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Virtual Design Review 2

Team 504: Corning's Automated Pallet Topper

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Sponsors and Advisors

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Project Leader

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Project Advisor

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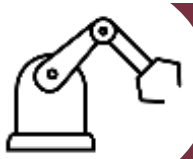
Objective

The objective of this project is to design an automated device to assist in Corning's current palletization and depalletization process through the placement and removal of pallet toppers and embedded foam layer.

Key Goals

Placement and removal of pallet toppers.



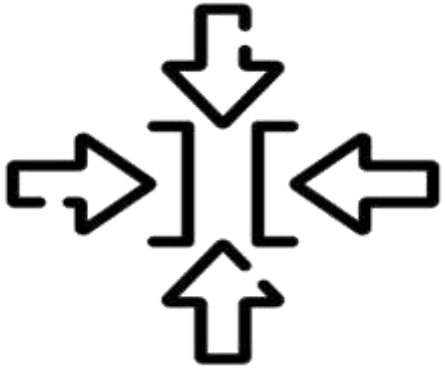
The device is automated.

The device will be able to fit in or around current assembly cells.

Ensure that the device is safe.

Customer Needs

Efficiency and Synthesis



Spatial Constraints

Physical Constraints

Targets and Metrics

Three-Dimensional Movement	Moves within x-y-z planes
Rotates	Rotates a full 360°
Collects Topper/Foam	Picks up and holds the Topper/Foam in less than or equal to 30 seconds
Releases Topper/Foam	System is able to lift and move a load of 30 pounds or more

Targets and Metrics

Moves Between Set Points	Moves between set locations in less than or equal to 30 seconds
Communicates Pallet Location	Pallet location is communicated between system and conveyor belt (1 Boolean)
Determines Height	System is able to read the stack heights from 32.75 to 42.5 inches
Carries Load	System is able to lift and move a load of 30 pounds or more

Targets and Metrics

Cycle Time	System will take less than or equal to 120 seconds to complete one cycle
Grip Reliability	Tooling of the system will have a grip reliability of 95%
Robustness of Positional Error	System will operate with the stack being offset by 6 inches or less
Max Payload	System will be able to operate with a max payload of 210 kilograms

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Concept Generation

Biomimicry

Morphological Chart

Brainstorming

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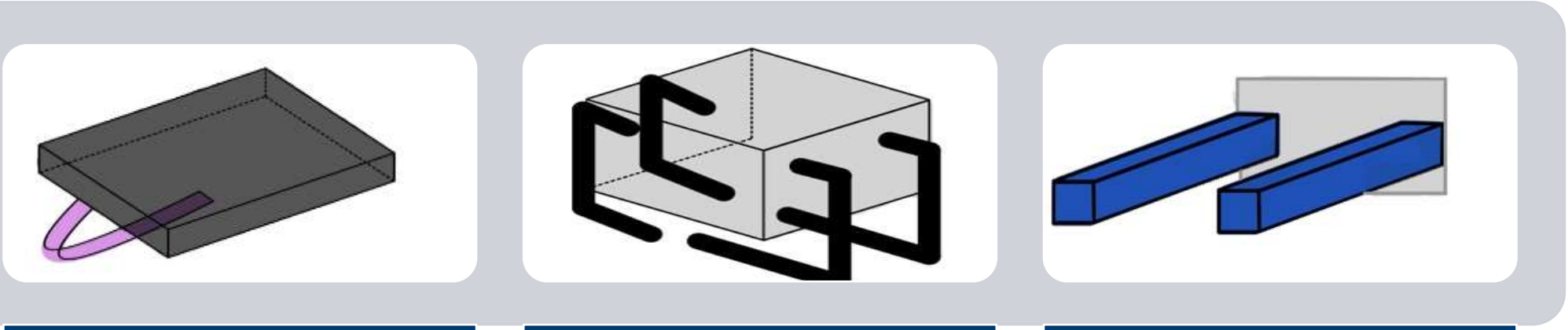
Medium Fidelity Concepts



Long Hook Clamp

Spider Claw on Gantry

Pinch Stacker

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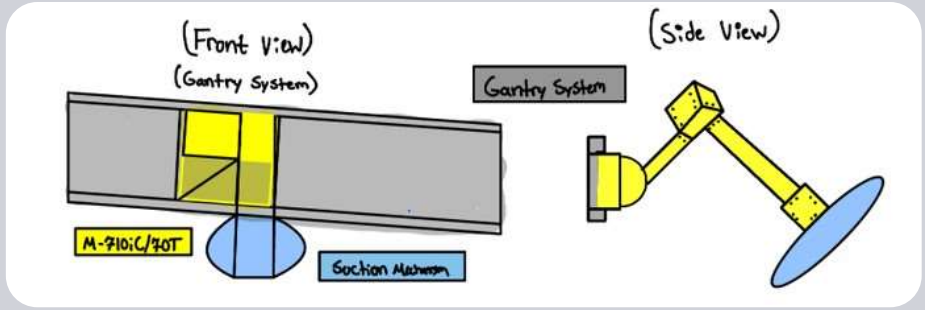
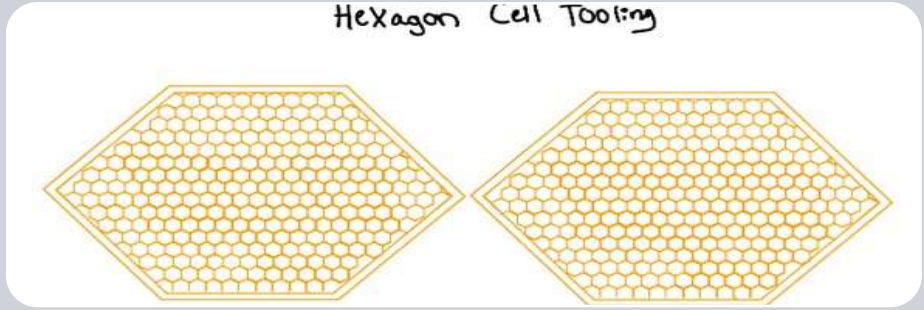
Medium Fidelity Concepts



Vacuum on Gantry



Hexagonal Cell

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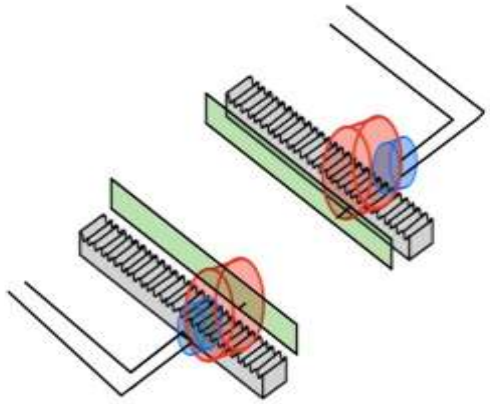
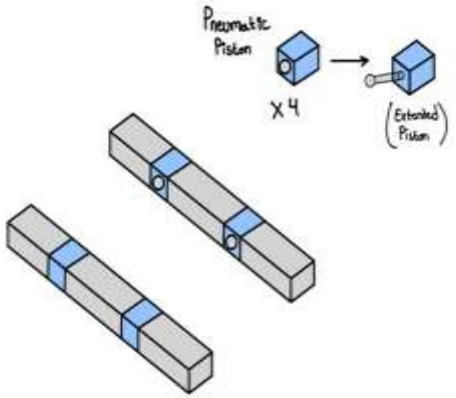
High Fidelity Concepts



Rack and Pinion Retractable Clamp



Piston Retractable Clamp

Vacuum Gripper that is Rack Mounted

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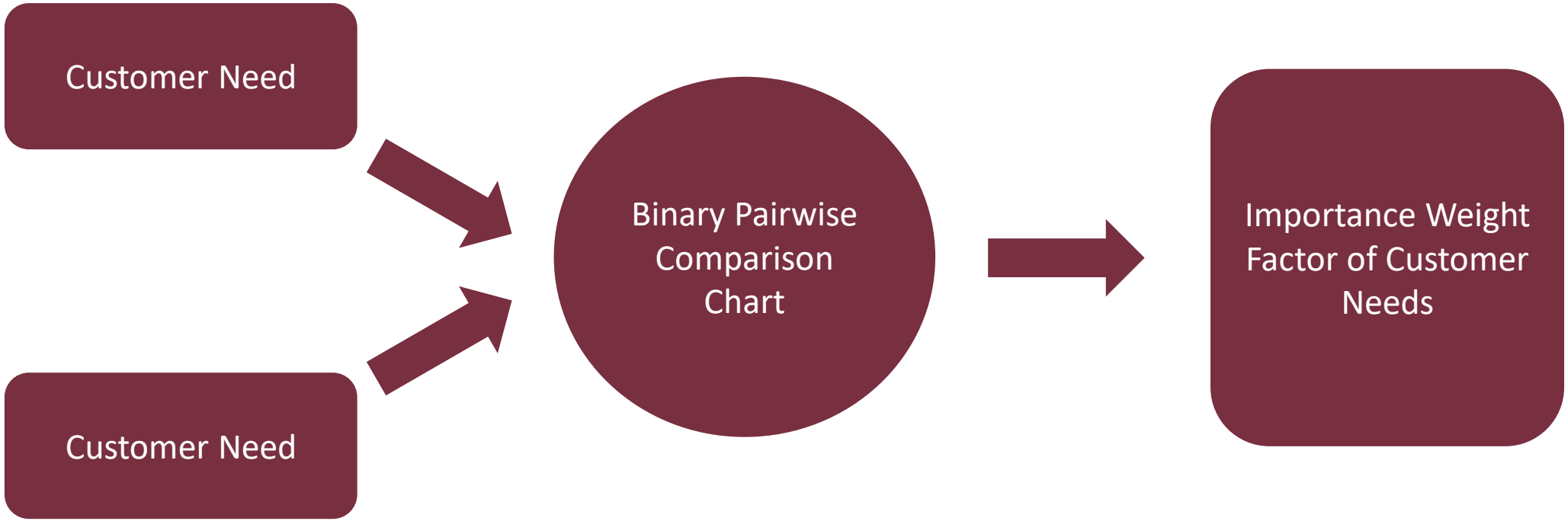
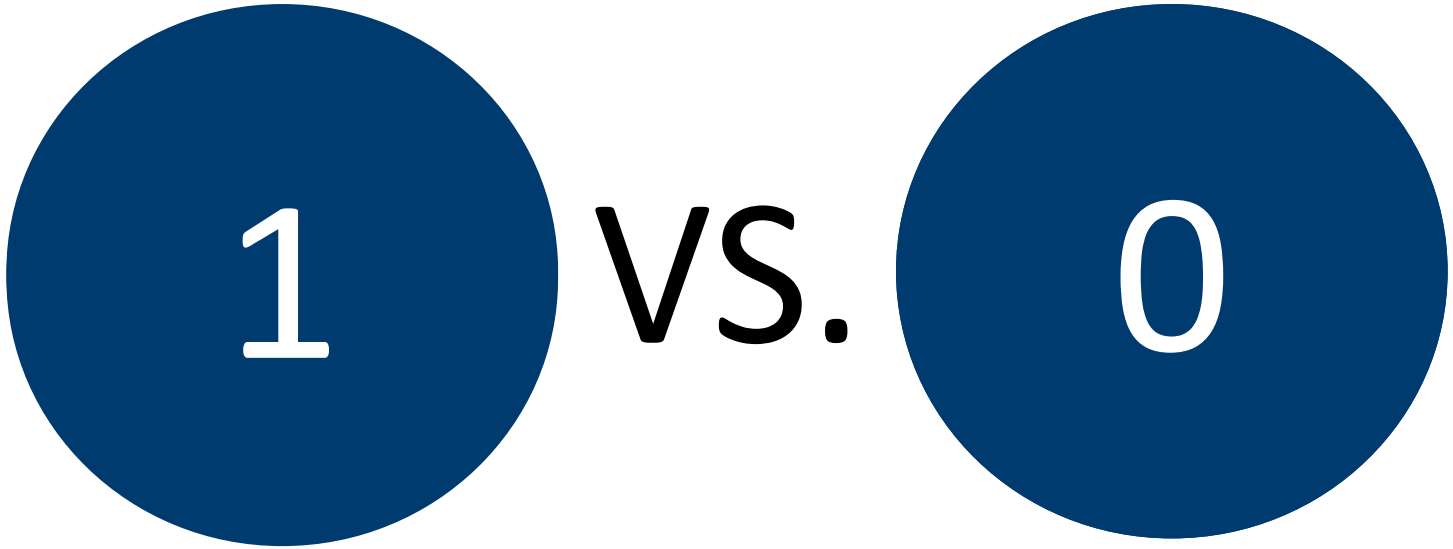
Concept Selection

Binary Pairwise Comparison



Binary Pairwise Comparison



Binary Pairwise Comparison

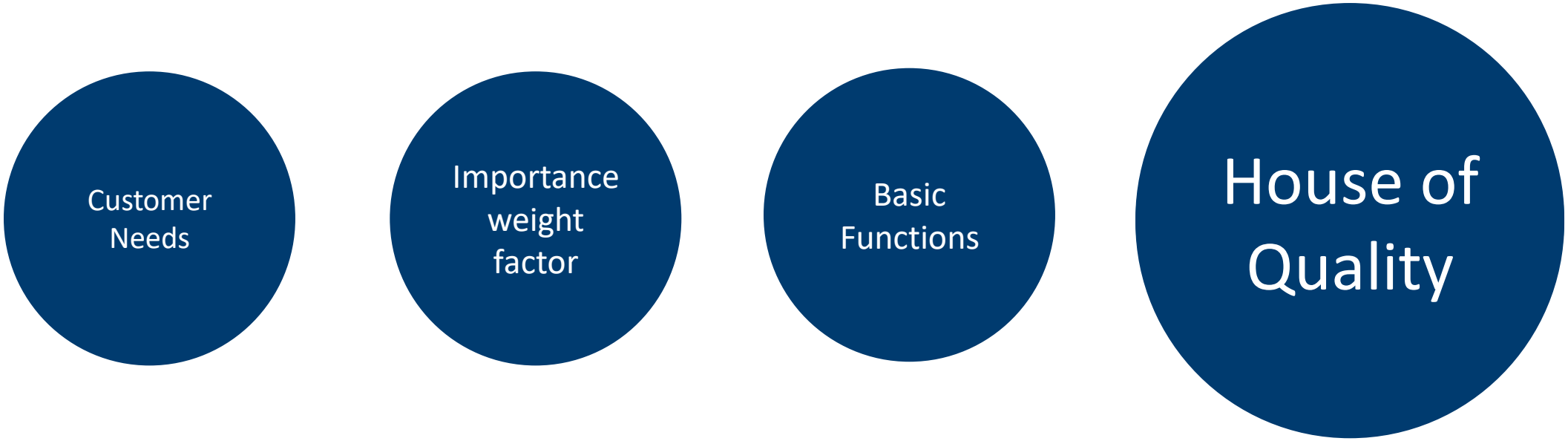
1
- Place pallet topper with foam
- Remove pallet topper with foam

2
- Lifts over the weight of pallet topper
- Does not interfere with current robot

3
- Communicates with Corning's current system

4
- Match the current time of human interaction
- Operates without damaging pieces

House of Quality



House of Quality Results

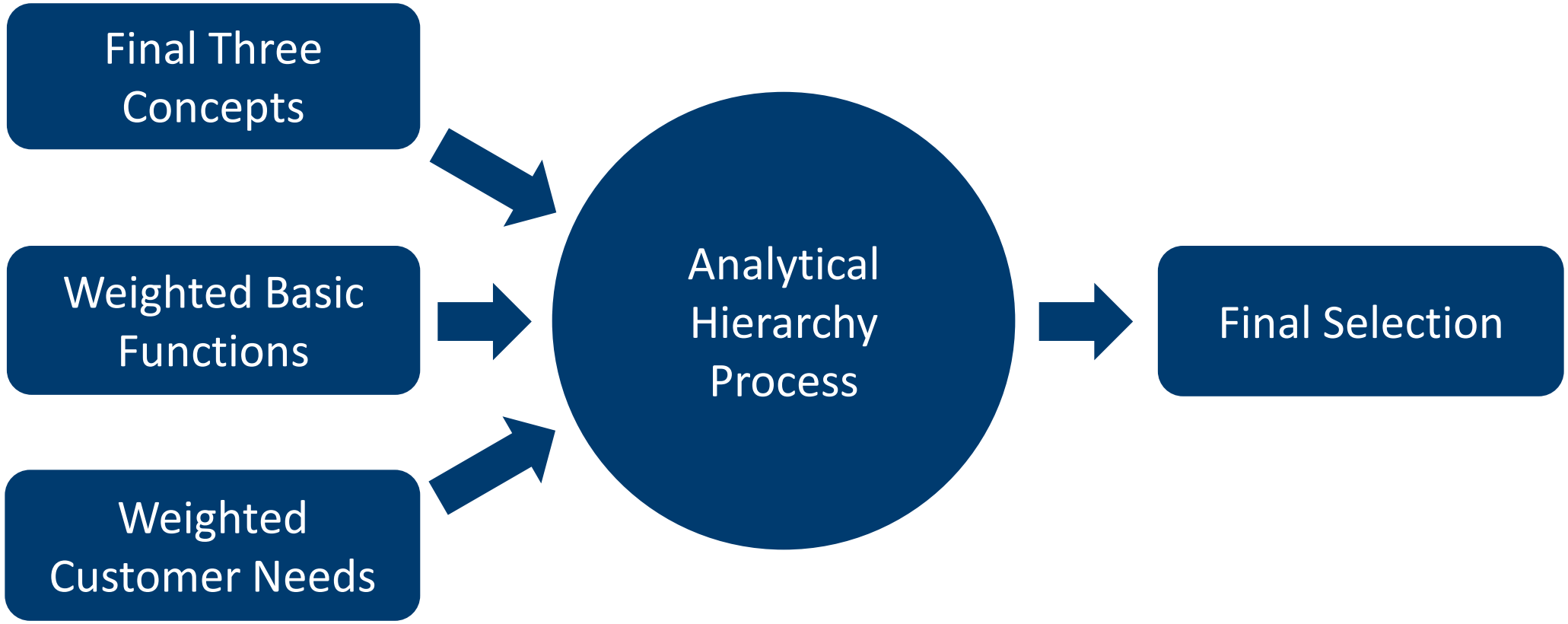
1	Collects Topper/Foam	(28.47%)
2	Releases Topper/Foam	(28.47%)
3	Carries Load	(28.47%)
4	Maintains Stability	(20.34%)
5	Locates Pallet	(15.93%)

Pugh Chart

Vacuum on R2000

- Long hook clamp
- Rack and Pinion
- Spider Claw
- Vacuum on M710ic
- Pinch Stacker
- Vacuum on R2000
- Hexagonal Cell Tool
- Piston Side Clamp

Analytical Hierarchy Process



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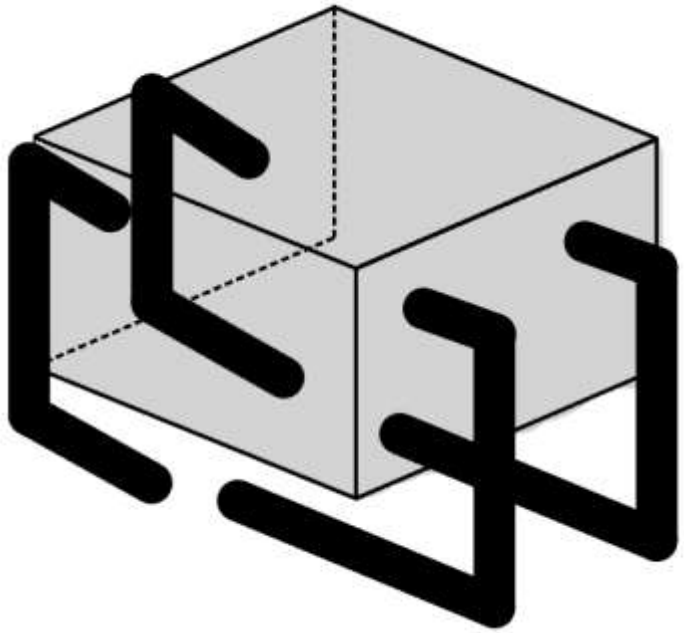
Final Selection



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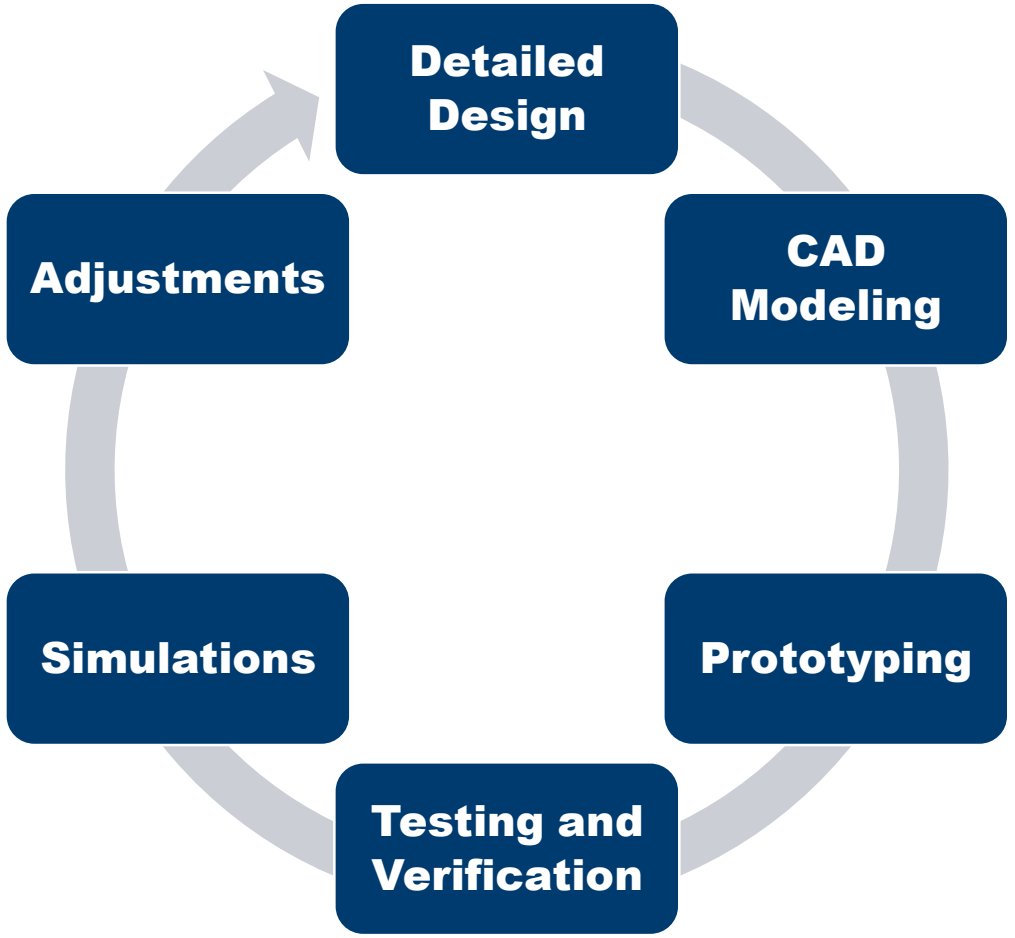
Future Work



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