Case Study: To Study 3D Printing Technology, its needs and Application in various Domains.

What is 3D Printing?

3D printing or additive manufacturing is a process of making three dimensional solid objects from a digital file.

The creation of a 3D printed object is achieved using additive processes. In an additive process an object is created by laying down successive layers of material until the object is created. Each of these layers can be seen as a thinly sliced horizontal cross-section of the eventual object.

3D printing is the opposite of subtractive manufacturing which is cutting out / hollowing out a piece of metal or plastic with for instance a milling machine.

3D printing enables you to produce complex shapes using less material than traditional manufacturing methods.

How Does 3D Printing Work?

It all starts with a 3D model. You create one yourself or download it from a 3D repository. When creating it yourself you can choose to use a 3D scanner, app, haptic device, code or 3D modelling software.

Need of 3D Printing Technology Because Of Following Advantages:

1. Less machine, material and labour costs

For any business, costs reduction is important and one of the advantages of 3D printing is that it will help to bring those costs down. Manufacturing costs are split into three different categories known as: machine operation costs, labour costs and material costs.

2. Machine costs

Machine operation costs play a very small part in the overall cost of the manufacturing process. While the energy required to create parts in an industrial environment can be high, the ability to develop and create complex parts and products in one step creates an increased level of efficiency and saves on time. Therefore, the cost of running the machines is offset by the savings made during the manufacturing process.

3. Labour costs

One of the good points of 3D printing is the fact that labour costs are kept low. Unlike traditional manufacturing where different people may be required to operate a number of different machines or a production line is required to put the product together. Each 3D printer will require an operator to start the machine and start the automated process of creating the uploaded design. Therefore, the labour costs are significantly lower as traditional manufacturing.

4. Material costs

The range of materials used for 3D printing is growing and this makes it possible for the price to decrease over the last years. But, in the same way as the machine operation costs, in comparison to traditional methods, the overall cost are a lot lower.

5. Reduce time

We live in a fast paced world where everything is required quickly and so, this is where 3D printing can really make a difference. One of the big advantages of 3D printing is that parts and products can be manufactured a lot quicker than they can use traditional methods.

Applications of 3D Printing

1. Medical

According to CNN, 3D printers are already being used by researchers to print tiny strips of organ tissue (bio printing), as well as facial appendages (ears and noses). Printed organs such as a kidney or liver – the next stage in the evolution of the technology – could be used initially for drug and vaccine testing and ultimately produce much-needed organs for transplants.

Basiliere states, "3D bio printing facilities with the ability to print human organs and tissue will advance far faster than general understanding and acceptance of the ramifications of this technology." In response, Mike Titsch, editor-in-chief of 3D Printer World claims, "Many major medical breakthroughs have suffered moral resistance, from organ transplants to stem cells. Will only the rich be able to afford it? Are we playing God? In the end, saving lives tends to trump all objections."

2. Artificial Limbs

Washington University students developed a prosthetic arm for a 13-year-old girl who had lost her limb in a boating accident. While not as advanced as other prosthetics, the cost of $200 for materials was substantially below the $6,000 cost of similar devices, a factor that precludes widespread application in many companies.

Kylie Wicker of Rockland, Illinois, born without fingers on her left hand, received an operating set of plastic 3D printed fingers for a cost of $5 and designed by a high school engineering class. A Canadian professor is working on a 3D printing process to make prosthetic limbs to be sent to Uganda for victims of their persistent civil wars.

3. Fashion

Fashion has utilized 3D printing to create visually stunning dresses and accessories presented on the runways of New York Fashion Week 2013, as well as a unique "smoke" dress unveiled at the 2013 Frankfurt International Motor Show. The smoke dress automatically creates a veil of smoke whenever someone steps in the personal space of the wearer.

Lady Gaga wore the world's first flying dress, Volantis, another 3D printed dress, at the 2013 ArtRave. Continuum offers the world's first ready-to-wear, completely 3D printed bikini, the N12, named for the material from which its made: Nylon 12.

4. Prototypes and Test Models

Oxfam International, an international confederation of 17 organizations working to find practical, innovative ways for people to lift themselves out of poverty, teamed with MyMiniFactory.com to develop innovative designs to solve the problems of water hygiene in Third World countries. Designs can be quickly printed, tested, and modified before moving them into mass production. While it is still early in the process, sponsors believe the rapid testing of new devices and subsequent modifications possible with 3D printing will prove successful in such humanitarian projects as hand sanitation devices for the current 2.4 million Syrian refugees living in crowded, unsanitary conditions.

Italian inventor Enrico Dini has developed a 3D printer, known as the D-Shape, which binds sand particles together to create sedimentary stone. The printer is said to allow the construction of a building four times faster than conventional means for half of the cost. The Urbee, a hybrid automobile designed by Kor Ecologic, is a two-seater that gets up to 200 miles per gallon with an estimated cost around $20,000, and is entirely manufactured by 3D printing.

5. Personal Use

People will be able to print custom jewellery, household goods, toys, and tools to whatever size, shape, or colour they want, as well as be able to print replacement parts at home, rather than ordering them and waiting for them to be delivered. According to research firm Strategy Analytics, home 3D printing could evolve into a $70 billion industry per year by 2030.

3D printers for food may even finally solve the problem of getting children to eat their vegetables, as parents will have the ability to mold them into all kinds of shapes. Perhaps a finicky toddler could be convinced to eat Brussels sprouts if they were prepared in the shape of a dinosaur.