

# A Pandemic| Rapid Response Needed|3D Printing

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## Introduction

We are passing through a pandemic because of coronavirus disease 2019 (COVID-19). Till the date, almost 3 millions of people has died because of it. Due to sudden increase of high numbers of patients and the supply chain disruptions, a shortage has created of medical devices and Personal Protective Equipment (PPE). Additive manufacturing specifically 3D printing is a breakthrough solution to fight against this crisis as it can build required equipment fast. Several devices such as face masks, face shields, valves, nasopharyngeal swabs etc. can be made using 3D printing.

## Methods

According to ISO/ASTM 52900 standard, additive manufacturing is a method of assembling materials to create parts from 3D model data, layer upon layer, as opposed to subtractive manufacturing and formative manufacturing methodologies. The 3D printing terminology commonly used with machines that are low end in price and/or capability [1].

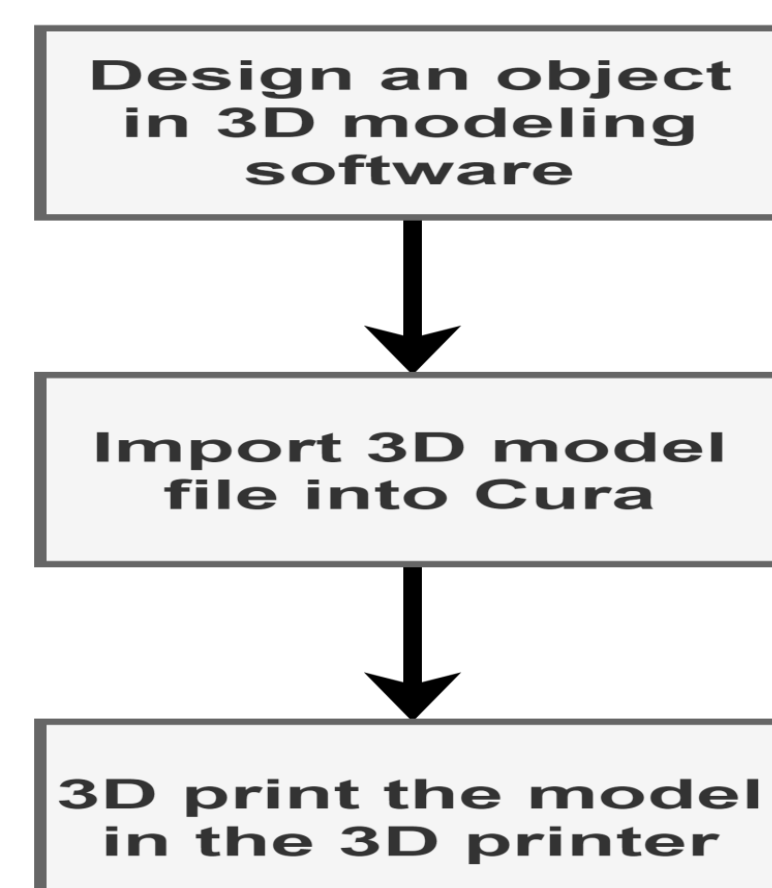


Figure 1: 3D printing method

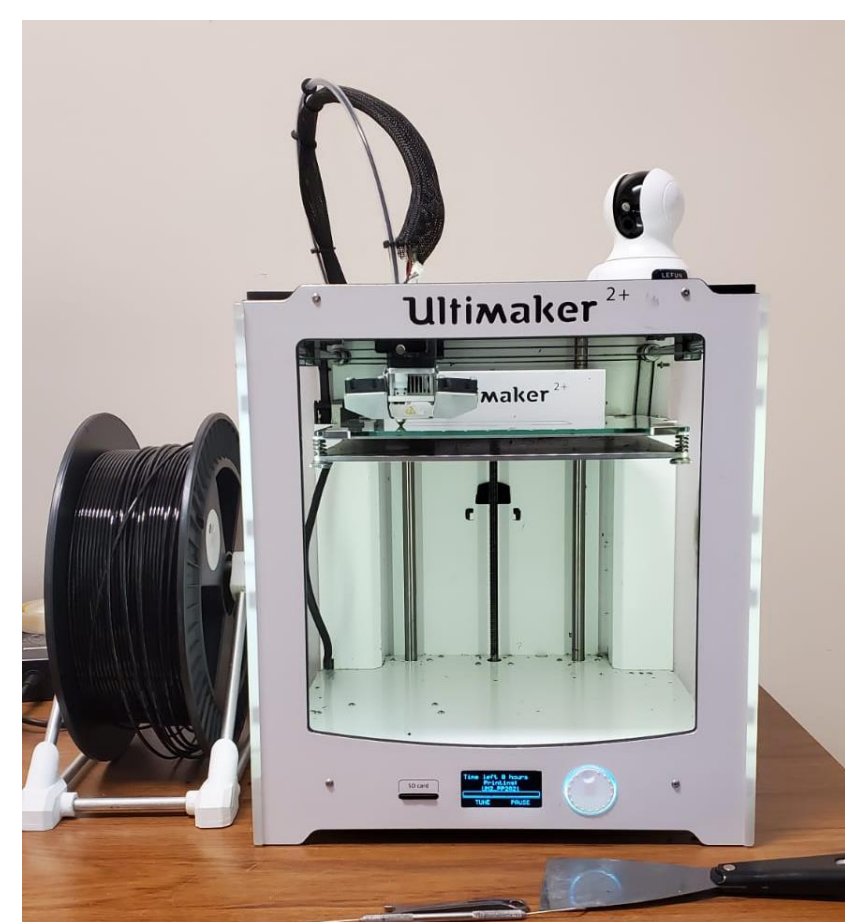


Figure 2: Ultimaker 2+ 3D printer

## 3D Printed PPE Printed in the Lab



Figure 3: Prototype of 3D printed face shield in the lab. Transparent material for face portion should be used for practical use



Figure 4: Prototype of 3D printed face shield band. A plastic cover can be attached with it for the extended portion



Figure 5: 3D printed face mask

## Market Availability



Figure 6: 3D printed oxygen PEEP mask developed by Materialise [2]



Figure 7: 3D printed mask by HP [3]



Figure 8: 3D printed face shield developed by Prusa3D [4]

## Challenges

### 1. Materials

- Selection of a suitable binder
- Poor mechanical properties
- Distribution of sizes
- Limited choices of materials
- Texture and color similarity

### 2. Printers

- Low dimensional accuracy
- Nozzle size
- Powder agglomeration limitation

### 3. Management

- High priced products
- Re-education of staff
- Size of the business
- Lack of guidelines
- Software development and capabilities
- Cyber security issues

## Opportunities Ahead

3D printing is not only beneficial to fight against COVID-19 pandemic but also highly effective in other medical uses such as:

1. Patient specific surgical models/ PPE
2. Fast and durable
3. New medical devices and instruments
4. Affordable Prostheses
5. Corrective Insoles and Orthoses
6. Bioprinting, Tissue Engineering, 3D Printed Organs and Beyond

## Literature cited

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## For further information

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