Attraction Ambassadors: Door Jig

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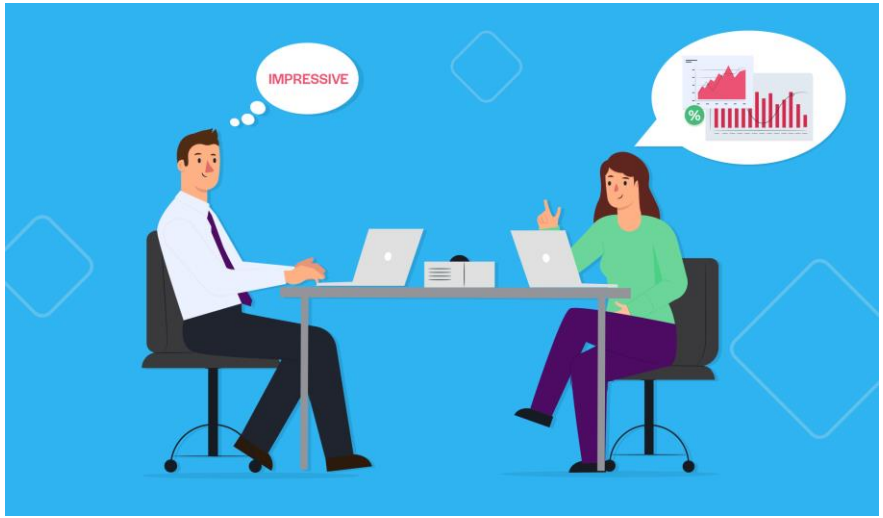
Design Thinking

Empathize

Client meetings



- Understand needs and expectations
- Feedback and iteration.
- Prioritizing features
- Resource optimization

Market research

- Understand user needs
- Risk reduction
- Competitive analysis
- Validating concept

Take-Aways From Client Meet

Briefing

High Priority Issues	• Jig is re-useable • Jig is easily useable and requires little to no set-up time (time efficient) • Jig is adjustable to be adaptable to the different back sets and thicknesses • Jig should be very precise/accurate

Define

Problem statement

"The objective is to develop a more efficient and cost-effective jig that improves production line adaptability and reduces setup times and material cost."

Specification chart/metrics chart

Cutout Height	6-¾”
Cutout Width	1”
Cutout Backset	Varies. Although should be equal on both sides of the cutout since it is centered.

Jig Setup Speed Requirement

Clamping on	Should be able to clamp on easily ~ < 30 seconds
Alignment	Alignment process should be simple ~< 1 minute

Ideate

Initial Subsystems

- Weight
  - compact and manageable
- Storage Space
  - convenience
- Practicality
  - Simple and easy to use
- Reusability
  - durability

Johnny Vu

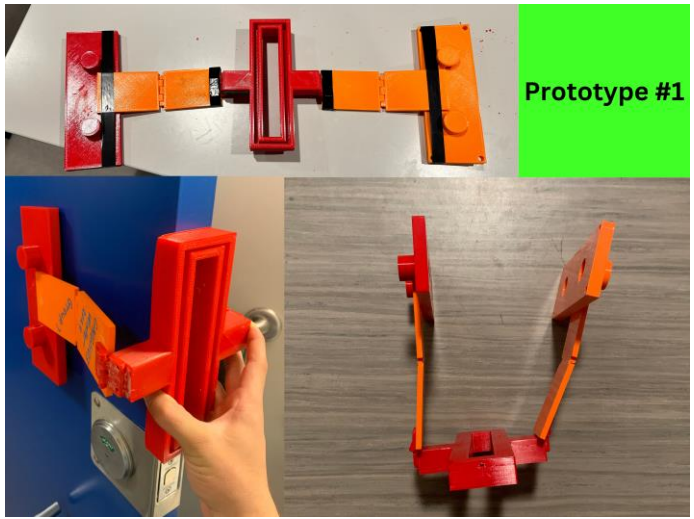
	Subsystem	Weight of Jig	Storage Space	Practicality	Reusability
Conceptual Design Ideas	/				
	/	Lightweight Materials	Foldable Design	Quick attachment method	Durable Materials
	/	Modular Design	Wall Mounted Storage	Colour Coded Components	Reinforced Critical Joints
	/	Removable Counterweights	Minimize Required Parts	Cutout accomodating all tools	Design With Easiy Replaceable Parts
	/	Minimized Volume	Hook Mount System	Clear marking and guides	Universal to all Doors
	/	Evenly Distributed Weight	Nested Storage System	Self Centering	

Prototype

Prototype Subsystems Considered

- Weight
- Storage Space
- Practicality
- Reusability
- Magnet Strength

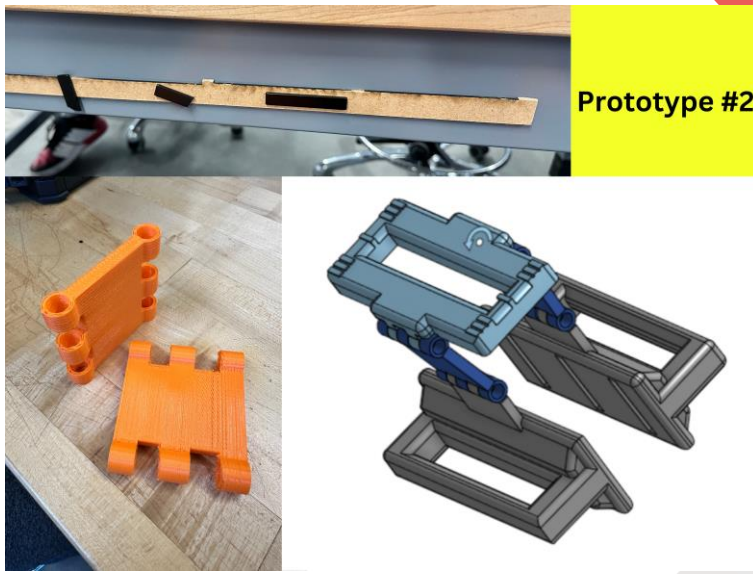
Prototype One



- Comprehensive Prototype
- Directed towards **practicality** and **reusability**
- **Targets:**
  - Test basic structure functionality
  - Structural integrity

Prototype Two

- Specific Prototype
- **Primarily focusing on magnet strength**
- Included structural design updates based off prototype 1
- Time constraint, switched from electromagnet to neodymium
- **Target:**
  - Determine if magnets strong enough for a 3/32" wooden veneer



Prototype Three

- Comprehensive prototype
- Focus on practicality, reusability, storage space, and weight **after design changes**
- Targets:
  - Ensure **centering method works**
  - Ensure hinges allow for **flat surface connection** between magnet and door
  - Ensure handle design allows for **hanging storage method**
  - Colour matching of parts

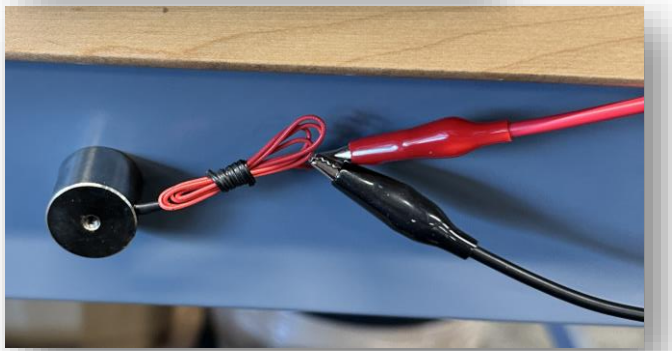
Testing

Magnet Testing

9V – 50 N Electric Lifting Magnet

Pros
- Overall size: 25 x 20 mm
- $ 13.49 + tax

Cons
- Lack of penetrability through 1/8” MDF



Magnet Testing

12V – 400 N Electric Lifting Magnet

Pros

- Can penetrate through 1/8” of MDF

Cons

- $ 17.99 + tax
- Overall size: 49 x 22 mm

Magnet Testing

Neodymium Bar Magnets

Pros
- Can **penetrate through 1/8” of MDF**
- Replaces the wiring through the jig

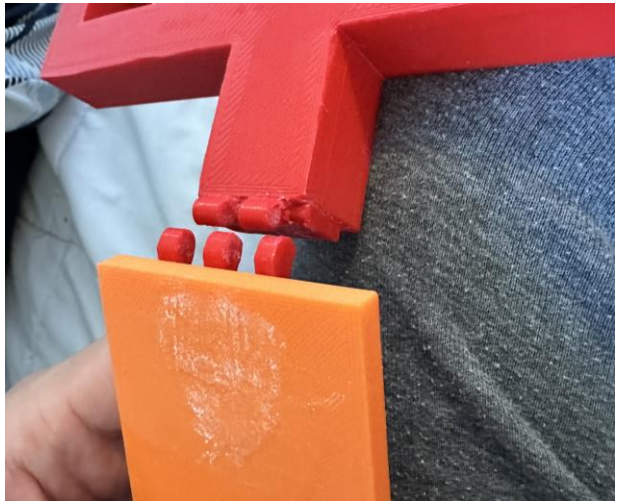
Cons
- Needs to be handled with care

Hinge Testing

3D Printed PLA Hinges (Friction fit)

Pros
- Prints **in place**, easy to manufacture

Cons
- Not securely mounted onto the rest of the components
- Friction fit wears out
- Each layer was difficult to print



Hinge Testing

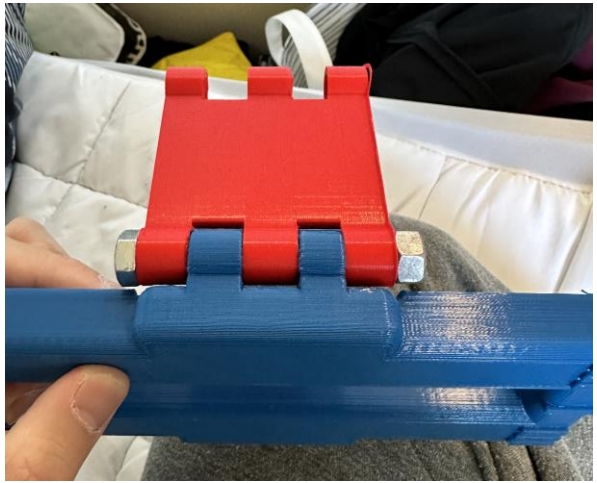
Hinges (Bolt + Nut)

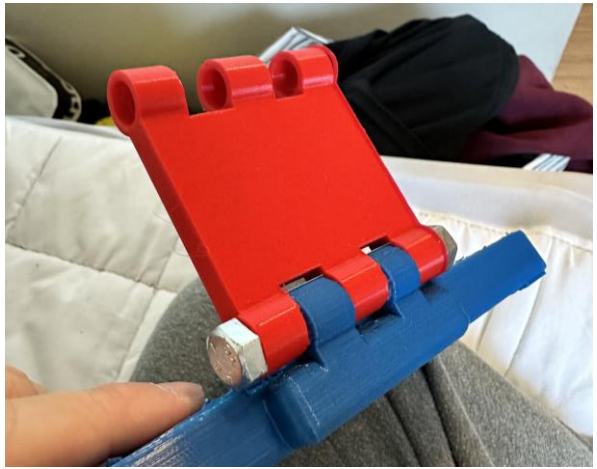
Pros

- Moving parts will **not wear out by friction**
- Can be **disassembled** in the event of a component needing repair
- 100% infill makes the component sturdy

Cons

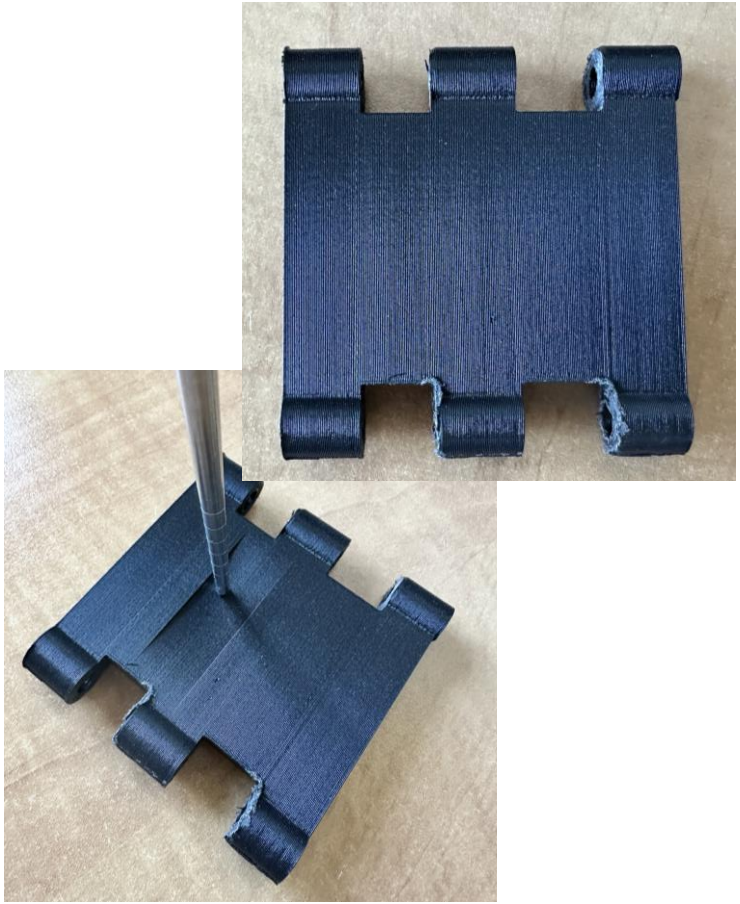
- Getting the hinge to move when first printed requires an adequate amount of force





Infill Testing

Hinge Midpiece (Lightning infill pattern)



Pros

- Printing **time was reduced**, even at 100% infill

Cons

- Sections that did not have the hinge were hollow
- Would not survive day-to-day wear and tear

Infill Testing

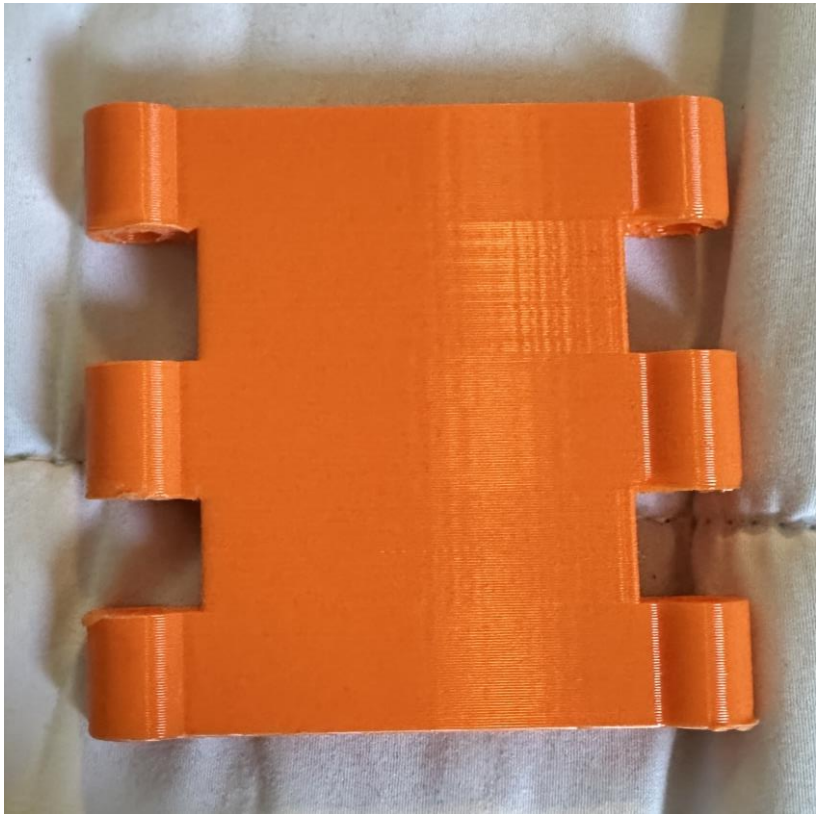
Hinge Midpiece (Grid infill pattern)

Pros

- **Solid** and higher quality
- Won’t break when pressing into it

Cons

- Longer print time
- More filament used



02

Bill of Materials

Subtotal	$ 47.98
Total	**$ 54.22 (incl. tax)**

03

Market Research

RYOBI Door Hinge Template

Pros:

- **Lightweight, accurate design**
- Has **rubber grips** to allow for friction to be evident when clamped against the side of a door

Cons:

- Breaks easily when the side of a drill bit hits the jig
- Clamping rod damages door due to the clamp design
- $41.58

MILWAUKEE TOOL Door Lock Installation Jig

Pros:

- **Lightweight, accurate** design
- Allows for **hole size adjustment**

Cons:

- Clamp is known to fail due to only clamping on one side
- To use safely, the jig only works when additional clamps added to the jig
- $56.48

04

Issues

Pricing Issues

Magnets

Issue

- Initial Magnets were too expensive
- Most of the full cost of our prototypes were the magnets
- Considered making our own electromagnets

Fix

- Professor Majeed provided cheap magnets
- He also provided a place that sells cheap magnets

Time

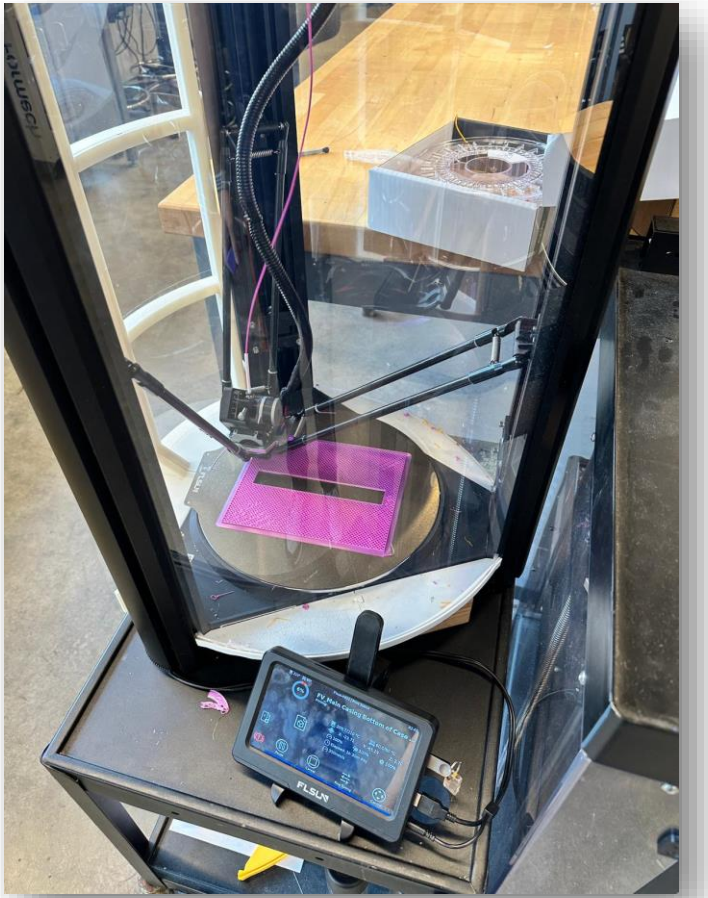
Printing and 3D Modeling

Issue

- Ideas and making the model
- Printing takes a considerable amount of time
- Print Fails

Fix

- Reserve more time into making the model
- Keep an eye on the printers
- Book more printers



05

Lessons Learned

Lessons Learned

- Iterative Design Process
- Importance of Collaboration
- Testing and Validation
- Adaptability to changes

06

Summary

- Attended **client meetings** with AMBICO
- Developed a **problem statement** based of client needs
- Developed a **unique but efficient design** that satisfied all the user needs and provided a solution to the problem statement using the design process

Questions?

Thank you!

Scan to see more behind the scenes photos from our group

bit.ly/gng1103testing