

## **fab**foundation

FAB LAB MANUFACTURING COVID-19 SURVEY JUNE 2020

## RESULTS

In early May, 2020, The Fab Foundation surveyed 65 fab labs and makerspaces, all Fab Academy or Fabricademy distributed education host sites, to help us begin to understand and document some of the Fab Lab Network's response to COVID-19. We wanted to better understand what was being produced, how it was being produced, who was it being produced for, and what challenges fab labs and makerspaces faced in Personal Protective Equipment (PPE) production. Our goal is to use this information to help connect labs to resources, to connect to communities in need of supplies and PPE, to help labs get paid for their work for long term sustainability, and to help build the connections between us that will rebuild the economy after the pandemic.



Worldwide presence of COVID-19 Response from the Fab Lab Network.

These are the results of that first survey. We will be expanding this survey to include the larger fab lab and makerspace communities in the months to come, in an effort to support a future in which we are all locally productive and sustainable, while globally connected, sharing best practices. There were a total of 42 responses from the community. The map above visualizes the countries where surveyed fab labs and makerspaces participated in the COVID-19 response.

#### LIST OF FAB LABS

- » Aegean Idea Lab
- » AgriLab
- » Anonymus (x2)
- » Artisan's Asylum
- » BSDU FabLab
- » CIT Fab Lab Universidad de Lima
- » Deusto FabLab
- » Dilijan Fab Lab
- » echofab
- » Fab Lab Aachen
- » Fab Lab Aldeias do Xisto
- » Fab Lab Chandigarh
- » Fab Lab Dhaka
- » Fab Lab ESAN
- » Fab Lab León
- » Fab Lab Madrid CEU
- » Fab Lab Oulu
- » Fab Lab Puebla
- » Fab Lab Recife
- » Fab Lab Rwanda
- » Fab Lab Tulsa
- » Fab Lab UCAL
- » Fab Lab UTEC
- » Fab LaT
- » Fab@CIC
- » FabLab 3dtoy
- » FabLab Irbid
- » FabLab Kamakura
- » Fablab O Shanghai
- » FabLab Powered by Orange
- » Fablab Puebla
- » Fablab Taipei
- » FabLab Vancouver
- » Fundación FabLab Córdoba
- » Impossible Objects\*
- » KromLabòro CasertaFabLab
- » Lena Park Fab Lab
- » Olabi
- » OpenDot
- » Shenzhen Open Innovation Lab
- » Vigyan ashram Fablab





Number of Fab Labs per country that participated in the survey



\*3D printer and materials company

#### FAB LAB STATUS

While the Pandemic has caused many Fab Labs to close temporarily, some have found a way to stay open, many partially open, so they can fabricate and distribute PPE within their local communities





61.9% of the Fab Labs that responded to the survey are designing, propotyping and distributing PPE. Most of these labs started by supporting local hospitals, March 2020, and shifted their focus to include other local organizations in need by May 2020.



#### **NETWORK RESPONSE TO COVID-19**

#### NEEDS, FAB LAB SUPPORT AND ACTION

Below you will find the Personal Protective Equipment (PPE) that Fab Labs are currently making during Covid-19 (in red) and the interest shown by Fab Labs to produce other types of medical supplies (in black)



Fab Labs are also manufacturing ear savers, door stops and door handles, intubation boxes, PAPR and more. **All other needs globally include:** Biohazard Bags - N-95 Masks - Shrouds - Gowns - Gloves - Hospital Beds - Elastomeric Respirator - Powered Air Purifying Respirator (PAPR) - Powered Air Purifying Respirator (PAPR) Visors - Pulse Oximeter - Tyvek Coveralls with Hoods - Tyvek Hoods - Tyvek Sleeves - Tyvek Suits - Protective Eyewear - Face Shields - Shoe Covers - Surgical Caps - Hand Sanitizer - Specimen Transport Bag - Metered Dose Inhalers - Ventilators - Ventilator Supplies - Tubing Sets - Humidifiers - Endotracheal Tubes - Testing & Diagnostics -FDA-Approved Swab Kits - FDA-Approved Transport Media - FDA-Approved Sample extraction (EUA) - FDA-Approved PCR Tests (EUA)

#### FAB LAB PRODUCTS IN RESPONSE TO COVID-19

28 labs gave us more specific information about the PPE and medical supples that they are making. There were a total of 43 products described in detail, hence many labs are making more than one product.



As of May 2020, Fab Labs have manufactured a total of ~108,600 products, all PPE combined.

#### SPECIFICS OF OVERALL PRODUCTS

#### APPROVED DESIGNS

27 of the 43 products made by Fab Labs were approved or medically reviewed by an agency or organization. This includes:



22 Hospitals

#### SUPPLY CHAIN FOR FAB LAB PRODUCTS



6 National

2 Local

6 Other\*

\*Including products from similar designs and fabrics being used by manufacturers that have been approved by national certifying organizations.

- » Direct access to state suppliers
- » Material is available locally
- » Multiple different companies supply materials to assemble
- » Materials are already available in the Fab Lab
- » Have to modify materials (and sometimes which machines to use) due to short supply
- » Hand off a model or mold to a company and they build it for us, for sale
- » High cost of some materials like Plexiglass makes it hard to find a reliable supply chain

#### PRODUCT DELIVERY

26 of the 28 Fab Labs that gave us specific information have already delivered products to organizations in their region.

#### PPE CONSUMER DELIVERY SYSTEM



29 Personal Delivery

19 Ground

2 Post Service

5 Consumer Pickup

31 Fab Labs had a very short production to delivery time frame, able to deliver the PPE in 1-3 days. 7 Fab Labs were able to deliver the PPE in 3-7 days, and 2 Fab Labs had a production to delivery time frame of 2 weeks.

#### ORGANIZATIONS RECIEVING PRODUCTS AND RECURRENCE

Specifically, labs are distributing PPE to hospitals, schools, nursing homes, doctors, dentists, restaurants, NGO's, homeless shelters, disability services organizations, army, police stations, ministry of healthcare, and city hall employees.



#### MATERIALS USED

Face shields: Acrylic, Cellulose acetate, PET plastic, polypropylene sheet, PETG shield, foam, elastic band, Styrene board, Plexiglass

Some Fab Labs weren't able to use the recommended materials for their products, the below graph shows how they adapted, based on their circumstances:





72% of all Fab Labs surveyed are suppling PPE for consumers for free, with only 51% of labs using a legal disclaimer for use of their products.

#### SANITATION AND STERILIZATION PROCEDURES

- » Product sterilized by the hospitals when they are received
- » Sterilization with bleach or alcohol and water before packaging
- » UV exposure and soap bath
- » Disinfect and sterilize machinery and molded parts before use
- » Provide disinfection instructions with product packaging
- » Sanitation protocol for the Fab Lab itself

#### QUALITY CONTROL STANDARDS

Fab Labs have relayed 4 basic quality control methods: visual evaluation, verbal/written feedback from users, using only certified materials and using ministry as a guide.









#### FEEDBACK INCORPORATION

- » Prototype, test, send to hospitals for another test, get feedback and make changes.
- » Get photos and feedback via email and SNS. It has been provided to dental, internal medicine, pediatrics, and sign language interpreters.
- » Discussion with the local authorities and the volunteer who deliver the face shield. Visit of the hospital and discussion with the "consumer".



#### STANDARDIZED PRODUCTION PROCEDURES

Fab Labs adapted as quick as possible to the COVID-19 Pandamic. Out of the Fab Labs that responded to the survey, 24 (55.8%) adapted to the new normal to fulfill the demand and 19 (44.2%) didn't change their regular production processes. In order to adapt, production line processes often had to change.

#### PRODUCTION CAPACITY INSIDE FAB LABS

Production capacity varies greatly within every lab and every PPE type, varying from 80 daily to 2000 daily, 200 weekly to 20,000 weekly, 100 monthly to 10,000 monthly.

#### MONTHLY PRODUCTION



The answers were quite varied even within the same product. We have to keep in mind the many factors that contribute toward production (equipment available, materials available, time availability, staff, volunteers, etc.)

EXAMPLE FACE SHIELD

# estimated production capacity from all fab labs 13,026 estimated production capacity from all fab labs



The monthly production rate of face shields ranged from **120 to 29,700** per Fab Lab. When you aggregate monthly production, the Fab Labs could together produce **195,400** face shields in a month. The average monthly production rate per lab is **13,026** face shields.

#### FAB LAB INTEREST IN A DISTRIBUTED GLOBAL COVID-19 RESPONSE

69.3% of the Fab Labs that responded to the survey are willing and interested in participating in a Distributed Global Covid-19 response. 75% of the Fab Labs that are NOT currently working on a Covid-19 response are willing to participate.





19 Fab Labs opt-in on making different design than the ones they are currently using:





Fab Labs are willing to share files, pictures, instructions, etc. of each of their design files.

## CONCLUSIONS

#### Α.

Local context is where the most of the work is happening, serving smaller, local organizations in need. Labs are opening just to make PPE, and delivering not just to hospitals but to many other local organizations in need, including nursing homes, police stations, schools, restaurants, etc. The labs are demonstrating very strong local resilience.

#### Β.

Most PPE produced in a fab lab is provided for free or for the cost of materials, and materials are coming from a variety of sources, some donated, some at a cost.

#### C.

Most PPE being designed and produced in a fab lab have local approval only, primarily from hospitals and healthcare professionals.

#### D.

Personal delivery is the most common form of delivery of PPE, showing that people are going out of their way to do what is necessary.

#### E.

The responding fab labs have already filled a large void between local needs and larger manufacturers' supply chains. A locally sourced, globally distributed manufacturing process could continue to fill an immensely important role in the months (and years) to come.



#### **DESIGN | PRODUCTION | EDITING**

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### **fab**foundation

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