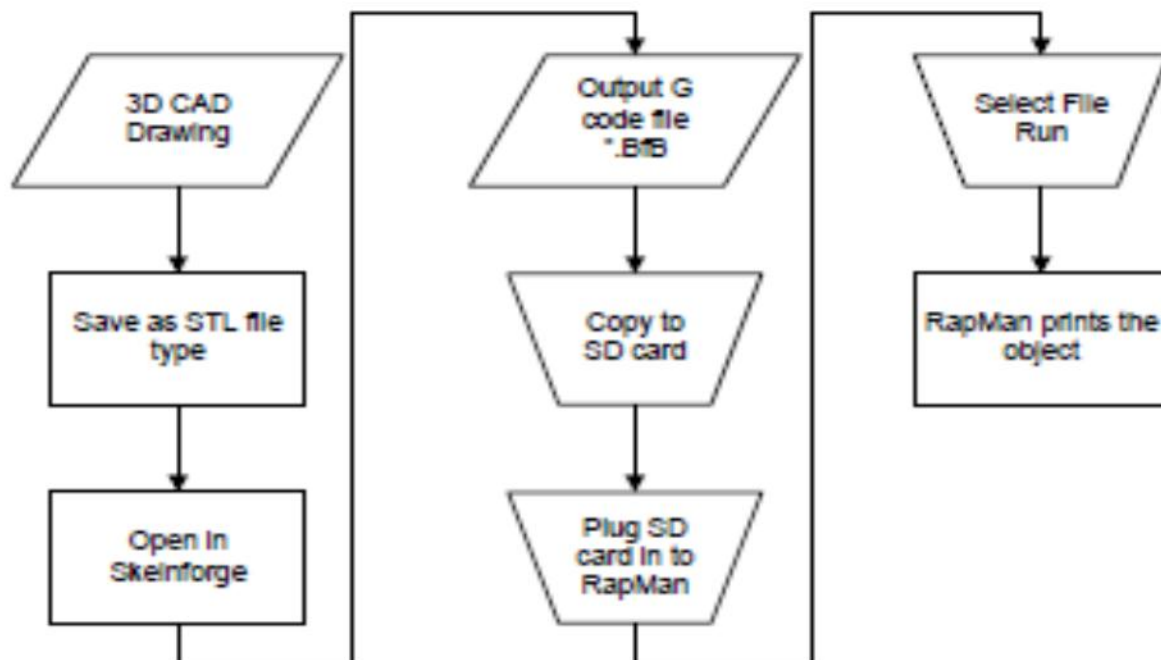


## What is 3D Printing?

Three (3) Dimensional (D) Printing can be defined as the making/manufacturing of parts and products using a computer-driven, additive process, one layer at a time. 3D printing builds plastic and metal parts directly from CAD drawings that have been cross sectioned into thousands of layers.

## How Does 3D Printing Work?



- 3D Printing “Buzzzz” Words
- CAD, Computer-aided design
- STL, STL is a file format
- G-CODE, (CNC) Programming Language
- SD Card, Secure Digital Card
- EPROM, Erasable Programmable Read Only Memory

## **Operations**

After designing the product using AutoCAD 123 or Solid Edge, you have to save the file in an STL format. Then open the file in the 3D printing page. Scale it, auto fit it. Then heat the Nozzle to (260°C) & Platform (80°C) After that, Initialize the printer and then click on print. By so doing the computer will send all the various layers to the 3D printer and after some few minutes the platform will set itself closer to the nozzle and the nozzle will start extruding the melted plastic onto the platform according to the design until its finish printing the product.

### **Caution “**

Do not shut down the UP! System or pull out the USB cable.  
Because you will have to start the whole process of printing again.

## **Reasons for Companies to Adopt 3D Printing as Part of the Design Process**

- Secure Business Quicker
- Improved Communication
- Speed and Time to Market
- Reduce Development Costs
- Increased Innovation

# Types of “3D Printing”

## 1. 3D Printing

3D printing is an inexact moniker, but usually refers to object made using ink jet technology in three dimensions. As its name implies it is a close cousin to traditional 2D printing. These printers work by layering a powder substrate and binding it with pigmented

## 2. Fused Deposition Modeling

Fused Deposition Modeling (FDM) creates models by heating and extruding a filament of plastic material. It is one of the cheaper forms of 3D printing with systems starting at  
Strengths:

- plastics used are very durable
- a wide variety of materials are available
- soluble support technology allows for intricate geometry, including simple moving parts
- materials are cheap

Weaknesses:

- Untreated surfaces have a rough finish
- Strength along the Z-axis direction is far less than in X or Y (because of layer adhesion)
- Slower build-times with multiple parts

## 3. Stereo lithography

Stereo lithography produces models by tracing a beam of UV light over a photosensitive pool of liquid. Over time the part is lowered into the bath and the final product is produced. The major benefit of this 3D printing technology is the high level of detail and surface finish it enables. Stereo lithography technology also provides the most interesting product reveal. Once the part is done printing it is lifted elegantly out of the photopolymer solution. It is a dramatic finish compared to the dust off or breaking of supports other systems require. The Viper line of stereo lithography apparatuses (SLA's) manufactured by 3D Systems produce the highest quality 3D prints available.

Strengths:

- Accuracy
- Good surface quality
- Wide variety of materials

Weaknesses:

- Resins
- Long post-processing times (due to removing support material)
- Resins are toxic & unsafe for an office environment

## **4. Selective Laser Sintering**

Selective Laser Sintering (SLS) is the awesome union of 3D printing and Lasers. The process is similar to stereo lithography replacing the UV light with a laser and a vat of liquid with a powdered base. The major benefit of SLS is the ability to produce parts in a variety of materials ranging from plastics to ceramic to metals. In some case SLS technology can be used in lieu of more expensive tooling processes.

### **Z-Corp**

Z Corp. These machines create each layer by using an inkjet head to deposit a binder onto a bed of compacted powder. Powder is layered and cured in succession until a part is formed. After each build, the loose powder is removed leaving only the part remaining. The fresh part is then coated in elastomer which gives the parts added rigidity. Some machines have the ability to print parts in full color.

#### Strengths

- Fast part production
- The only full color parts process

#### Weaknesses

- Fragile parts – even when coated
- Lowest surface quality than other “jet” processes

# 10 Things 3D Printers Can Do Now!

## 1. Art



3D printing allows artists to create objects that would be incredibly difficult, costly, or time intensive using traditional processes. These sculptures are manufactured using a laser sintering process.

## 2. Action Figures



These two were created using zCorp machines which apply glue ink and powder in fine layers slowly creating a replica of one of your characters.

### 3. Jewelry



Jewelry makers were some of the first to use 3D printing in their manufacturing process, but rather ones that use wax. In a process called “investment casting” a piece of jewelry is sculpted or printed out of wax. Plaster is then poured on either side. Molten metal is poured onto the wax which melts out leaving a metal version of your wax sculpt in its place in the plaster.

### 4. Hearing Aids



Hearing aids, a cast of your ear canal is made. The casting is digitized using a 3D scanner and a perfect replica of your ear is printed from that ensuring a great fit and improving the quality.

## 5. Prototypes



Prototyping in product development is currently the biggest use of 3D printing technology. These machines allow designers and engineers to test out ideas for dimensional products cheaply before committing to expensive tooling and manufacturing processes.

## 6. Home Decor



This service, called “Shape ways” allows you to create products like this lamp.

## 7. Models



Sales folk's lives get much easier when you can have models like this of your product printed up for show and tell.

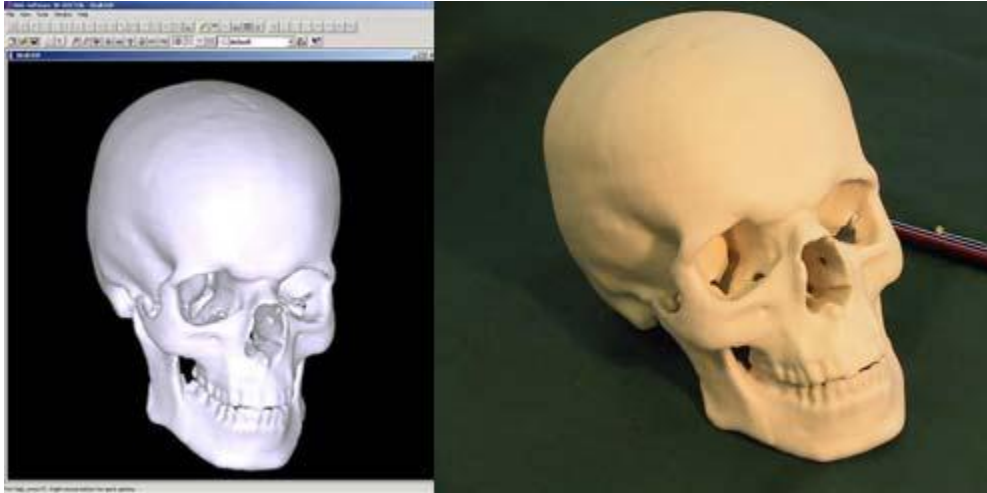
## 8. Components/Manufacturing



In the left hand picture a surgical knee replacement implant has been designed and manufactured to fit a patient's joint perfectly. On the right, is an engine parts that is printed using printed using an Electron Beam Melting



## 9. Medicine



3D printing now has the power to help save lives. Surgeons are using 3d printers to print body parts for reference before complicated surgeries. Other 3D printers are used to create bone grafts for patients who have suffered traumatic injuries. Looking further in the future, I believe scientist will work out a way of printing replacementorgans.

# Components of a 3D printer and their functions

## The Frame

A frame to hold the machine together.

## Head movement mechanics

The head must be able to move relative to the bed in all three spatial directions, typically X, Y and Z.

Four Stepper Motors

To control the spatial movement and the extruder.

## The print head/extruder

To extrudes the warm plastic with the aid of a motor to push the raw material, parts inside the Nozzle ; (1) chamber/nozzle,(2) a heating coil,(3) a temperature sensor, and, something to hold it all together.

## Electronics

computer” or “controller” that controls the whole printing process.

## 3D Software

Not part of the printer, but the printer is useless without a companion pc with software that can:

- create/manipulate 3D models, view on a pc.
- convert these models into “slices” for the 3D-printer In some cases to automatically cope with making support.
- convert slices into motion commands that give good edges and fill areas.

## Disadvantages of 3D Printing

- ❖ Current 3D printing materials for investment casting tend to yield sporadically rough surfaces.
- ❖ Sometimes encourages informal design methods which may cause more problems to fix.
- ❖ It may not be suitable for large sized applications.
- ❖ The user may have very high expectations about the prototype's performance and it might fail in the exact replication of the real product or systems.
- ❖ 3-D printers are still expensive.
- ❖ Although 3-D printers have the potential of creating many jobs and opportunities, they might also put certain jobs at risk (for example, you can make your toys at home so toy stores and toy makers might go out of business).

## ADVANTAGES of 3D printing

- Complete 3D models can be manufactured including those with hollow parts that could not possibly be made by hand in one piece, even by the most skilled engineer or craftsman. Parts such as bearings, engineering parts and complex working models can be manufactured.
- A variety of resins and waxes can be applied to the completed model. These increase the strength of the model, its temperature resistance and allows paint and finishes to be applied realistically.
- A two part can be added to a model to give it the properties of rubber.
- Models can be electroplated to give the look and feel of a range of metals.
- Prototyping machines such as the ZPrinter 310 can even be used to produce highly accurate patterns for casting.
- 6 Manufactured model parts can be combined with real parts to produce a fully functioning product that can then be tested and evaluated

## **Conclusion**

This is truly a revolutionary technology which could become one of the major breakthroughs of the twenty first century. 3D printing has evolved from mere science fiction to science fact. Future expectations might even include printable organic parts, for example replacement organs, identical skin grafts and even limbs (to combat victims of illness, disease and war).

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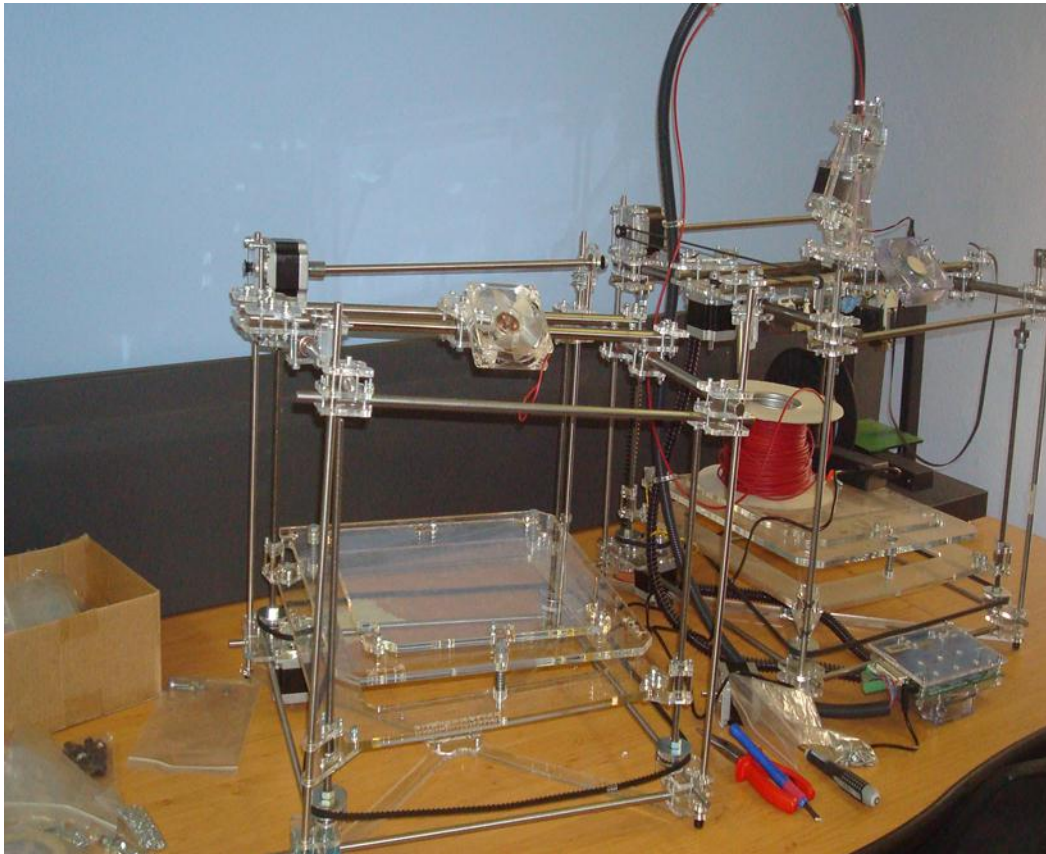
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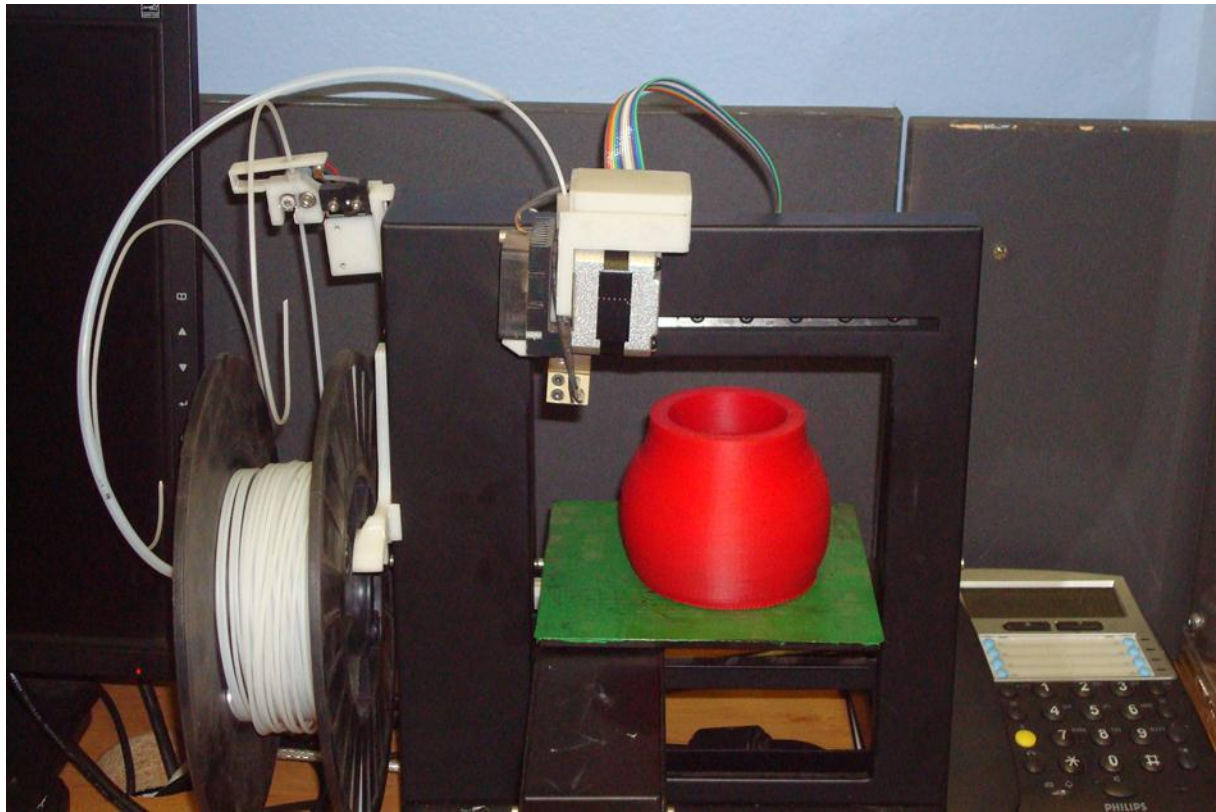
## Rapman



**BFB 3000**



**Implementing colures on an UP while its printing**



**Printed parts**



