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Additive manufacturing and the 3-D opportunity

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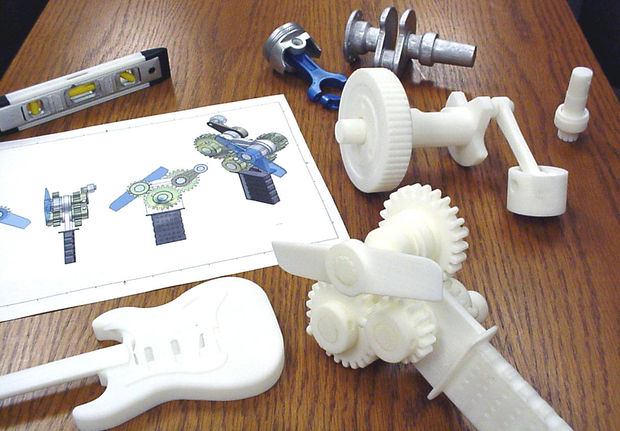
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# Introduction

# Three Dimensional printing with additive manufacturing is a field that is expanding rapidly, the demand and use of three dimensional printers with additive manufacturing grows as I type. This introduction to three dimensional printing with additive manufacturing will offer the reader an insight view of the range and capabilities of three dimensional printers. I will cover the brief history and associated sciences that are involved with three dimensional printing. Also I will discuss the moral and ethical implication that have arisen with this new technology.

# Brief Description of 3D Printing & Associated Science

## What is 3D printing

The evolution of the 3-D printing started nearly 20 years ago it started out being used by manufacturers to build prototypes and models. The way a 3-D printer works is simply by following instructions. These instructions come from a digital computer

Instructions to print objects. The materials used are plastic, metal, and ceramics. There is a layer building process that is followed until it’s completed. Digital blueprints called computer aided design (CAD) files are used by 3-D printers to make objects.

Stereolithography is a 3D printing method that can be used to make your projects that involve 3D printing of and object. Even though this type of 3D method is the oldest one that used in thehistory of 3D printed objectsit’s still mostly used. Whether you are a person who wants to use creative methods to make a prototype of a new coming and exciting project, an engineer, who needs to check if the part can fit into a special design, or Stereolithography can help you attain any idea that you would like to see realized.

According to Lemu (2012)Selective Laser Sintering is a technique that is used by a laser as a power source to make solid 3D printed objects. Carl Deckard developed this technique, a student of Texas University, and his professor Joe Beaman in the 1980s. Later on they took part in the foundation of Desk Top Manufacturing (DTM) Corp., that was sold to its big competitor 3D Systems in 2001. As was stated previously, 3D systems Inc. developed stereolithography, which in some way is very similar to Selective Laser Sintering. The main difference between Selective Laser Sintering and stereolithography is that it uses powdered material in the vat instead of liquid resin as stereolithography does.

The first commercial 3-D printer was invented by Charles Hull in 1986. A technique that heavily relies on lasers to solidify an ultraviolet-sensitive polymer material called stereo lithography. This technology became popular in 2012 when President Barack Obama awarded the National Additive Manufacturing Innovation Institute (NAMII) an award of 30 million dollars in federal funding.

## Automated Additive Manufacturing

Additive manufacturing has grown globally over the past decade, especially with the availability of home 3D printers. More and more objects are being created using this process because it saves time and money. The time is drawing near that items will be available to be manufactured at home. There are questions of safety and intellectual property issues. It’s now possible for individuals to scan items and print copies; under the intellectual property laws many items that are manufactured using 3D printing aren’t protected.

According to Whitehouse.gov(2012) Additive manufacturing, often referred to as 3D printing, is a new way of making products and components from a digital model, and will have implications in a wide range of industries including defense, aerospace, automotive, and metals manufacturing. 

## What is 3D printing used for?

### Healthcare

3D printing technology has an authentic likelihood to improve treatments used for medical conditions/issues that range from arthritis, hearing loss, and bone cancer. Already 3D bio-printing gives orthopaedic surgeons the opportunity to print synthetic bone by scanning a patient, using existing surgical objects to get the accurate shape of the damaged or missing bone. Recently, a skull implant was created for people that have head injuries and bones that need replacement.

In the near future, 3D printing technologies could be used with stem cell research to produce living organism from patients’ own cells for transplants. 3D bio-printing is one of the latest in the use of personalised medicine. The advancement of this technology could allow doctors to tailor treatments to patients individually, rather than making a treatment that works well universally for a condition

# Why is 3D printing Important

From an industry perspective, this is a great tool that allows manufacturers to create designs and controls that are centralized. In the past a blacksmith required special knowledge to create an object, with modern technology this process is no longer utilized. Likely, operators of machines don’t need the ability to design the objects that they create, unlike in the past the blacksmith would design the tools he created. Otherwise, the factory relies on labor distribution: there are several roles in this process. A designer, a translator that makes the design into machine usable parts and then the laborers that utilize the machine. Along with price, the advantages for consumers are numerous for this model, since the objects can be created at a higher speed using 3D printing and are sold through retail locations. Mass production allows for increased availability of a 3D printed object; this raises the reach of objects, making it easily accessible for the consumer to obtain 3D printed objects without the need for living next to the blacksmith. Additionally, this allows society to place quality controls on manufacturing that has been centralized. Since identical copies of objects are created by machines, it’s now possible to run quality inspections on objects and have assurance that it is an accurate duplicating of the factory creation; similarly, machines can be inspected in a centralized factory and assure the safety of multiple items. In the case of the blacksmith this is different, items can vary every time they are produced and this lacks any oversight.

# Moral and Ethical consideration

## 3D organs made from human cells

One matter of obvious moral concern is that the in home use of these 3D printers will allow people to easily and discreetly duplicate copyrighted and patented objects. They will be able to do this by utilizing an available home 3D printer, a person could print up copies of books, and every day use objects. Repairs could be made easily and this could wipe out the need for warranties on home appliances. The 3D technology will allow people to duplicate objects that have been patented and have copyrights from the comfort of their homes.

3D printing technology has the advantage of allowing individuals to specifically tailor objects on demand. The health care industry has taken the opportunity of 3D printing's ability to make objects that are unique and hard to build using known methods. The FDA currently treats conventionally made medical devices the same way it would treat 3D-printed devices in this modern time. The safety and effectiveness of 3D technology is evaluated along with other devices that require evaluation so there is no fine line separating 3D printed objects and traditional objects.

According to (Baase,2012) Patents protect inventions by giving the inventor a monopoly for a specified period of time. Patents differ from copyrights in that they protect the invention, not just a particular expression or implementation of it. Anyone else who wants to use the patented invention or process must get the authorization of the patent holder, even if the other person independently came up with the same idea or invention.

. Different countries will utilize the machine in different ways, hospital usage, producing food, environmental, at risk for jobs, pirating, and the good will all need to be evaluated to determine the potential threats or success of 3D printing. Many countries have found a use for the 3D printer; China is using it for bio printing and Canada is using it as an education tool for children.   
“The Makerbot at the Lunenburg library is one of sixteen 3D printers distributed by the Nova Scotia government in 2013 to rural and urban locations around the province” (Barrett).The library has found a way to inspire children with more than just reading and utilizing computers. Barrett’s simple explanation of a 3D printer is; facilitating an educational use for 3D printers will give younger generations an introduction to future innovations. This allows the machine uses beyond a profit engineering tool. There were two librarians who decided to raise funds to have two additional 3D printers added to another library. The librarians also organized a program for children aged 10 to 12. During the program they used Sketch Up modeling to create images. It seems as though they are helping students plan for the future by introducing them to new technology.

## Pros and Cons of 3D Printing

One possible benefit of 3D printers also brings some legal implications. Once 3D printing becomes more affordable to the public, more and more people will have access to them. Accessibility has its pros and cons, because consumers have the potential to print any object they want or need. If a particularly company has a patent for a useful object and requires consumers to purchase this object, circumstances could arise where the consumer refuses to purchase and decides to print the object the object instead. There are few that believe that use of automated manufacturing, such as 3D printing, will become part of our near future. There are ethical implications that need to be figured out first. In a way this new technology with no known limitations, could give an associative explanation.

The adaptability of 3D printing is the foundation to their dramatic potential. One upper hand is that they allow us to manufacture 3D printed items that we could not create otherwise; for instance, there are geometries that can be created through additive manufacturing that we cannot manufacture with traditional methods.

One more ethical issue that involves 3D printing is safety. Now, safety regulations depend greatly on centralized manufacturing. Products are first tested and then certified as safe; factories are on scheduled inspections on a regular basis to ensure that their products meet the standards that passed the safety inspection originally. This heavily relies on using a centralized location to check for originality of the product. Once this is done the machines should make duplicate copies of the originally tested product. In the future this model will not hold up, with the main idea of 3D printing is the capability of consumers to print from home. Thus the machinery is dispersed throughout the world. Even though the product is created by the same plan, the quality can vary from machine to machine. If a single 3D printer is used, then the overall outcome of products should be the same and a single inspection on one 3D printer should suffice.

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The term morality deals entirely with an individual’s interpretation of right and wrong.   Also, it can be used as the standards that a individual has about right and wrong.   Morals for the most part, are equally unwavering among individuals.   The majority of individuals agree that murder is wrong it is wrong and immoral. This is just one sample of how moral standards are seen by individuals. Moral standards are described as the behaviors that are believed to be immoral. There is also what is known as non-moral standards.   These principles judge what is good or bad in a non-moral way such as good grammar or proper etiquette.

Resources

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This site provides information on funding that was granted for the research of additive manufacturing.

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