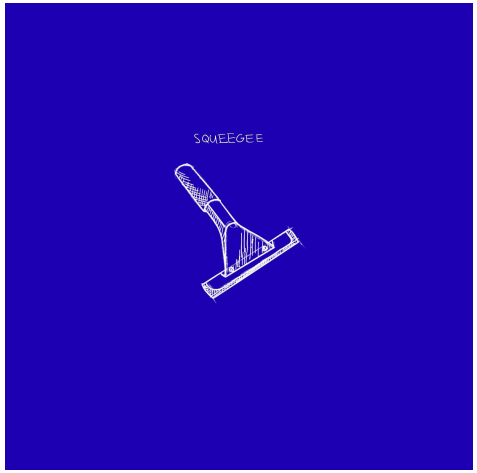


CHOSEN GLOBAL CONCEPT 1

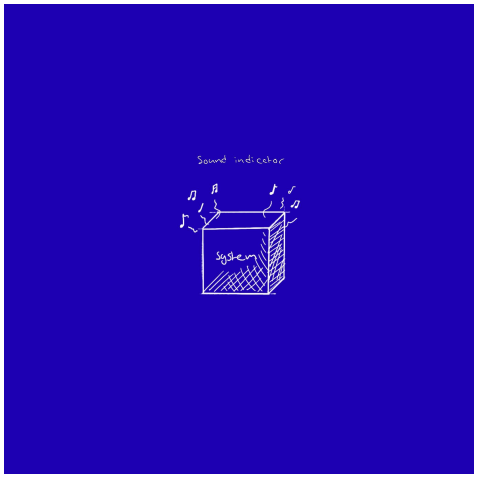
Rotating brush that sprays high-pressure water + Squeegee + Colour coded lights + Sound Indicator + Stacked boards individually fed through conveyor belt vertically

Algae Removal

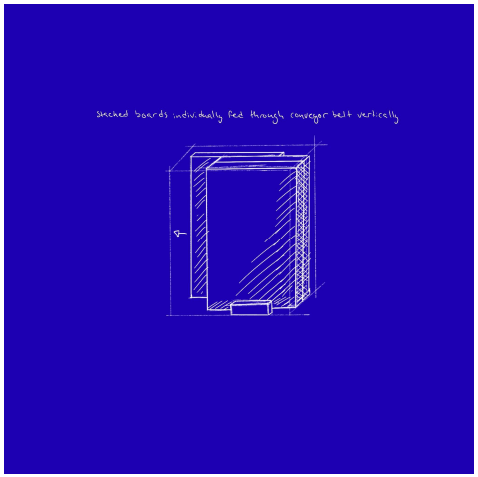
Board Drying

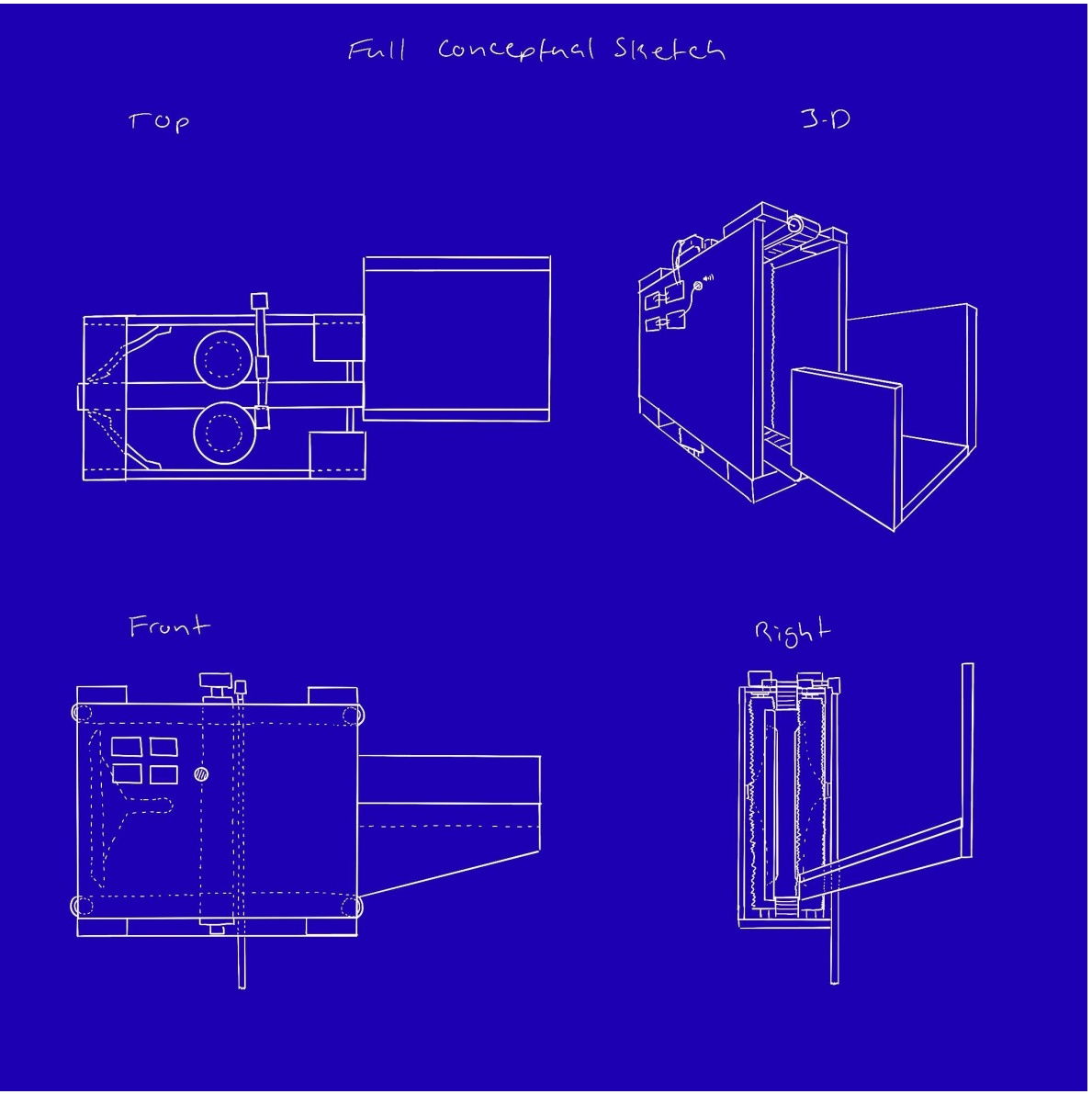


Indicator



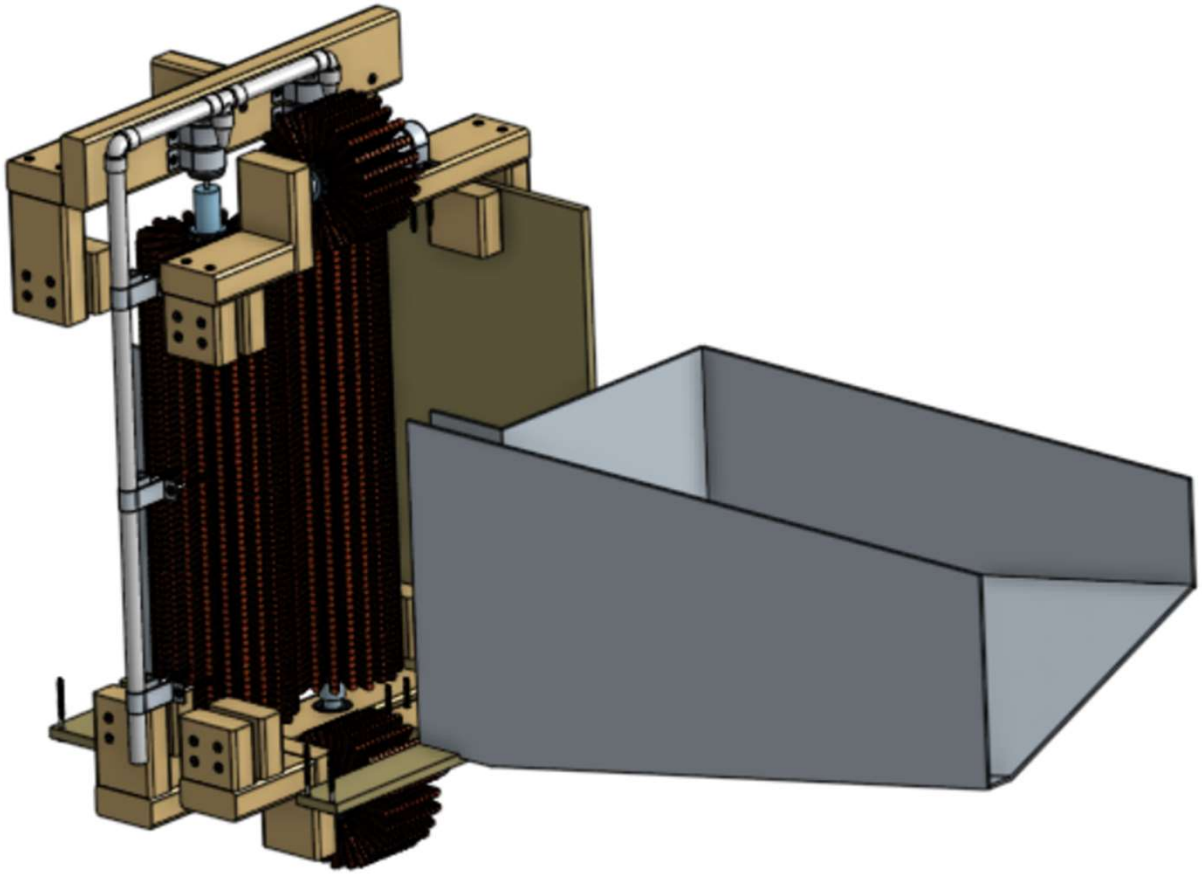
Loading Setup





CLIENT FEEDBACK MEETING II

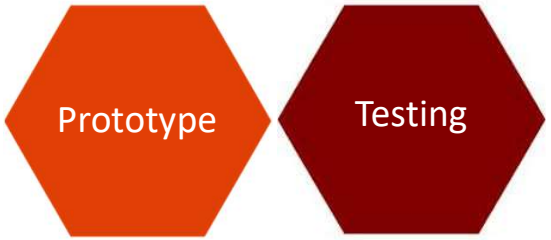
- Drying system not necessary
- Conveyor belt inhibits cleaning of upper and lower faces of the boards
- Can be smaller
- Liked the simple design by using gravity



RESULTING MODIFICATIONS

- Whole system tilted eliminating the need for conveyor belts
- Brushes added to top and bottom allowing all faces to be cleaned
- Smaller in length
- Removed the drying system

PROTOTYPE I: CAD MODEL



Objective

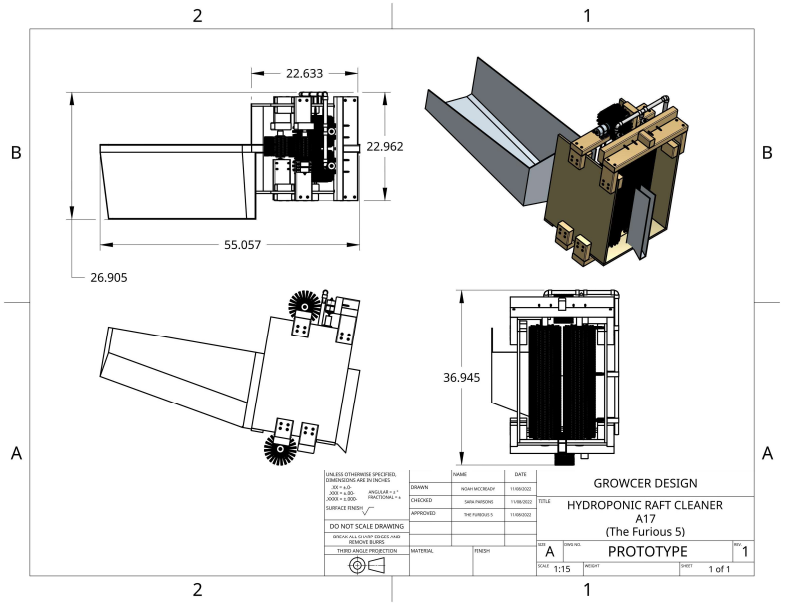
- Determining and optimize dimensions
- Fastening locations
- Optimal fastener types
- Aid in better communicating our design

Process

- 3D CAD model using OnShape
- Ensured target specifications for dimensioning are met
- Optimized size of components to be contained within the frame

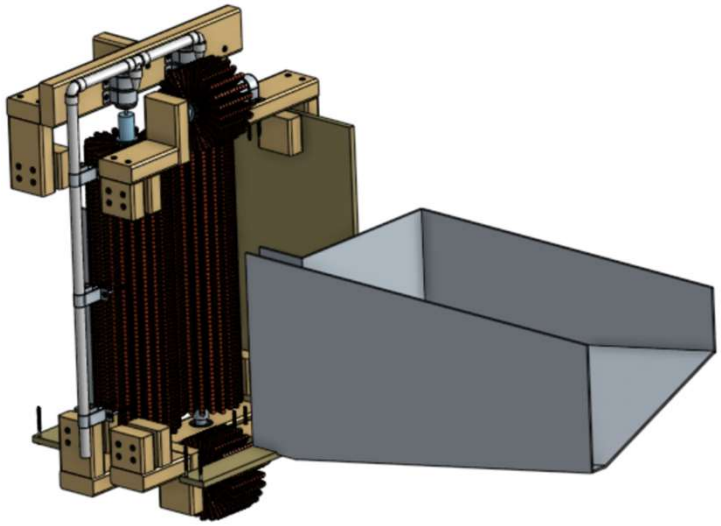
Results

- Determined dimensions, fastening locations, and approximate weight



CLIENT FEEDBACK (MEETING III)

- Boards may not have enough force to go through system without getting stuck
- Cannot control timing of boards entering system



RESULTING MODIFICATIONS

- Wheels
  - First contact with the boards after loading magazine
  - Can be programed to a specific timing

PROTOTYPE 2

Objective

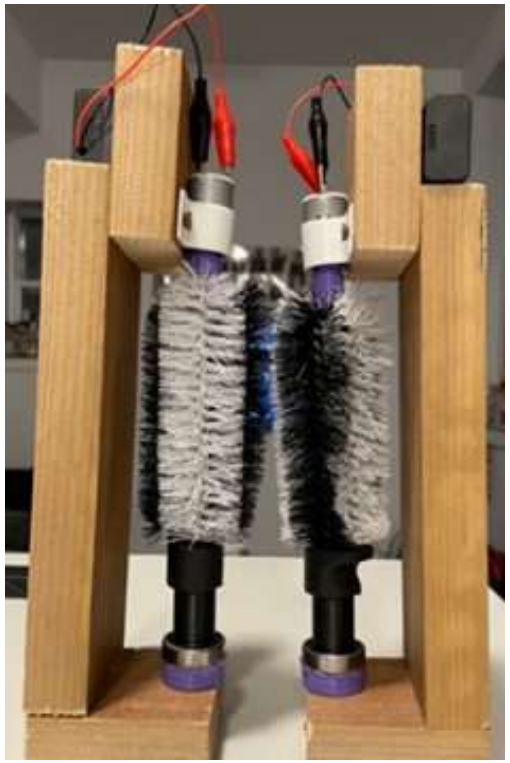
- Determining the effectiveness and feasibility of the brush system

Process

1. Build frame
2. Secure motors onto brushes
3. Secure brushes onto frame
4. Secure brushes onto bearings

Testing

Manually feed simulated dirty boards through the system while brushes were spinning



RESULTS

- Boards did not get fully clean
- Motors did not have enough torque, stopped with resistance
- Boards and bearing create more resistance than anticipated

TAKE AWAYS

- Brushes are appropriate size and bristle toughness
- Bristles need to be touching to clean all surfaces

DESIGN MODIFICATION

- New motors with higher torque
- Gear system

NEXT STEPS

Prototype 3

Objective:

- Determine how all parts will work together
- Determine functional dimensions

Process:

- Build a scaled functional design incorporating the latest feedback