# Role of computers in fashion industry

The fashion industry in particular has come a long way and has grown into one of the largest industries in the world. On account of the growth of this industry, the use of technology in this field has increased with the constantly changing business environments and faster changing consumer demands, it becomes necessary for a business to quickly update and upgrade its production processes to stay competitive in the industry. Especially, when it comes to fashion, where change is a constant, there is a growing need for good information tools to remain ahead of the competition.

Digital fashion illustrations really started during the 90s as more affordable and capable technology made it possible for illustrators to experiment with this fledging art. The current areas of application of computers in textile industry include weaving, knitting, printing, fashion illustrations, texture mapping, embroidery, pattern making, pattern grading, marker-planning and cutting.

The use of computers in the fashion industry can be listed as follows

Textile Design Systems – This includes
Designing and creating different weaves
Designing and creating different knitted fabrics
Designing and creating various prints

**Computer Colour matching systems** – Colour matching in apparel is often directly related to the colouring of textiles with certain amount of dyestuffs in order to achieve the designer's idea of colour for the final garment

**Fabric Defect Checking Systems** – The fabric is inspected for defects with the help of scanning device.

**Garment Designing** – Here the designer creates fashion sketches and adds varieties of texture to it. Digital fashions have started in the early 90s.

**3D Garment Designing** – Here the fabric is draped on a mannequin and the dress designs are formed. The mannequin can be animated to perform a ramp walk and the garment can be viewed in all the angles.

**Embroidery Systems** – New designs can be created in the system and various colour combinations can be applied in the designs. The designs can be created in the computer controlled embroidery machine.

**Computerised Pattern making** – These are Pattern Design Systems (PDS) with which patterns can be drafted with ease and accuracy.

**Digitizing systems** – The manual patterns can be converted into the digital pattern with the help of the digitizer.

**Grading systems** – The block patterns or basic patterns can be graded to different sizes.

**Marker making systems** – The marker planning or lay planning can be efficiently done in the computer and the same can be printed on the top layer of the lay using a plotter.

**Computerised Cutting** – Patterns generated by marker making systems can be directed to automate cutting machines, which can be operated without a human hand.

**Computerised sewing machines** – Computer controlled sewing machines increases the production and the quality of the product.

**Computerised Production Planning and Scheduling** – The work flow and the entire production plan can be created and maintained in the system. This helps in the effective co-ordination of different departments.

**Virtual Marketing** – Consumer gets to see the products displayed before they are developed virtual products in virtual stores. The internet is a form of virtual store. To market a product there in reality, there is no need to physically produce the product, what is needed is an electronic representation of the product.

**Quick Response System** – Computer technology is playing a key role in quick response programs that improve communications among fibre, fabric, apparel and retail business. Quick response shortens the time between the placement of orders by retailers and the delivery of goods.

**Internet and Information Explosion** – This helps the manufactures and retailers to be in line with the latest trend. It is a resource for the students and facility member.

**Made-to-measure systems** – It allows quick and easy entry of customer details, body measurements and customer orders. This is integrated with the pattern design software, plotters, cutters and production schedules. This gives the ability to manufacture single garments at mass production speeds and avoids the high cost that is usually associated with the single garment production.

**3D Body Scanning** – 3D body scanners capture the outside surface of the human body and records the dimensions of the individual, thereby the body measurements are extracted. This is a very important step that enables the designer to create garments with good fit.

# CAD in Designing

The Computer Aided Designing increases the productivity of the designer, improves the quality of the design, creates database for manufacturing and improves documentation. In general terms CAD means computer assistance whilst a designer converts his or her ideas and knowledge into a mathematical and graphical model represented in a computer. CAD systems help in design, constructing and modelling of garments with rapidity and extra accuracy. The designing of garments in the CAD software has the following advantages *Next Topic*.

1. Tools – Pen of different types and sizes are available to the artist. This enables the artists to draw lines of different shapes and sizes. The shapes of the lines can be easily modified without erasing them.

2. Colours and brushes – The CAD offers a wide range of colours, may be a million shades. Also the artists has the freedom to choose from different colour wheels for example – RGB, CMYK etc., The range of brushes and sizes is a boon to the designer. It is very difficult to create a spray painting effect which can be easily created in the computer

3. Effects – The CAD provides the designer with a variety of images, fabric designs which will take days to draw manually. Fabric swatches (new fashion fabrics) can be scanned or photographed into the image library and draped on the sketch in few minutes.

4. Editing – The copy and paste options helps in recreating the designs in part or full in colour and also helps in repeating the motifs. The number of repeats of the motif and the size of the motifs can be controlled by scaling techniques. Mirroring the image and erasing or deleting part of the design is made easy with the advent of computers. The designs undergo changes many times, still the designs sheets can be maintained clean.

The erasing tool and delete tool does the work without spoiling the paper. Crop tool also helps in taking the part of the design easily.

5. Storage of designs - The garment designs can be stored in the computer memory and a copy of it can be stored in the CD or pen drive and the same can be retrieved anytime, anywhere. The paper on which the design is drawn may get spoiled after a period time. Thanks to the computer the designs can be stored for unlimited time duration. The designer can work half way through the design and store it the system and work lesser whenever he/she feels comfortable a convenient.

6. Zoom tool – By using the 'Zoom' and 'Pan' tool the design parts can be enlarged and the details can be observed and edited accurately.

7. Physical arrangement – The designer usually needs an easel board, and a stand for keeping different types of pen, pencils, colours and palette. With CAD the artist needs only a system to draw and paint the fashion sketches

8. Internet – The Designs can be stored in the email and can be retrieved in any place of the world. The burden of carrying the paper and maintaining the design is eliminated. The designer can send the designs to foreign countries for approval with the touch of a button

Hence the CAD design aids the designer in creating designer faster and neat. It also enhances the creativity of the designer. CAD includes garment designing, textile designing (weaves, knits and prints) and embroidery designs

## CAD in Textile Designing

Much of the use of CAD grew from the idea that new textiles could be created by scanning existing designs and making modifications. Most of the first systems were used in their

manner. Textile designs include designs created with weaving, knitting and printing.

## I. CAD in Weaving

Weaving is a method of fabric construction where a warp yarns and weft yarns are interlaced at right angles. The interlacement of the yarns, the structure of the yarns and the colour of the yarns can be varied. There is a lot of variations in the weave patterns. The yarn is woven into a fabric in a loom. The yarn is spun from the fibers and the preparation of the yarns on the loom is an elaborate process. Lots of calculations are involved at every stage. CAD is an indispensable tool to a yarn/fabric designer. The following points proves the above said statement.

- It improves the creativity of the designer.
- A new sample can be scanned and the same can be digitized and converted into an weave pattern.
- The software has inbuilt facilities of yarns of different varieties. Hence a yarn of the desired quality and dimension can be selected.
- The weave patterns can be changed easily. Input of weave patterns automatically aids in the creation of draft plan and peg plan.
- The computer has a wide range of colours. Designer has the freedom to select from thousands of million colours.
- The effects / patterns / design availability can be easily created. The spray patterns that takes days for a designer to manually create can be created in a matter of a few minutes or even seconds.
- The duplication of designs and editing of designs is faster and neat. The designs can be cropped at any proportions and mirrored or rotated at any angles and the same can be saved in another file. The editing does not create any damage or spoil to the paper.

- The pattern generator automatically generates the pattern / fabric design on the screen which helps the designer to gain a clear perspective.
- It takes weeks for the designer to view the fabric sample. As the spinning of the yarn and the weaving of the fabric takes a longer time. Thanks to the CAD, the design can be rendered and the final appearance of the fabric can be viewed instantly.
- The design can be viewed in different colours which enables the mills to sell the fabric without creation of sample which is a very costly process. This gives more choice for the buyer.
- Recent technology is a boon to the garment / textile industry where the fabric can be draped onto a 3D model.
- The fabric simulation, the draping of the fabric in the garment on a model and the change of the colours thus enhances the marketing of the fabric.
- The samples can be presented in the digital form to the buyer and hence the task of carrying of bulks of samples and maintaining the samples for long distances can be eliminated.
- The approval of the fabric swatches for an export order can be done by mailing the same in the web.
- The production details like the weight of the yarn, length of the yarn and the loom card details can be generated automatically. This helps in eliminating the complicated job of minute calculations like the the yarn needed for the floats, crimp etc.,
- The production data can be directly taken to the loom for production

A printer is used to see the output of the design in a miniature size. The plotters is a large scale printer that will give the final appearance of the design in its original size.

## II. CAD in Knitting

Knitting is a method of fabric formation where the yarns are interlooped. The knitted fabric can be created in the flat bed machine or circular knitting machine. The recent developments in knitting include seamless garments.

Knitting systems allow users to divide illustrations into grids that indicate each stitch and then to specify the structure of the resulting pattern, mixing the combination of coloured yarns and different stitch formations. Some give a realistic visualisation of the finished effect on screen, allowing designers to make changes before samples are produced. All have the ability to produce the output on tape, disc or by direct connection to knitting machinery so the production of the design is quick. Designs can be then passed onto production in ready-to-use form.
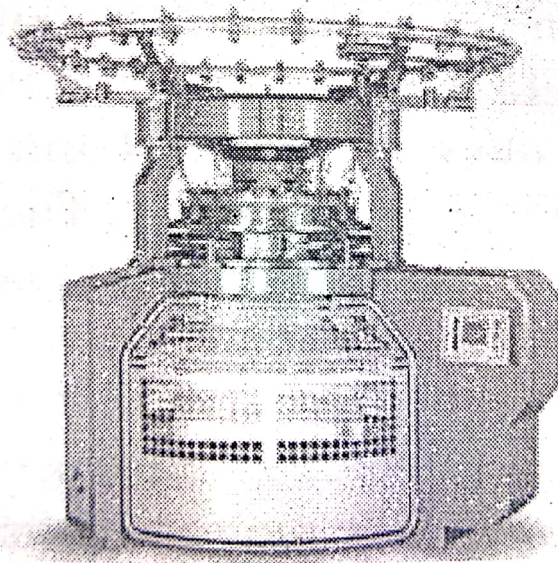
CAD systems are used for two main purposes – one to define on a grid format the layout of yarns and stitch formations that will be used to create a final item. In this form CAD is the primary means by which a design is turned into a fabric. The other purpose is to produce realistic images that represent the finished product. Output from systems takes two forms; predominantly systems are used to produce instructions for knitting

machinery on disk or directly to a printer. The alternate form is, the knitted fabric can be simulated on a body form and shown as a garment.

Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) have revolutionized the knitting industry. The 1970s saw the introduction of CAD/CAM systems. Designers used the CAD system to create product designs and these were transferred to CAM machines to manufacture the final product. CAD/CAM technology replaced the mechanical patterning and shaping devices on machines with electronic controls. These systems enabled companies to respond quickly to changes in demand. New designs could be set up using CAD and quickly produced on the CAM machine. Though manually operated flat and V-bed knitting machines are still used, computerized technology is also preferred. Initially, this system was expensive and only the major companies could afford it. However, in the 1980s and 1990s CAD/CAM fell in price and even the small and medium sized companies invested in this new technology. The introduction of this technology enabled companies to work globally, and on a fast scale.

Side by side with the CAD/CAM knitting technology, the process of whole garment knitting was introduced. Cutting fabric into shapes and then stitching the pieces together to create garments has been in practice since the eighteenth century. In the 1970s companies researched more efficient technologies which could produce a complete garment in one process without the need for sewing. Without the loss of fabric associated with cut and sew techniques, garments could be knitted quickly.

### III. CAD in Printing

The main uses of CAD system are the creation of original designs, or the interpretation of artwork supplied by customers,

the latter being either painted artwork, fabric samples or possibly black and white film negatives add few lines. The following is the list of advantages of digital textile printing:

- Permits customers to control the design and printing process from remote locations.
- Virtually eliminates the expense and time of screen printing preparation.
- Makes Just in Time (JIT) delivery and the Quick Response is also possible.
- Can virtually eliminate the threat of design theft before market release.
- Facilitates the increase in the number of fashion seasons.
- Prints directly from easily stored, transmitted, and transported computer files.
- Reduces the space necessary for archiving art, films, plates, and screens.
- Is more cost effective for proof and short-run printing than analog printing methods.
- Reduces proofing time from weeks to hours, thus accelerating design and product development.
- Permits customization and personalization. Allows for design correction and modification at any time without significant schedule delays or cost increases.
- Eliminates the design and process distortions associated with on-contact analog printing.
- Is cleaner, safer, and generally less wasteful, and less environmentally hazardous than analog textile printing methods.
- It has been established that, thanks to digital printing technology, designers can now reduce textile research and pattern design time by over 50%.
- The designer can now see how a particular piece of fabric or garment will look in different colours and shapes without having to commit to a final product.

On the basis of above advantages we can say that the transition from traditional design work to using a CAD system can be a very positive experience.

**Creation of Designs:** The designs can be created virtually in the computer using a different type of pen, paint brushes and effects. Usually a motif is created first and is repeated to the length of the fabric. Software packages now have a wide range of effects such as water colour and oil which enable different results to be created with the same input devices. The next step is to repeating the pattern. The use of clone brushes is helpful in the blending of wash effect and backgrounds into the new areas of the design or the artist can draw new motifs to complete the repeat. Following this, is the cleaning up of individual images or motifs. Here we use a combination of reduce brushes, dot clear brushes, dot removal and drawing function. It is easier to work on the CAD systems where the manipulation of the design/ motif is very easy. Any kind of repeat like straight, half drop, mirror, with or without overlap can be chosen. The motif can be rotated to any angle, mirrored, copied and pasted any number of times at the click of a button. The size of the design can also be scaled. Design by can be enhanced shading any texture over the design which produces realistic fabric renderings. Designs that are stored in the system can be retrieved and edited by cropping a portion of the design or adding details to
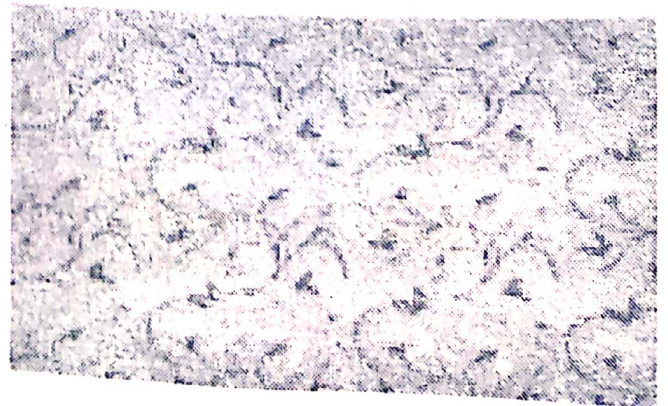
it. The colour of the design can be changed any number of time before finalising it. The storage of the design is easy and does not require a large space as that of the manual designing.

**Scanning Artwork:** Textile design systems sometimes start with work created on paper or other medium. Most companies making printed textiles use scanners to capture data in digital form. Scanner can also be used to scan in black and white, artwork and separates. We can also scan black and white film, and then merge them back into a coloured design in our design station. Of course, the great advantage is that a user can undo any element so that mistakes or unwanted effects can instantly be corrected. Other systems use digital cameras as a means of data capture.

**The Editing of Designs:** The first step in editing a design is to take the scan file and do some colour reduction to get the file as close as possible to the final number of colours that the finished design will have. Some of this will be done by the colour reduction function in the CAD system, where the computer picks the next closest colour left in the palette to replace the colour to be discarded, or we choose which colour we want to replace the colour being discarded. We then use CAD systems to manipulate the image, changing colours, adding, deleting, moving or copying elements and putting them overall into a suitable pattern repeat.

# CAD in Garment Designing – 2D and 3D Forms

## CAD in Garment Designing – 2Dimensional

The apparel design is very specific with its various drawing tools and tools for modification in CAD systems. The maximal aid is possible only after the optimum use of tools. As mentioned earlier CAD enables the designer to tackle a task more quickly

and accurately, or in a way that could not be achieved by other means. CAD (computer-aided design) has become a major part of the design process and to become a designer or manufacturer, on should understand the importance of CAD software in today's fashion industry. Design may be created from the scratch using a stylus, with colours and textures from the large library of the system. Previous designs can be recalled and modified. It is also possible to produce an image from photographs which can be digitized and modified using different drapes and lights.

'Style testing' meaning pretesting with consumers, can aid in easy identification of styles with low consumer interest and can be eliminated. A fashion scout can see a new design in Europe, transmit the colour photo to incorporate headquarters, where a prototype design can be developed using CAD. The designs thus submitted to consumer testing can be tabulated within 24 hours.

Increasing number of fashion designing software is available for the designer to work with. The nuances of the software are listed as follows;

- The software has a library of different types of models for different ages, varied sizes and shapes. Hence the time needed to create a base figure is eliminated.
- The software is customised for different fabric structures. The colours of the fabric swatches can be changed in part or full.
- The software also aid in final presentation of the garment in an attractive way.

CAD designing is not observed by some of the designers because:-

- Sketching directly on the computer with a mouse is awkward for an artist trained to draw with pen and pencil.
- Many designers are unfamiliar with the computer and are unwilling to master those skills

# CAD in Garment Designing – 3Dimensional

Garment designs for the 3D human figure are usually presented as sketches or photographs, which is 2-Dimensional. In 2-dimenesional sketches it becomes hard to imagine how it will be in the other angles, say for example side view. Fashion design drawings will be more convincing if the model and the garments are portrayed with a certain 3-Dimensional effect. 3D computer visualisation is a very effective way to communicate design ideas. The need for 3D designing can be listed as follows:-

In this age of information technology, it is essential to have a database of garment designs in the 3D image. Traditional garments are a treasure to our heritage. Hence it is necessary to store them in the 3D form for the future generation to view our rich culture.

• Before the dress is sewn, the tailor cannot know for sure what the dress will look like and what the effect will be when it is worn on the human body. For a new fashion design, the tailor can only imagine the results, depending on his experience and talent. With 3D designs, there is no need to physically produce the product. The styles can be presented to the consumer and tested for their acceptance or rejection.

• Fashion show is the presentation of a designer collection using a human model. This involves lot of time, manpower and money. The 3D images can present a virtual fashion show at a minimal cost.

• Clothing is three dimensional, which means it is perceived in the round. As we visualise some of our designs on paper or view them from catalogs and magazines, it is important to remember that this view point is only two dimensional shapes. 3D catalogues will be of great interest to the consumer while shopping through internet.

- 3D designing also enhances e-business capabilities by allowing the user to create an e-store with the 3D collections prepared by the garment manufacturing companies.

The 3D designing software is of two types, one is general purpose software and the other is a customised fashion designing software. The general purpose software include 3D Studio Max, Cinema 4D, Poser and so on. Some of the fashions designing software are VStitcher, Optitex, Modaris 3D and Assyst Bulmer.

Today there is an increasing demand for the involvement of 3D computer graphics in textile industry and entertainment industry. Especially, computer aided design systems, fashion design programs; new generation movies and computer games require new tools that perform realistic simulations.

Geometric transformations are more involved in three dimensional space than in two dimensions. Viewing transformations are much more complicated because we have many more parameters to select when specifying how a three dimensional scene is to be mapped to a display device.

## Designing Process

- Three dimensional viewing of objects requires the specification of a projection plane, a centre of projection or the direction of projection and a view volume in world co-ordinates.
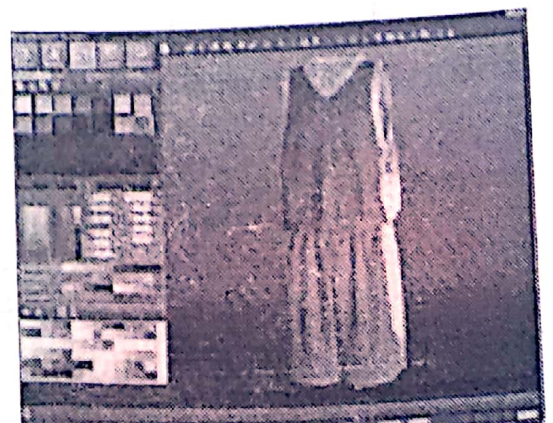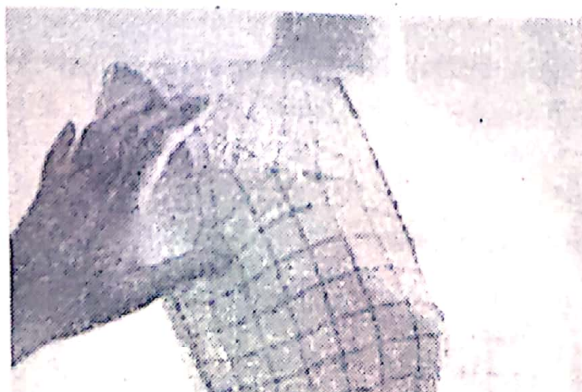
- Creating human figure is itself a research. Hence it can be downloaded from an available source. If it is a fashion designing software, the models are available in the library which can be modified for a wide variety of human body shapes, hair colour, shoulder slope and postures.
- Designs are created by drawing directly on the 3D model. It acts as a mannequin or human body
- It is acknowledged that advanced 3D garment sketching tools are required for dressing a mannequin directly in the virtual world.
- The garment designing is similar to the process of draping, where a material is placed over the body form to create different styles of garment. Similarly 3D lines or shapes are created over the body form and a garment design is created.
- Once a 3D object is created, textures and colours are applied to it to make it seem more realistic – rough and coarse or shiny and smooth. Shading is the process of calculating the colour of a pixel or a shading sample from user specific surface properties. Shading model and texturing is the method of varying the surface properties from point to point in order to give the appearance of surface detail that is not actually present in the geometry of the surface.
- Texture application is a method of projecting pictorial information (materials) onto surfaces. Materials make the model and the garment look real and interesting. The texture is applied with the material maps available in the material library. When a material is wrapped around the surface of an object, it can be stretched or shrunk so as to follow the shape of the object.
- Rendering produces the final output file and needs specifying the file type, frame size and frame. Rendering is a technique that facilitates users to get a preview of how objects can appear in the final 3D product after the users have modelled them, animated them and applied the desired shading, texturizing and lightening on them.

- A circular path was set for the camera to move. The render setting was set for a definite number of frames. Brightness and contrast level were adjusted to give more clarity to the scene. The fashion figure is placed in the stage setting and is animated. Animation refers to the movement of the object and the scene at different angles. This enables the viewer to get full view of the garment at all possible angles.
- The most difficult task is simulation of the fabric. It takes a lot of geometric calculations to give a beautiful fall to the fabric. The beauty of the garment lies in the graceful movement of the fabric while the human walks. This still predominantes the area of research
- In some of the fashion designing software, it is possible to prepare a 2D pattern which will be converted into a 3D garment, virtually draped over a human figure. It is interesting to note that the while the pattern is being draped on the model the sewing of pattern pieces takes. Another notable significant feature is that the fit of the garment can also be checked. This tightness of the fabric is shown by displaying redness in the garment parts and so on.

3D Scanning: Developments with 3D body scanning systems are capable of producing anthropometrics data and offer a direct link to the 3D design and pattern making. The customer is welcomed into the cabin by an automated voice system that explains the procedure. Featuring an automatic body positioning control, it helps the person find the ideal position and then automatically triggers the measurement process, which is simple. It takes less than a minute to start up and the cycle comprises of an automated calibration of 110 measurements within 30 seconds. It uses digital projection of structured white light and does not affect the skin. It captures the human subjects quickly enough of reconstructing the complete set of 3D body

data and automatically extracting body measurements. This automatic measurement technique means more privacy for the clients. Shops can further adopt a morphological database that will help to optimise stocks and customer loyalty. It helps to provide tailor-made comfort and elegance at a ready-to-wear price.