The 3D Printing Revolution
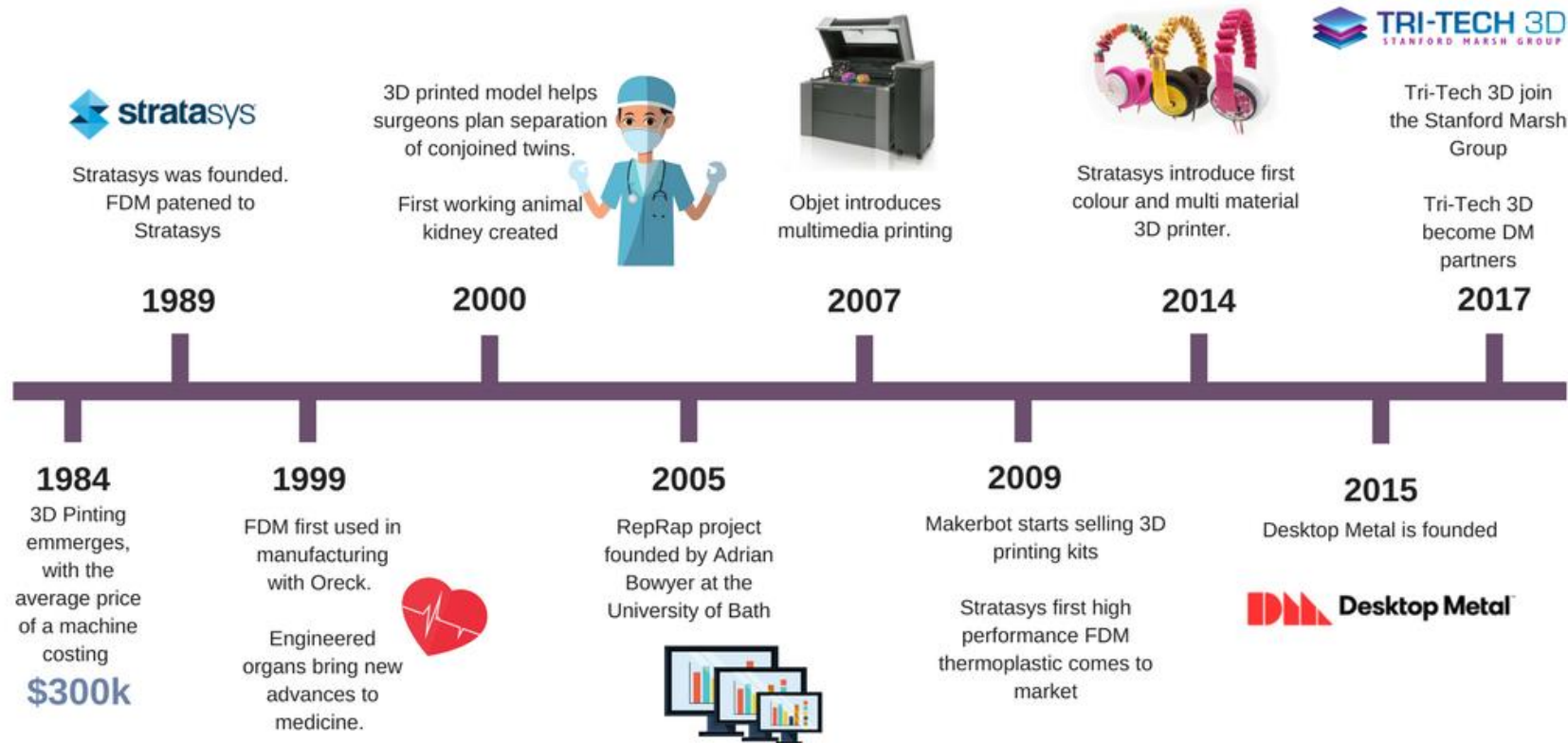
Presented by Wing Chan

Agenda

- History of 3D printing
- How 3D Printers Work?
- 3D Printing technologies
- Where Designs come from?
- Where to Find 3D Printers?
- 3D Printing Applications
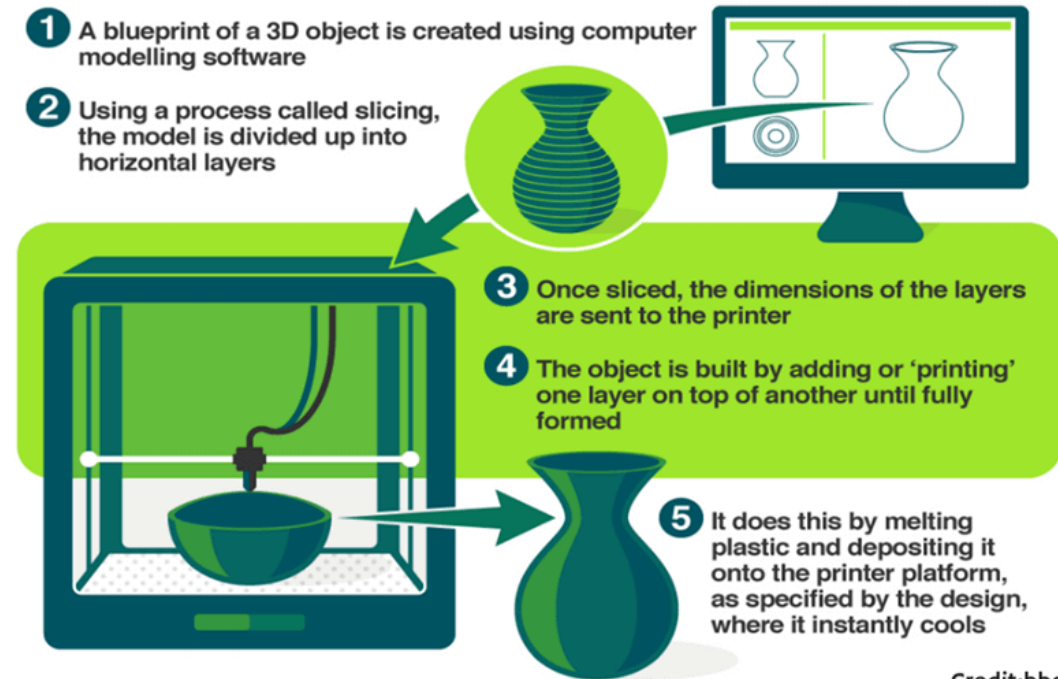- What is the future of 3D printing?

History of 3D Printing

stratasys

Stratasys was founded. FDM patened to Stratasys

3D printed model helps surgeons plan separation of conjoined twins.

First working animal kidney created

Objet introduces multimedia printing

Stratasys introduce first colour and multi material 3D printer.

TRI-TECH 3D
STANFORD MARSH GROUP

Tri-Tech 3D join the Stanford Marsh Group

Tri-Tech 3D become DM partners

1989

2000

2007

2014

2017

1984
3D Pinting emmerges, with the average price of a machine costing **$300k**

1999
FDM first used in manufacturing with Oreck.

Engineered organs bring new advances to medicine.

2005
RepRap project founded by Adrian Bowyer at the University of Bath

2009
Makerbot starts selling 3D printing kits

Stratasys first high performance FDM thermoplastic comes to market

2015
Desktop Metal is founded

Desktop Metal

How 3D Printing works?

- Additive manufacturing
- **Process**
  1. Creating 3D object model using software
  2. Printing using 3D printer
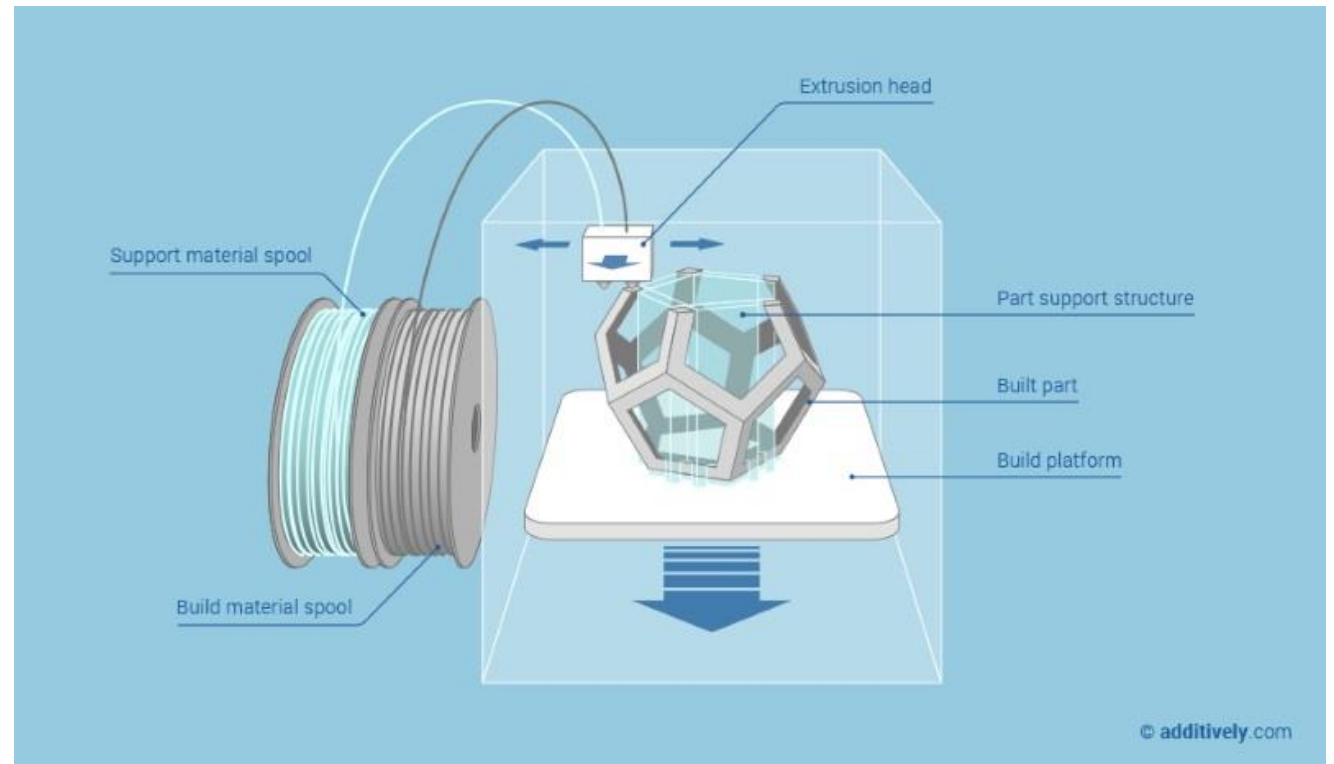 3. Finishing by human touch

3D Printing Basics

1. A blueprint of a 3D object is created using computer modelling software
2. Using a process called slicing, the model is divided up into horizontal layers
3. Once sliced, the dimensions of the layers are sent to the printer
4. The object is built by adding or 'printing' one layer on top of another until fully formed
5. It does this by melting plastic and depositing it onto the printer platform, as specified by the design, where it instantly cools

Credit:bbc.co.uk

3D printing technologies

- Fuse Deposition Modeling (FDM)
- Selective Laser Sintering (SLS)
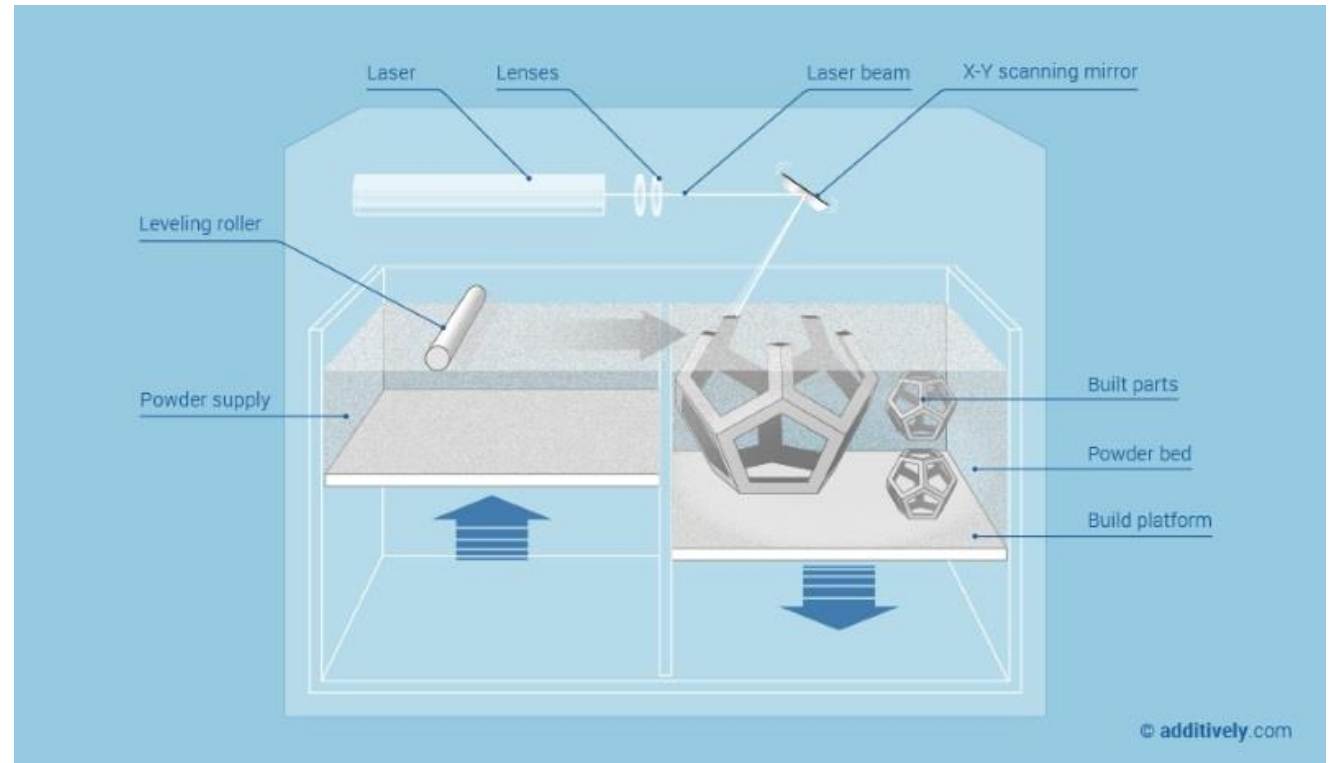- PolyJet printing
- Stereo Lithography (SLA)

Fuse Deposition Modeling (FDM)

- Raw material – Plastics

- Hot plastic flows out of a nozzle to create layers

- Each layer is deposited on top of the other to turn 2D layers into a 3D object.

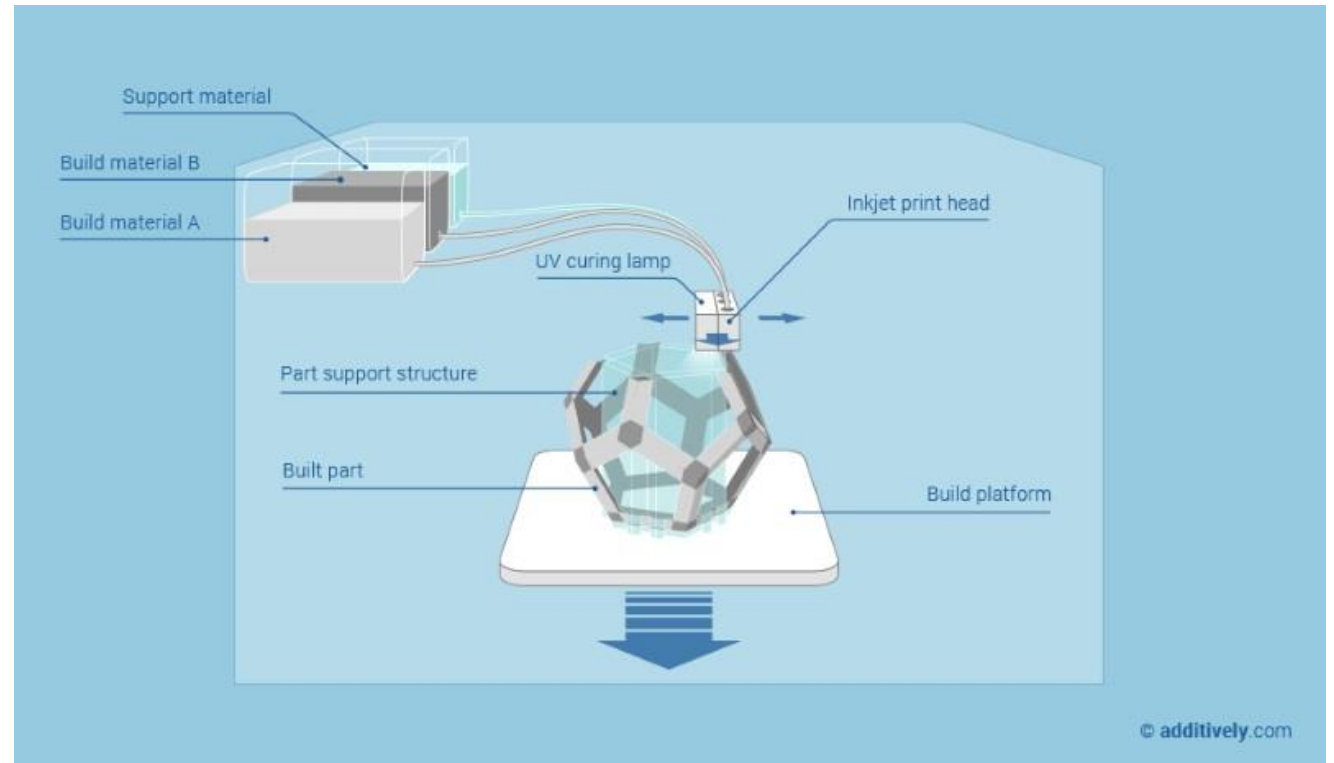- Support structure may be required

Extrusion head

Support material spool

Part support structure

Built part

Build platform

Build material spool

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Selective Laser Sintering (SLS)

- Raw material – Plastics, glass and metals such as aluminum

- In powder form

- A nozzle spays powder onto the printing surface

- The laser fuses the tiny particles layer by layer turning it into a solid from powder

- No support structure required

PolyJet Printing

- Raw material – Plastics
- In liquid form
- Work like Inkjet printer
- The thin layer of liquid material is hardened using UV light.
- Allows mixing multi-material or multi-color parts

Support material
Build material B
Build material A
Inkjet print head
UV curing lamp
Part support structure
Built part
Build platform

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Stereo Lithography (SLA)

- Raw material – Plastics

- Uses liquid resin

- The resin layer is hardened by UV laser which is the part you need while leaving the rest as liquid.

- Pro: Speed, fast prototyping

- Cons: Expensive
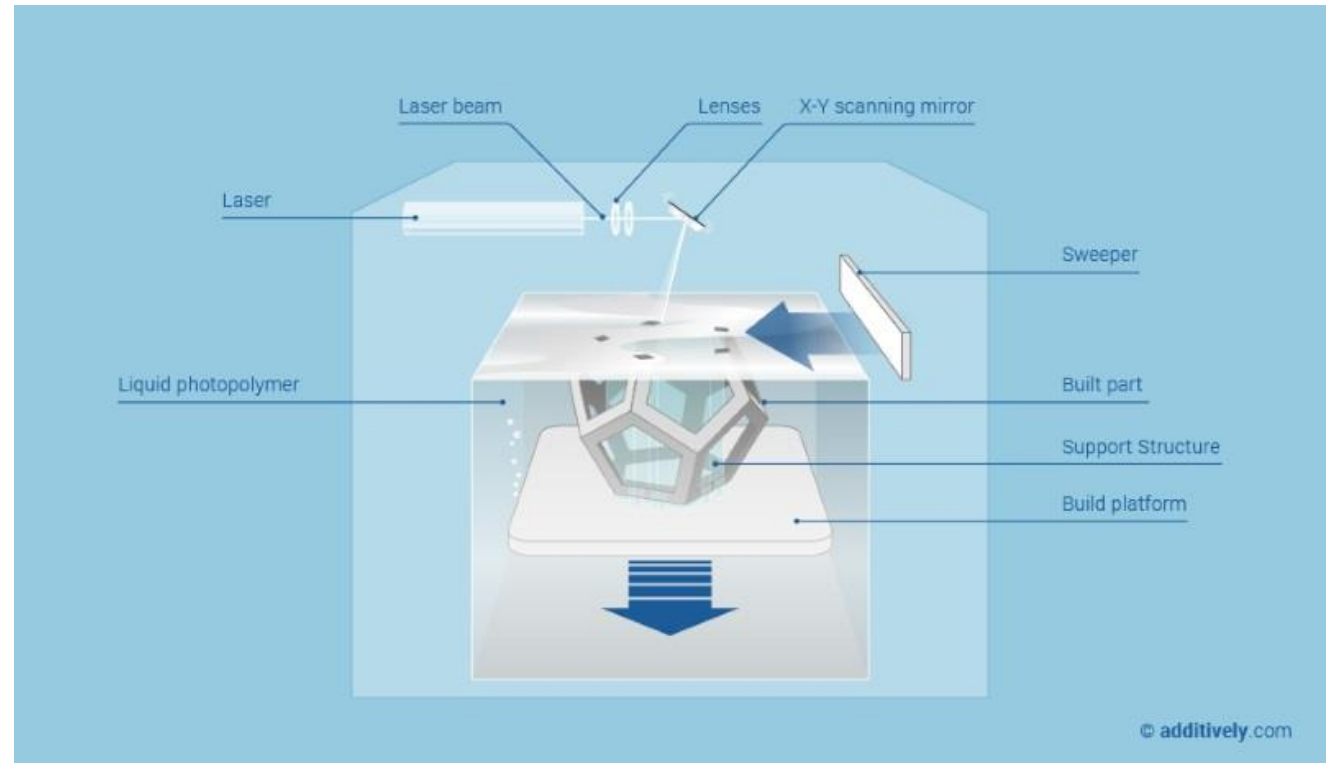
Where Designs come from?

- Download and modify from the existing design template
  - Thingiverse
  https://www.thingiverse.com/
- Create your own by using 3D printing software
  - Tinkercad by AutoDesk
  https://www.tinkercad.com/
  - Fusion 360 by AutoDesk
  https://www.autodesk.com/products/fusion-360/overview#banner
  - Cura Slicing Software by Ultimaker
  https://ultimaker.com/software/ultimaker-cura

Where to Find 3D printers?

- Local Services
  - FabLabs - https://www.fablabs.io/
  - Makerspace - https://dallasmakerspace.org/
  - UPS Stores - https://www.theupsstore.com/print/3d-printing
  - Check with your local libraries / university - https://www.plano.gov/2809/3D-Printing
- Online Services
  - 3D Hubs - https://3dhubs.com
  - Shapeways - https://www.shapeways.com/
- Buy your own 3D printers
  - Ultimaker - https://ultimaker.com/
  - Makerbot - https://www.makerbot.com/
  - Formlabs - https://formlabs.com/

3D Printing Applications

- Creations
- Substitutes
- Solutions
- Replacements
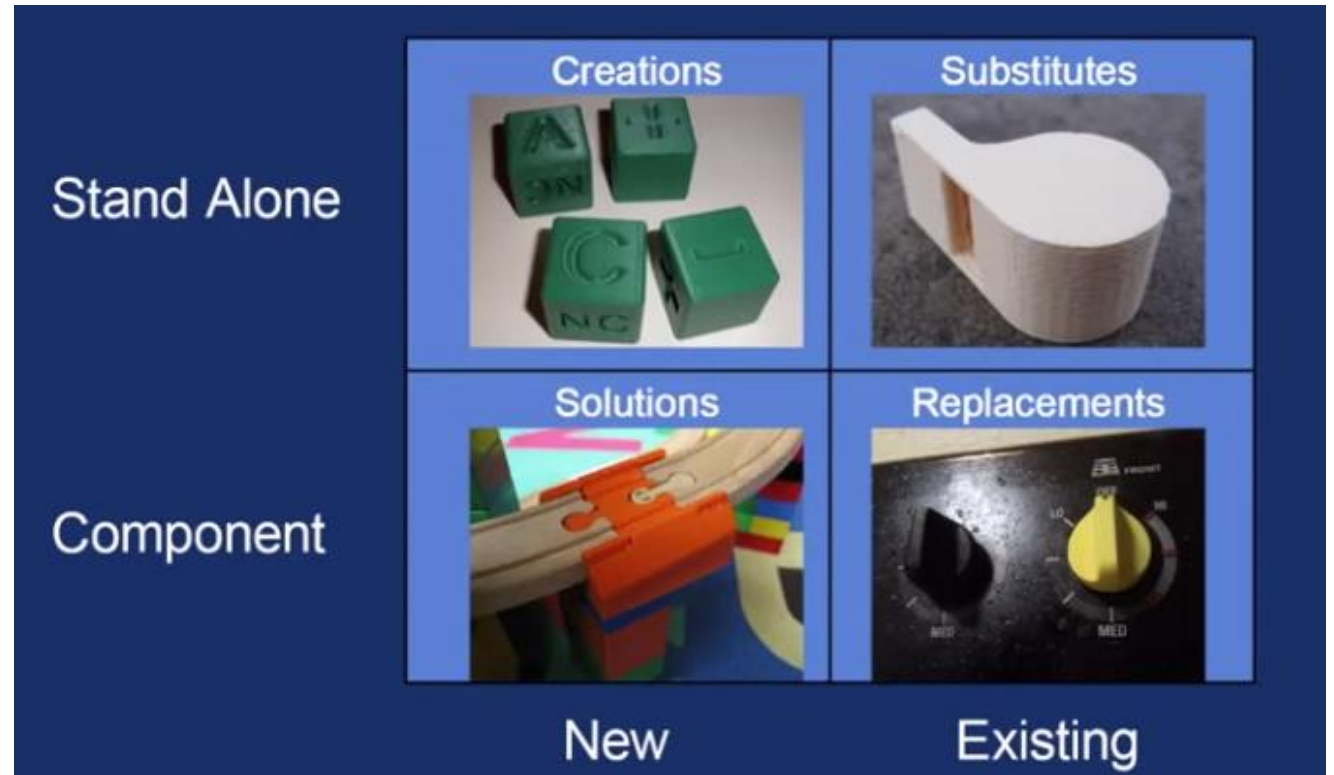
What is the future of 3D Printing

- Elon Musk – The future of Design

https://www.youtube.com/watch?v=xNqs_S-zEBY

Questions?