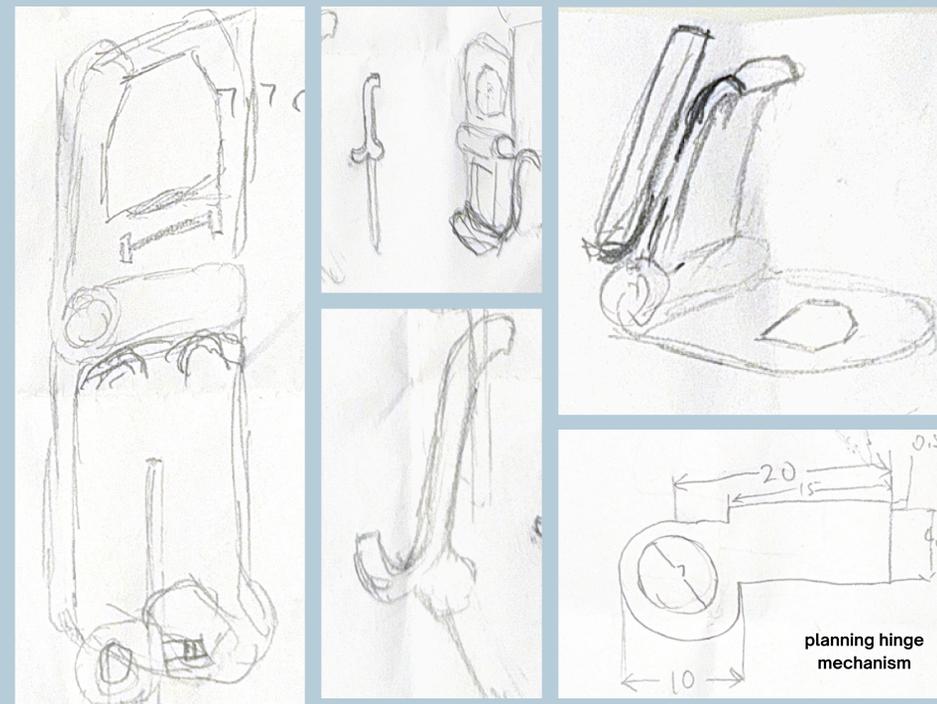


# DESIGN FOR ADDITIVE MANUFACTURING

## Opportunistic DfAM

### DESIGN CONCEPT SELECTION

Going through the qualities of the existing product and the expectations from the redesign, one personal goal of this challenge was to design something that would be very useful to after this challenge was over, which is “incorporating one additional beneficial function not seen in the original design”. The decision was to add a phone stand feature which keeps the phone as vertical as possible as most phone holders tend to keep the phone slanted as at an angle.

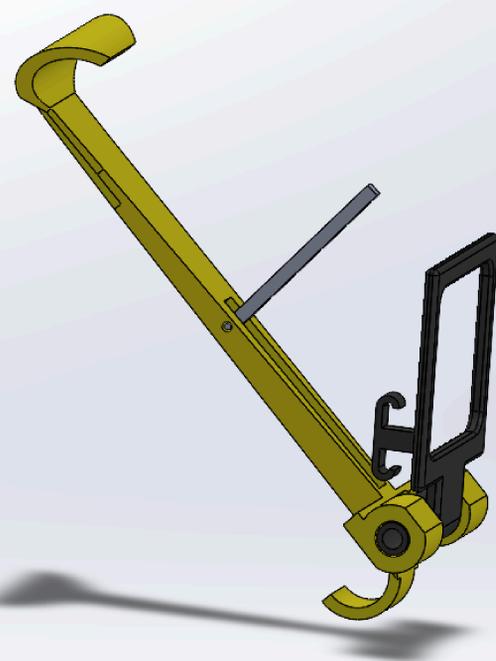


### REDESIGN

The redesign was inspired by an existing product which holds the phone to the outlet and also acts as the phone holder. Considering that there are two different hinges, the goal was to reduce that to one and with a bigger goal of reducing the amount of material used. Yet maintaining all the desired functions. i.e. i) to decrease the part count to one (so the whole structure prints as one piece) and ii) to decrease the consumed print material (both build and support) as much as possible while still ensuring that the product can perform all of its intended functions (i.e., attaching to the outlet, securely holding the phone, and organizing the charging cable).

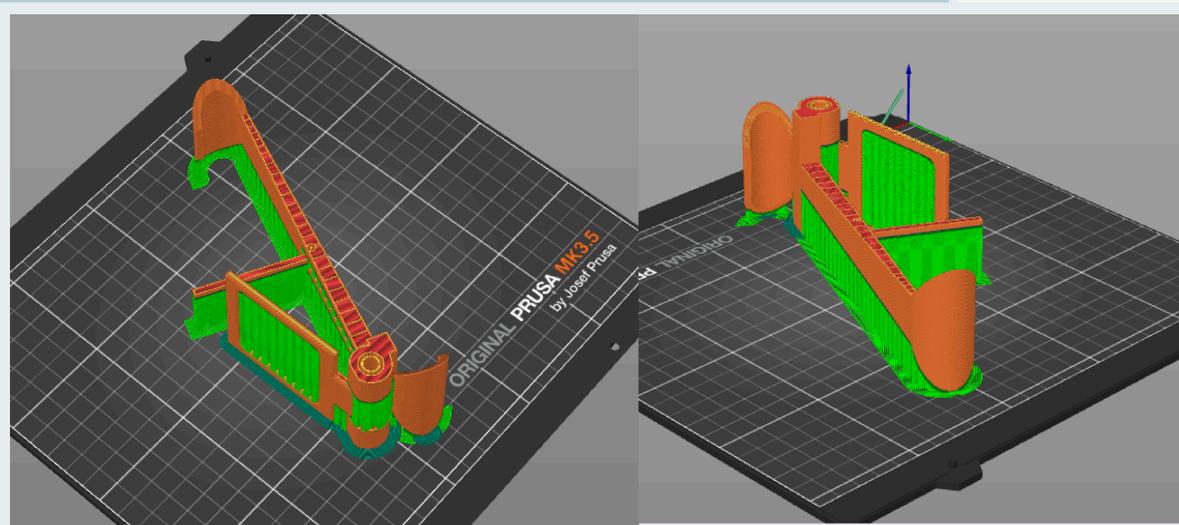


In creating this design, one the main challenges was figuring out the positioning of phone rests when the phone is in different modes, charging, or acting as a conventional phone stand. Another anticipated problem was the hinge wearing out due to friction, so, a helper stand was made to accommodate and wear suffered from friction which was discovered after a certain iteration of printing. Also, I was looking to reduce material use as much as possible by sliming down the phone holder connector to its rest base and also shaping the rest base to somewhat like an oval.



### PRINT ORIENTATION

When building the product, the print orientation selected was to have it printed on the side. One of these is because there are a lot of circles that needed to be printed, and printing them that way helps those features come out better. Also, the hinges used were designed to have an assembly clearance right from the build plate since it had to be printed in one piece.



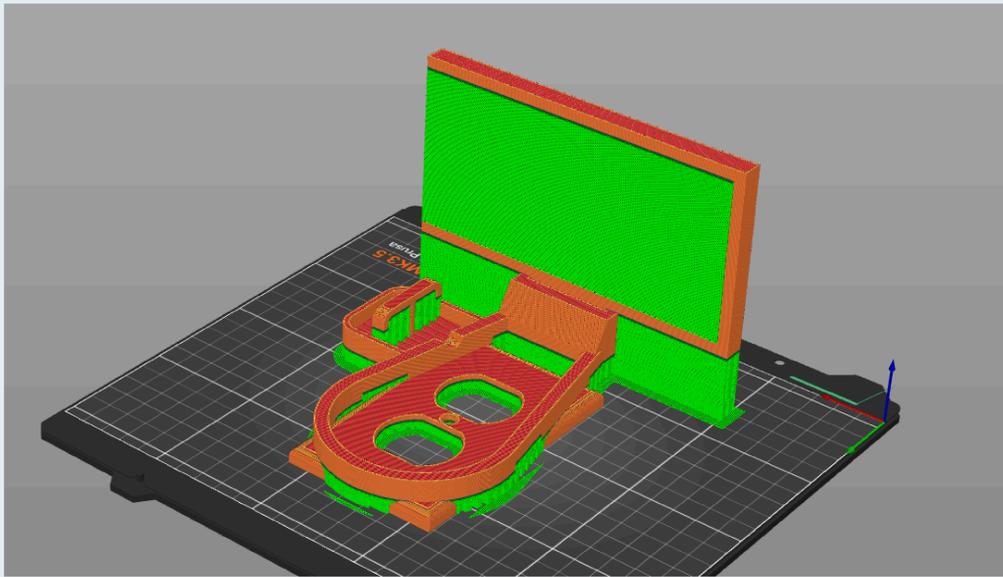
# DESIGN FOR ADDITIVE MANUFACTURING

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### COMPARISON WITH SAMPLE DESIGN GIVEN

Comparing to the sample test piece that was provided, printing in its best orientation (the orientation that used up less material) used 122.66grams of filament and a total of 4h 24m minutes. With the same print slicing settings for the redesigned model made, the total print time was 2h 13m with a total of 36.69grams of material used to make the part.

One part that I realized could be improved after the final design was made to take advantage of opportunistic DfAM was to make the support pin a part that goes throughout the main support stand rather than just a small piece of it. This part was made to stick out for easy support material removal, even though it ended up using more support when it was made to stick out.



**Info**  
Size: 6.00 x 6.02 x 4.42 Volume: 7.72   
Facets: 1784 (4 shells)  
No errors detected

**Sliced Info**

Used Filament (g)	122.66
Used Filament (in)	1619.17
Used Filament (in <sup>3</sup> )	6.04
Cost	3.12

Estimated printing time:

- normal mode 4h24m
- stealth mode 4h38m

### SAMPLE DESIGN SPECIMEN



**Info**  
Size: 3.56 x 7.23 x 2.36 Volume: 3.19   
Facets: 6146 (4 shells)  
No errors detected

**Sliced Info**

Used Filament (g)	36.65
Used Filament (in)	483.75
Used Filament (in <sup>3</sup> )	1.80
Cost	0.93

Estimated printing time:

- normal mode 2h12m
- stealth mode 2h22m

### REDESIGNED SPECIMEN

### CHALLENGES AND CONCLUSION

One of the main challenges was cleaning out support material and getting moving parts to actually move without breaking the product. To overcome a failed test print was carefully worked on to know how to clear all support materials and actually get moving parts to move. Auto-generated supports were not generated to support the phone rest sides on the build plate, which actually led me to learn to use the paint on supports feature on the slicing software. All in all, it was a great challenge which led me to apply minimum assembly clearance principle used in design challenge

