

# Facilitating beads-making through computer aided design

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**Abstract.** The world has become a global community; information is easily shared using the modern digital computer to ease the process of beads-making. The use of computer in bead making speeds up the work, giving accuracy and versatility. The use of computer in bead-making consist of Computer Aided Design (CAD) and Computer Aided Manufacturer (CAM). The CAD deals with the designing of the bead in two-dimensional and three-dimensional forms. It also deals with direct production of the bead design prototype, since it has always been a repeated process in bead making to acquire the right length. CAD has reduced the need of draftsman and manual drafting techniques. Beads designers should undertake computer lessons to learn more about the use of AutoCAD in CAD and practice the use of other modeling softwares such as Adobe, Corel, JewelCAD and others. To produce beads design and if possible produce a catalogue for the consumption of the public such as the one designed in this paper.

**Keyword:** Computer aided design, computer aided manufacture, AutoCAD, beads, bead design.

## INTRODUCTION

Generally, there are thousands of graduates with certificates or in computer, yet are busy looking for jobs for survival. Beads-making is as old as man by the use of local or synthetic beads. An individual can be self-employed through beads making. Beads are important materials for making jewelry. In this paper, we will consider Computer Aided Design (CAD) in beads making, because of its advantages in our contemporary age. These beads come in different sizes, shapes, colours, and materials. The importance of beads making is a global issue; CAD eases and gives accuracy in beads making design. Beadwork is the art or craft of making things with beads. Bead making is an ancient craft universally practised among the various ethnic groups and societies in Nigeria dating to antiquity (Appolos, 2012). Bead making can be a craft practised as skill developed through formal and informal education. It is not limited to Nigeria or Africa but the whole world. Bead-making has taken beads designers out and within various countries for exhibition, workshop, seminar and conferences. Therefore, in order to move into computer aided design, there is need to learn about various ways in which beads making is done traditional as well as

automated transferable skills learned from working with dimension, which includes skills, visualization, spatial perception, elements, principles and mouse control of the computer as well as the use of some softwares such as AutoCAD." Computer Aided Design (CAD) "is the process of using a computer in the design process", it can be used in both the representation and the analysis steps, it also aid engineering analysis, application, architecture, construction engineering and so on (Chang, Wysk and Wang, 1991). According to Groover, 1980 CAD is any design activity that includes the effective use of computers to create, modify or document an engineering design. Young (2012) further explain that, CAD is a catch-all term used to refer to any software that allows you to visualize 2-D or 3-D design using computer while CAM refers to any machine that can create a physical object from a CAD design. CAD is a very broad subject, there are many software packages with a particular task or for use in a specific area of product design; it has specific tools that help the designer works more productively. Using CAD, one can design from 2-D to 3-D. the 2-D design tools such as Adobe photoshop, Corel paint and 2-D vector drawing tools include Adobe

illustrator, CorelDraw, inkscape and DelCAM power-shape, matrix, JewelCAD, monarch CAD and Rhino. The main function of 2-D the design tools is to emulate a painter's brush, while 2-D vector drawing tools, work like a technical drafts person drawing table. 3-D design tools can build objects with architectural precision. The AutoCAD software used in this paper has all the above tools.

## REVIEW OF LITERATURE

### Definition of bead

According to Encyclopedia Britannica, "Bead is a small decorative object that is formed in a variety of shapes and sizes of material such as glass, plastic or wood, that is pierced for threading or stringing. Beads range in size from under 1 mm (0.039 inch) to 1 centimeter (0.39 inch) in diameter". Wikipedia, 2014 defined bead as a small decorative object that is formed in a variety of shapes and sizes of a material such as glass, plastic, paper, bone, metal, stone or wood and that is pierced for threading or stringing. Also a bead is a small, round and perforated object which is usually strung to form necklace/bracelets or attached to garments or articles of clothing for decorative effects (Horace, 1928). Beads made from wood, plastics, stone and its imitation, shell, paper and synthetic beads are mainly for costume Jewelry. For good designer in bead works, anything available to his environment can be transformed into bead jewelry by giving it a good surface finishing using lacquer or varnisher.

### Origin of bead for jewelry

About 35,000 years ago an object called bead came to play, a pair of beads made from Nassarius sea snail shells, approximately 100,000 years old are thought to be the earliest known examples of Jewelry. The art of bead work originated in prehistoric times when primitive people used objects from animal world, such as horn, shell and feather for adornment as seen in their cave painting and carving, figures were seen with decorated bracelet, necklaces, earring and head dresses. Almost all part of the body is adorned with beads Jewelry of various types and sizes. Beads have played a vital role in jewelry design and decorative art for over 5000 years ago. Beads can be worn as symbol of loyalty, display of power and wealth, for aesthetic and adornment while others used it to wards evil.

### *African beads jewelry*

Africans produce a lot of jewelry with local materials

available to them especially beads from different materials. Fagg (1974) explained that, African beads were obtained cheaply at home but more highly prized by the natives, in the archaeological records. African jewelry is not just ornamental but others may be for rituals and adornment (Camera, 2005). Each piece is also represented and worn for particular reason ranging from aesthetics to identify marks of society or group, which are better display during cultural festivals.

### *Nigerian beads jewelry*

According to Nduka (2009), "The origin of bead in Nigeria is spectacular due to its fragility, portability and popularity." Beads have been traced and used since time immemorial. The earliest known African bead is traced to Libya and Sudan. In Nigeria, the Nok terra-cotta and Igbo ukwu arts display some elements of the usage of bead in those societies as early as 500BC. Beads design and production is very important in Nigeria because most of the states used various beads available to their environment and sometimes materials from other neighbouring states; such beads from seeds, shells cowries, bones, animal teeth, wood, plastics and so on, these materials comes with season especially seeds cowries and shells, they are then polished and assembled as Jewelry ornament, Ife and Benin artist were good in using bronze, silver, plastic for Beads design, the Nupe artists from Niger state use colour bottles to recycle into beads design and production. Fagg (1974) explained that, stones beads of many shapes and sizes, some made of tin were used in Nigeria.

### *Fashion (costume) beads jewelry*

Globally, beads are example of costume Jewelry because most of the beads are inexpensive and fashionable, which goes in harmony with most of the attire worn by ladies, costume beads are made from materials such as assorted synthetic beads of different colours, sizes and shapes, others are from wood, textile, shells, papers and so on. The writer of this paper took up jewelry as a formal course from her early hobbies of beads making using local materials leading to the use of synthetic beads. Fashion (costume) set jewelry is designed to reflects trends and is likely to be discarded with fashionable clothes if it is not in harmony (Wicks, 2003:4). In this contemporary trend, ladies adorn themselves with variety of fashion beads Jewelry made of synthetic beads such as glass and gemstone imitation, which are sold in different sizes, shapes and colours, which goes with both traditional and English wears. Gordon (1987) points that, "costume jewelry are history which show what people wear to expose on their past, present and speculate what their future might look like".

### **Types of beads jewelry**

Beads may be divided into several parts of overlapping categories based on different criteria such as the materials from which they are made, the process used in their manufacturing, the place or period of origin, the patterns on their surface or their general shape. In this contemporary age, beads are available in different shapes, sizes, colour, textures and qualities, beads could be transparent, opaque, metallic and some with natural finishes. Therefore, beads could be traditional, cooperate or casual in used. Beads could be natural or synthetic in nature. For example, natural beads, synthetic beads, semi-precious beads

### **Colour**

Beads are usually made of different colours, sometimes mixture of colours or single colours of different tones. Some beads have their natural colours while others can be added by the process of anodizing, electroplating or by painting.

### **Size**

Beads range in size from under 1 mm (0.039) to over 1 cm (0.39 in) in diameter. In this contemporary period beads could even be bigger than the known sizes particularly when its manufactured for a special use, as those used by the royal families.

### **Shapes and its types**

Beads could be of different shapes depending on the use and user, it could be hair pipe, which are usually long and tabular or seed beads which are uniformly shaped, spheroidically or tube shaped, for example, acrylic beads, charms, crystal beads, bugle, glass beads, spacer beads, seed beads, wooden beads and others.

### **Objects that can be made with beads**

Hand bags, bangles, crowns, earrings, necklaces, play toys, rings, flower vase, table mats, wrist watches, handset case, shoes, purses, waist belts, caps and so on

### **Symbolic meaning of beads**

- (a) Used for prayer e.g. rosary beads
- (b) Used for anti-tension devices e.g. worry beads
- (c) Used as currency e.g. Aggrey beads from Ghana
- (d) Used for guming e.g. Owari beads for mankala
- (e) Used for adornment

### **Computer aided design in beads making**

This is the use of computer systems to assist in the creation, modification, analysis or optimization of a design. CAD software is used to increase the productivity of the designer, quality of design, improve communications through documentation, and to create a data base for manufacturing. CAD output is often in the form of electronic file for print, machining or other manufacturing operations. CAD is used in many fields which includes industrial arts. CAD is one of the many tools used by engineers and designers where it uses depend on the profession of the user and the type of software in question. For this paper is the use of AutoCAD softwares for two different beads design (blue, blue and white).

### **Relationship between CAM/CAM in beads making**

CAD/CAM is the application of computers in the design and manufacture of components used in the production of its items such as automobiles and jet engines. CAD is software for creating precise engineering drawings. CAM added a computer to a machine tool such as a drill or a lathe. CAM engineers similarly use computer modeling to determine the best overall manufacturing procedures for use in an industrial plant including the testing and handling of finished products. Ralp (2009) explained that CAD and CAM are used together to create the design in CAD on one computer, then transmit the design to the second computer that creates the part using CAM.

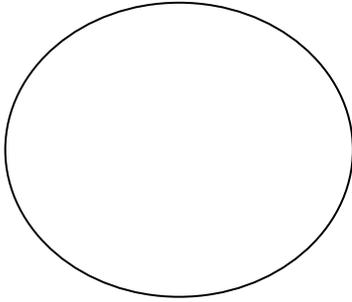
### **CAD techniques**

The best quality for beads designer is commitment, practice and perseverance for better achievement by the use of CAD. Wicks (2003) explained that with no formal training in bead making, it remains one of the few field in which talented individual working alone and with limited facilities can make an ends meet not really a full time occupation.

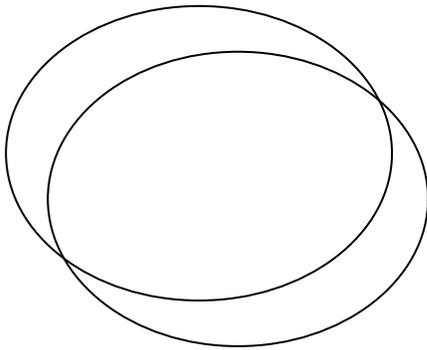
### **Advantages of CAD**

This is to say that, the automated CAD system increases the efficiency in making and designing of beads for quick production, the used of geometric models (known as Computer Aided Geometric Design) was very helpful in beads shapes making too. CAD making reduces too much stress on the brain especially in term of colour combination, it makes work easy, give accuracy, less labour and time.

1. It is used for accurate creation of photo simulation
2. It has proven to be useful to beads designers using the



**Figure 1.** Draw a circle of 9 mm diameter by clicking the circle icon on the drawing tool bar.



**Figure 2.** Offset circle of 3 mm.

four properties (history, features, parameterization and high level constraints).

3. It is used to design curves, circles and figures in two-dimensional (2D), space, curves, surfaces and solids in three dimensional (3D) space.

4. It is used to produce computer animation for special effect in movies, advertising and technical manual known as DCC (Digital Content Creation).

5. Is a major driving force for research in computational geometry, computer graphics (both hardwares and softwares).

6. It aids in jewelry model making where 3D printable models may be created with CAD.

## MATERIALS AND METHODS

In modern manual beads making, the materials required to create jewelries or ornamental objects from beads include:

- i) Round nose pliers
- ii) Cutter
- iii) Fishing line or tiger tail
- iv) Stoppers
- v) Scissor
- vi) Findings for example hooks

- vii) Clips
- viii) Assorted beads

## Methods using CAD

This paper deals with the method used to aid the work of beads design using Computer Aided Design (AutoCAD softwares) to reduce the hard labour and time consumption with all the stress one go through in the manual used of the various materials to produce beads design for small or mass production.

## Tools

1. CAD workstation consisting of:

- a) Monitor
- b) Computer processing unit (CPU)
- c) CPU hard-ware

2. Microsoft windows

- a) Operating system
- b) Higher processor
- c) Windows for Intel
- d) 10 MB hard disk space
- e) 32 MB RAM
- f) Keyboard
- g) Mouse
- h) AutoCAD software or drawing space
- i) Software aided manufacture
- j) Computer numeric control
- k) Palette of colour bar

## Procedures

A simple beads design can be done through AutoCAD software which is a computer- aided drafting software program that enables the users to create precise 2- and 3-dimensional drawings used in construction and manufacturing.

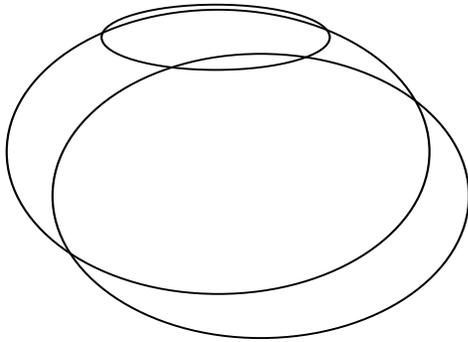
### Step 1:

- i) Double click the front view – part to enlarge
- ii) Click on AutoCAD drawing space
- iii) Click on geometrical shapes for example circle and enlarge it to 9 mm (Figure 1).

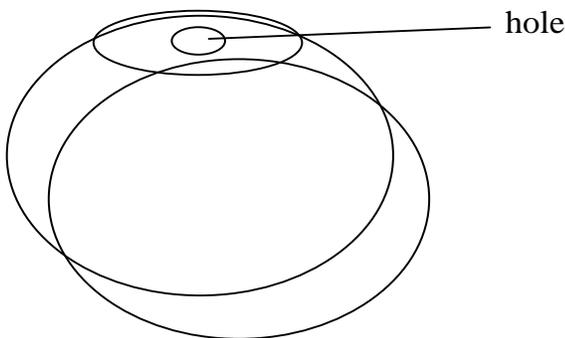
**Step 2:** Copy the circle and offset to 3 mm (Figure 2).

**Step 3:** Draw an ellipse and give radius 3.5 mm to create hole on the circular bead (Figure 3).

**Step 4:** Draw another ellipse of 1.5 mm radius from the



**Figure 3.** Click on the ellipse icon to draw ellipse of 3.5 mm radius.



**Figure 4.** Ellipse 1.5 mm radius from the centre of the first ellipse.



**Figure 5.** Colour – blue design as the first bead.



**Figure 6.** Colour – white and blue design as the second bead.

centre of the first ellipse (Figure 4).

**Step 5:** Use gradient tool to shade all the beads in blue

colour (Figure 5).

**Step 6:** Use gradient tool to shade the 2<sup>nd</sup> beads white and blue colour (Figure 6).

Beads that can be designed using CAD are shown in Figure 7.

## RESULTS

In making of the above bead sets, CAD helped in the design of the curves, circle, ellipse and first of all the designing in two dimensional (2D) space or surface, and after applying the colours, it became solids in 3-dimensional (3D) space. Farin et al. (2002) explained that the modern ubiquity and power of computer means that several design of beads can be achieved in production and creation of beads.” Therefore, the computer softwares used provided tools that improved creativity and flexibility for the bead shapes. The result of this paper give the analysis of the CAD using AutoCAD: Two beads were design in a circular form with a double ellipse of different sizes which serves as hole as passage of fishing line of 0.5 mm. The main body of the bead (Figure 5) was shaded blue using the gradient tool; and bead (Figure 6) was shaded blue and white colour alternatively. The two beads were arranged alternatively around the produce ellipse 15 mm frame which serve as a guide for proper arrangement of the beads. Eleven beads were arranged on the right hand side of the ellipse frame, it was highlighted and then copy and paste on the left hand side. One bead was enlarged and paste in the middle of the arranged beads to serve as pendant. Using the auto-cad software, the design colouring of the beads took less time to manipulate the twenty-two beads.

## DISCUSSION

Bead designers are trying to reduce the use of traditional technique to modern techniques by embracing technological advancement in CAD and CAM which expedite production process, minimise cost and labour. Storage and maintenance of beads is as important as its cost and value. The material selection for beads making help to determine the quality and cost of the bead works.

## CONCLUSION

It is very important for all bead designers and lovers of bead craft, to have knowledge of CAD/CAM, which reduces the task of hand tools for bead making, while the use of CAD will hasten design, materials selection, processes, dimension and tolerance. All that the designer needs is to be patient and be computer literate in CAD/CAM in order to conform to modern beads design

**Paper beads****Metallic beads****Crystal beads****Wire and synthetic beads****Figure 7.** Beads that can be designed using CAD.

and production.

## RECOMMENDATIONS

1. Bead designer should embrace technological inclination in computer aided design and CAM to enhance the designing ability in 2D and 3D.
2. The designer would practice the use of the various modeling softwares, for example people who learn how to use AutoCAD can create scaled drawing that are used to manufacture equipment, beads design and so on.
3. CAD/CAM should be a course right from undergraduate, to enable self-employment.
4. Globally, the demand for beadwork is high but the bead makers and designers are few due to the fact that it is time consuming when done manually.

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