Patternmaking: Past to Present

By Dr. Kim Anderson, Writer/Reporter for [TC²]

The creation of a garment is comprised of interdependent yet disparate processes. The appearance and fit of a garment is highly dependent on each process. Patternmaking is one of the earliest steps in the development of a garment. It is a craft that has evolved over the centuries into a skilled technical process. Today, patternmaking tools have been carefully tailored to quickly perform repetitive time-consuming tasks, allowing apparel companies to cater to the fast-paced world of fashion. As technology improves and research intensifies, patternmaking software packages continue to become more sophisticated. Software packages are being finely tuned in order to successfully address the needs of the apparel manufacturer.

In the late medieval period, weaving was a laborious process, carried out entirely by hand on primitive looms. As a result fabric was regarded as a coveted commodity. For the most part, clothing was constructed with rectangular shaped pieces of uncut fabric. Fabric was left intact to minimize waste. In the fifteenth century the seminal art of patternmaking began. Instead of using uncut fabric, carefully engineered pieces were cut to contour to the body. Forevermore, fabric would take a back seat to fashion (Macdonald).

Prior to the Industrial Revolution the art of patternmaking was highly revered. Tailors meticulously worked with their client's personal measurements to customize patterns. Clothing made by tailors was elaborate and relegated only to the very rich. With the onset of the Industrial Revolution, standardized patterns were essential to the success of ready-to-wear clothing. Initial attempts to create standardized patterns resulted in poorly fitting garments with little detail. Men's suits were boxy, plain, ill-fitting sacks. After lengthy experimentation and standardized sizing, patternmaking made a triumphant transformation from customization to standardization (Macdonald).

Patterns can be formed by either a 2D or 3D process. Often a combination of methods is used to create the pattern. The most common 2D patternmaking methods are flat, drafting and reverse engineering. In the flat method, a pattern is generated from an existing foundation pattern called a sloper or block. A sloper is a pattern that has no seam allowances or style lines (Macdonald). From a sloper a myriad of garment styles can be generated. The patternmaker creates a new style by adding design details such as a collar, pocket and pleats. The flat patternmaking method is widely used in the ready-to-wear market because it is fast and accurate (Aldrich).

In the drafting method, patterns are made directly from measurements taken from a preexisting garment, an individual or a body form. Using the collected measurements, the pattern is drawn directly onto paper (Ng).

Reverse engineering is sometimes referred to as garment deconstruction or a knock-off. In the reverse engineering process, patterns are made from an existing garment. The garment is taken apart, analyzed and the patterns pieces are made (Burg).

In the 3D patternmaking process, the pattern pieces are generated from a 3D form. Draping is one of the oldest methods used to generate a pattern. In the traditional draping process, a garment is produced by molding, cutting and pinning fabric to a mannequin or individual (Burns). Style lines and constructions details of the drape are carefully marked and removed. Fabric pieces with the construction and style details are generated. The fabric pieces are then laid flat over pattern paper and traced. The pattern is finalized by adding directional markings such as grainlines, notches, buttonholes, correct seam and hem allowances and facings (Burns). Draping is especially helpful when developing intricate garment styles or using unusual fabric (Macdonald).

Computers have been used by apparel companies since the early 1980's. Pattern Design Systems (PDS) have become invaluable tools to the patternmaker, assisting in much of the repetitive tasks associated with patternmaking. PDS systems are capable of storing an incredible amount of data that can be quickly retrieved, tweaked and re-filed. Using a mouse or stylus, patternmakers are able to swiftly add style details and make changes. There are many benefits to PDS - speed, accuracy and ease of data transmission being some of the most obvious. In today’s competitive environment, software companies are zeroing in on the growing demands of the apparel manufacturer.
Gerber Technology offers an array of software packages designed to address many aspects of the apparel design and manufacturing process. Gerber is continuously pursuing the latest technologies to improve their software. Currently, the main focus at Gerber is speed. Angela Cruz, Product Manager AccuMark Family Products says, “We are investing in cutting edge technology that enables our customers to shorten their product development cycles so they can get their products to market faster.” Speed has always been one of the defining features of the PDS, however, Gerber has developed unique tools to expedite the patternmaking process.

Gerber Technology has recently introduced 3D Direct™, a user-friendly 3D flattening software package. Cruz explains, “This software takes a 3D model of a car seat, for example, and allows the user to flatten it automatically into 2D parts which can then be used in the AccuMark or CutWorks software (Gerber's 2D PDS). This can take days even weeks out of their product development cycle.” The 3D flattening software minimizes the need to make “full-size physical prototypes” required to create flattened patterns. The software also has a color coded stress visualization feature that allows the designer to view points of stretch and sag.

A question on many industry professional's minds is - when is 3D computerized patternmaking going to be available for apparel design? One of the main advantages of 3D patternmaking is the ability to generate patterns that provide excellent fit. Starting with an actual 3D form as opposed to working in 2D allows the patternmaker to better assess body shape. Cruz has “seen good results for creating basic blocks from scanned bodies,” but adds “we are still a long way off.” She also expresses a bit of insightful caution – “I'm not sure if the apparel industry is progressive enough to embrace such a massive paradigm shift.”

OptiTex specializes in the development of innovative, easy-to-operate, CAD/CAM solutions for sewn products and other related industries. Yoram Burg of OptiTex says one of the main focuses of their research is “… 3D simulation and animation.” 3D fashion software with the ability to produce realistic cloth simulation will soon be available. A demo of the software shows a virtual model walk toward the viewer, turn and walk back. The flow and bounce of the fabric is quite impressive. Burg rightfully boasts, “The OptiTex engine is very good.” To insure that kind of realistic result, Burg warns, “Make sure if you're driving a Mercedes Benz that it has a Mercedes Benz engine in it.”

Burg says they are focusing on patternmaking software that works “3D to 2D…the ability to work the reverse process.” In OptiTex Runway ™, changes can be made to a 3D image, and the style changes can instantly be seen in the 2D environment. The patternmaker can change the styling according to their preferences, for example, adding darts and dropping necklines. With these sophisticated visualization tools, merchandisers and sales personnel can play the “what if game.” Styles can be adjusted according to the customer's preferences, viewed and sent directly to the patternmaker via email.
OptiTex is in pursuit of “better fit.” New software is being developed to generate patterns that will produce garments with better fit. Patterns that accommodate unique body shapes can be generated by two different methods: specific points on a computer generated drape can be manipulated or patterns can be tweaked according to a computer generated drape produced from an actual body scan of the individual.

OptiTex is researching computerized 3D patternmaking. But Burg admits it is a challenge. He notes that “the world of apparel is like the world of medicine…it must be 100%.” The long term goal at OptiTex is to develop software in which the patternmaker can draw directly on a 3D form to create 2D patterns.

Lectra is one of the largest global suppliers of software to the textile and apparel industries. Jean-Louis Heyd, Strategic Projects Manager / Large Accounts Brand & Retail shared some of Lectra's latest developments.

At the beginning of 2005, Lectra released the latest version of their PDS system - Modaris V5. Four new features were added to further assist the patternmaker:

- Addition of 40 new functions which will allow the user to quickly and accurately perform traditionally manual
tasks.

- Ability to export and import Modaris V5 files more easily.

- Addition of a “dynamic chart.” The chart contains measurements that the patternmaker can define and manipulate to produce better fitting patterns. From the measurements, a template can be produced and used to modify similar styles. The modifications made to the pattern can be executed quickly and accurately with little operator participation.

- Addition of Modaris Asset Manager, which allows the user to create models. Utilizing a combination of pre-defined data and user-defined data, the patternmaker can retrieve models or create new models.

Lectra is continually evolving their software to better suit the needs of their customer. Lectra plans to offer a unique service that will benefit the customer, retailer and manufacturer. Measurements collected from a body scanner will be used to create a “size survey.” The data in the survey will allow the company to segment their customers into two groups - those who fit ready-to-wear apparel and those with more challenging dimensions, and therefore require “made to measure” apparel. It is a win-win situation- better fitting clothes = increased customer satisfaction = fewer clothes relegated to the sales bin.

Lectra has designed a system that will enable patternmakers and stylists to assess the fit and style of a garment using 3D prototyping. The system analyzes the topography of the pattern, noting how the pattern pieces are assembled. From this data the system drapes a 3D garment onto a 3D model. Fabric properties are taken into account to reproduce a realistic virtual drape. 3D prototyping is an excellent visual tool that allows the patternmakers, stylists and merchandisers to fine tune fit and style in a 3D virtual environment.

In 1998 Lectra acquired the U.S. company Computer Design Inc. Based on previous work done at Computer Design, Lectra has developed a 3D design solution software called DesignConcept 3D (DC3D). The software targets the home furnishing and automobile industries. Realistic virtual prototypes can be generated. The software is able to identify areas of fabric compression and extension to produce a more realistic image.

![Points of Fabric Compression and Extension](https://www.techexchange.com)

*Points of Fabric Compression and Extension*  
*Courtesy of Lectra*
In the DC3D software, patterns pieces can be adjusted according to the fabric design.

Lectra is currently researching 3D to 2D patternmaking. The goal is to have the ability to draw on a 3D model to generate 2D patterns via a “flattening process.” Fabric properties need to be considered. Fabric distortion occurs when transferring a pattern from a 3D form to a 2D form. At this time there is no date for the release of such software but research continues.

PAD System Technologies was founded in 1988. The company is based in Montréal, Canada. PAD was one of the first companies to offer CAD/CAM systems in both Windows and Macintosh. Today, PAD systems can be seen in over 50 countries and is available in 15 different languages.
Andrei Tilin, Marketing Manager of PAD System Technologies, offered some insight into why PAD systems have become so popular. Tilin says a major plus is the ergonomics of the modules, "... it is particularly easy to learn and easy to use with fewer clicks than other systems.” He goes on to say “PAD's unique Plan View allows the pattern maker to use work methods that are similar to manual pattern making, yet much faster.” Any type of patterns can be designed "quickly from scratch or blocks in less working steps."

PAD has a keen interest in their user's needs. Programmers are continually making improvements to the software based on the user's feedback. Tilin strongly believes the main industry trends will be “speed, more automation and more intuitive working methods that will boost user's productivity and efficiency.”

Tilin believes that in the future the apparel designer and the patternmaker will work closer together, making the entire process more time and cost efficient. When asked about 3D to 2D pattern making, Tilin responded “The core element of this system is already available for the PAD user... from the original 2D pattern the patternmaker can create and dynamically modify 3D samples in the PAD System Haute Couture 3D module.” He goes on to say, “The next step in development will be the reverse engineering process, from 3D to 2D - coming soon.”

3D to 2D automatic pattern unwrapping is one of [TC]²'s newest software developments. [TC]² has been researching 3D to 2D patternmaking for the last two years. The main impetus for the research was to produce better fitting slacks for women. In the ready-to-wear market, the 2D patternmaking process assumes a standard body shape for each size category. Using standard measurements to create garments neglects the inherent variability of a woman's body.

A pattern can be made from a 3D form in just a few steps. An individual's measurements are collected from [TC]²'s NX12 3D body scanner. The measurements are used to create a virtual 3D model of the individual's body. The 3D to 2D software allows the user to define a garment surface in relation to the 3D body model. Once the garment surface is defined, the application automatically unwraps and outputs a 2D flat pattern in .dxf format. Unlike the traditional 2D patternmaking methods that assume a single body shape, [TC]²’s 3D to 2D patternmaking process accounts for an individual's distinctive shape.

At present, [TC]²'s 3D to 2D software can generate pant, skirt, and bodice patterns. Garment ease can be added to the pants to create a style specific silhouette. Skirt and bodice slopers can be generated with customizable features for garment length, sleeve length, and shape. The automatically generated pattern can be imported into any pattern design system having .dxf conversion capabilities, where more complex styling and construction features can be added.
The ability to mass produce customized patterns according to an individual's unique body shape could offer tremendous benefits to the consumer, retailer and apparel manufacturer. [TC]² continues to research this exciting field with a long term goal of bringing superior fit and performance to the customer.

The apparel industry is notoriously fast-paced and competitive. Innovative software companies continue to make improvements to their PDS to enable apparel companies to better serve their customers. Current research focuses on generating patterns that produce better fitting garments and 3D visualization tools to help fine tune style. With ongoing technological advances and diligent research, patternmaking software companies continue to successfully address the needs of their customers.

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**References**


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