

Evolution and Advancements in Pattern Making: From Historical Techniques to Computerized Innovations

Ms. Rakhi Virmani

Assistant Professor

Department of Fashion Design

School of Journalism and Liberal Arts, Devbhoomi Uttarakhand University, Dehradun, India

Abstract — As the blueprint for constructing garments, pattern making is a fundamental step in the garment construction process. The development and importance of pattern making in the fashion business are examined in this abstract. It goes over important ideas including pattern blocks, grading schemes, and grain lines and how these help with cutting and piecing together fabric pieces. During the industrial revolution, pattern making historically changed from bespoke tailoring with individually tailored patterns to mass-produced ready-to-wear garments with standardized patterns. These days, specialized pattern maker are essential in converting design ideas into functional patterns that provide manufacturers with precise construction and easy-to-follow assembly instructions. Anyone working in the fashion industry needs to be familiar with the vocabulary and pattern-making procedures in order to efficiently produce high-quality.

Keywords: Industrial Revolution, Mass Manufacturing, Standardized Patterns, Pattern Blocks, Grading Methods, Bespoke Tailoring, Grain Lines

I. INTRODUCTION

The very basic meaning of pattern is template. Before construct any garment, to make our work simpler we first do paper pattern. Some common terminology pattern making is Grain. Grain is the basic term in pattern making which refers to the direction & this actually helps us to follow the proper direction, when we placing the paper pattern to the fabric and when we do the drafting on the paper. The grain refers to the direction of warp & weft yarn on the fabric. Grain line which actually highlight the warp yarn on the fabric. With the help of pattern we can construct any type of garment. Pattern is nothing its just a template which is generally made up of in piece of paper. It is also known as slopper. When it is used for industry production. We defined a block pattern as a custom fitting basic pattern from which many different style can be develop. Pattern are generally made up of paper but sometimes it is made up of sturdier material like cardboard or paper board.

According to (Dibyendu Bikash Datta, 2018) during the overdue medieval length, cloth weaving turned into accomplished manually on primitive looms which have been a gradual and laborious manner and therefore material changed into taken into consideration as a coveted commodity. Square fashioned material pieces have been used for garment production to reduce waste. The seminal artwork of pattern making commenced within the 15th century. In area of rectangular uncut fabric, pieces had been cautiously reduce as in line with length and body's contour. The art of sample making prior to the commercial revolution changed into extremely revered. Tailors labored meticulously to personalize patterns based on their consumer's private

measurements and apparel changed into difficult and totally relegated for the wealthy. The onset of the commercial revolution marked the importance of standardized patterns for the fulfillment of prepared-to-wear apparel.

In historically reduced bespoke apparel by way of directly marking measurements on fabric by tailor's chalk have been evolved for each purchaser. Which is likewise known as tailoring approach in sample slicing and home stitching? Whilst in commercial production, business patterns were added to cater the mass production to match several trendy sizes. Pattern 'blocks' or 'slopers' have been tested to have an impeccable match and are altered to create a spread of recent patterns. The technique of growing special sizes of a completed pattern is called 'grading'. It enables in developing a line of in a different way sized or contoured clothes which might be but further patterned. Numerous firms promote pre-graded styles to clients who further sew them at home. Business clothing producers commonly hire specialized sample maker to make their personal in-house styles as part of their layout and manufacturing technique. Sample makers are responsible for making sure assembling of add-ons and clothes via sewer and producers. Each layout is tested by way of pattern makers to discover the best way to interrupt a pattern down into a series of portions as according to layout that may be reassembled; construct paper outlines of each a part of the design and verify that the layout can be nicely reassembled; prepare a set of commands that can be used by producer to reassemble the design from the sample; make notes on the pattern to factor out where every piece be attached and in which every feature (button, pocket, zipper, and so on.) have to be placed.

II. METHOD OF PATTERN MAKING

Drafting method is also known as flat pattern method as the patterns are drafted on flat paper. Drafting patterns are of two types.

- 1) The patterns that are drafted for a style and it is based on individual body measurement.
- 2) Commercial patterns where patterns are drafted for standardized body measurement.

All these patterns of drafting involve mathematical calculation and have a set of instructions for drawing. The pattern is prepared with extra allowance which is called ease allowance. Ease allowance is the difference between body measurement and garment measurement. This allowance is very at different position like chest, hip, waist & hip it can be 4 cm to 10cm. For style that are symmetric the pattern are drawn for one side only and for the asymmetric style the pattern is drawn for both sides.

A. Modelling:

Often referred to as "draping on the stand," this technique for creating patterns involves using fabric on a dress form to

produce three-dimensional models that will eventually be turned into a line of completed sample clothes. While draping is a great way to create patterns, it may also be combined with flat pattern creating. Muslin, an unfinished cotton fabric with a plain weave, is typically used as the medium for draping. In fashion design, drapes refer to the technique of pinning cloth onto a dress form in order to build the structure of the garment design. The draped fabric is then taken off the dress form and used to construct the garment's pattern. High-class fashion frequently uses drapery, which should be playful and motivating since it allows designers to see a clear image of the final product as it is being constructed.

III. IMPORTANCE OF PATTERN MAKING:

Pattern Construction is divided into two parts namely measuring correctly and knowledge of techniques. They are applied learning pattern making by trial and error is like learning to play music by ear. A pattern is a template from which part of a garment is trace on the fabric before we cut out an assemble. Pattern is made from paper. Pattern making is a blue print of garment on the basic of which fabric is cut. It is the technique of drafting or drawing of a garment. Standard size chart dress forms or figures are measure and these measurements are then converted into 2D paper patterns and then garment are made from these patterns. Pattern making is very necessary foe fashion designer to enable to make different garment. Pattern making is very interesting and Important for students as it help to interpreted design and understand with techniques ability. There are many methods for pattern making. Flat pattern making & Draping are common one.

True Bias	TB
Centre Front	CF
Centre Back	CB
Front	F
Back	B
Waist Line	WL
Arm Hole	AH
Neck Line	NL
Shoulder	SH
Grain Line	↔
One Way Grain Line	↓ ↑
Centre Bust Point	+
Two Way Grain Line	↕
Notches	∇ ∇
Stitching line	-----

IV. COMPUTERIZED PATTERN MAKING

Pattern making process is required to run an apparel enterprise easily. Accuracy in pattern comes to a decision garment best. With time, the whole lot is coming in software so pattern making cannot be an exception. Computer Aided layout (CAD) is the usage of the pc era and advancement for the technique of design development and collection development. The pattern making software is part of the CAD machine. Abbreviation of CAD is Computer Aided

Designing. A CAD software is used for pattern making in addition to for marker making and sample grading. Laptop-aided layout or "CAD" is fast turning into the destiny of sketching and garb production in the industry. In now a days state of affairs, fashion layout Institute college students decorate the understanding of a way to use that CAD software program, as this can be the destiny of fashion enterprise. A few famous software, which normally used inside the clothing industry.

- 1) Lectra: (Institute, 2012) defines Lectra as modeling software. It sheds light on the functions that patterns serve in the production of clothing. One essential tool for producing samples is Lectra's Modaris sample reduction software. Title blocks and the entire process of digitizing a garment are covered in short, easy-to-follow steps. A thorough tutorial on the Lectra Modaris toolbox, bar top menu tool, and lower is then provided. With years of real-world experience, CAD clothing prototyping is an invaluable, helpful, and approachable manual for making the most of Lectra's Modaris software. It is ideal for both professionals and students who are interested in textile and fashion design.
- 2) Tuka CAD: Tuka Cad is a state-of-the art CAD software with advanced features. It was founded developed by garment industry Veterans Ram Sareen for the unique needs of pattern maker. Tuka cad advanced software and hardware gives designers and marketers the tools they need to improve operations and increase profits. It offers 2D and 3D pattern design and manufacturing software engineering specifically designed for manufacturing garment markers of all sizes and levels, as well as garment plotters and automatic spreaders and cutters. It is very easy to create notches, darts, folds, seams, drill holes and Internal shapes with tuka cad. Tuka Cad has two components Tuka design for pattern making and grading and Tuka mark for marker making.

Tuka design for pattern making and grading

- a) Measurement chart, pattern card, cutter's must
- b) Integration of artwork and logos
- c) Yield reports and costing
- d) Adobe PDF plot format
- e) Multiple-size grading with automatic half-size creation
- f) Angle grading for curved contours
- g) Block libraries with "master grading"
- h) Automatic grading update with pattern changes

Tuka mark for marker making.

- a) Manual or automatic marker making
 - b) Merge pattern pieces and marker efficient results
 - c) Dynamic blocking and measuring function
 - d) Call up for additional pieces or size
 - e) Create and edit cut path for CNC cutters
 - f) Edit or alter patterns while making markers
 - g) Add bafflers during marking at selected segments of patterns for quality cutting
- 3) Gerber: According to (Rashid, 2021) Gerber transforms your layout, improvement and marker making procedure through an enterprise leading suite of software program application. With the help of this software customer can visualize designs, create accurate patterns and optimize their markers seamlessly sharing information in the

course of the supply chain. Gerber offers an array of software program application designed many component of the apparel design and production manner. Gerber software program is used for digitizing the pattern, grading and marker making. Digitizing is a system of adding info of a pattern or slope into the laptop which is completed by way of Gerber software program. The sample making is executed with the aid of the notch kind, grading regulations, sizes to be produced. Two Different hardware used with Gerber for this purpose are plotter and digitizer. Gerber program storage area is used to define the work vicinity on a laptop. Each character could make his own garage vicinity. A garage place is used to organization related work, which include pattern pieces and a marker for a selected fashion.

Advantage

- a) Boost up sample making responsibilities and save cash : Gerber Software speed the sample making procedure and store fabric, it also minimizes exertions expenses. Pattern designers can mechanically generate patterns from dimension specs either automatically or interactively.
 - b) Grade styles without difficulty: Simplify the grading method by using referencing existing grade rule libraries. Accelerate the technique with the aid of grading multiple sample pieces concurrently.
 - c) Built the greenest markers: With this powerful marker making software program, you get all the records you need for downstream activities including how tons cloth is needed to make the marker, marker duration, amount of fabric wasted and more. Simplify marker making even similarly, upload Gerber's AccuNest™ software which routinely makes markers 24 hours an afternoon, analyzes a couple of nesting alternatives and selects the marker that is most efficient
- 4) Richpeace: One business that specializes in offering software solutions to the clothing and textile industries is called Richpeace. Their software solutions are made to simplify a variety of garment design, production, and management procedures. The main functions provided by Richpeace software include digital printing, marker creation, pattern design, grading, and embroidery design.
- Richpeace software uses automation and technology to increase productivity, accuracy, and creativity in the fashion and textile industries. From the first design concepts to the latter stages of manufacture, their solutions address several facets of the production cycle. It's important to note that Richpeace provides a variety of software packages suited to various requirements in the clothing and textile sector, such as CAD software for creating patterns and embroidery software for creating complex designs.
- 5) GT CAD Software: Software for computer-aided design specifically designed for the garment industry is known as GT CAD (Garment Technology Computer-Aided Design) software. It is intended to help with the process of creating patterns and designs for apparel and other textile goods. Pattern drawing, grading (resizing patterns for different sizes), marker creating (maximizing fabric usage for cutting), and occasionally even 3D depiction of clothing are all possible using GT CAD software.
- Among the main attributes of GT CAD software could be:
- a) Pattern Design: Users are able to design digital patterns for a range of apparel items, including jackets, dresses, slacks, and shirts. The fit, style, and size of these patterns can all be altered.
 - b) Grading: An essential part of producing clothing that fits a variety of body types is the software's ability to efficiently resize patterns to create several sizes.
 - c) Marker Making: To reduce waste during cutting, the arrangement of pattern pieces on fabric can be optimized with the use of GT CAD software. In order to minimize production costs and increase fabric consumption, pattern components must be arranged.
 - d) Digitizing: Hand-drawn patterns or pre-existing paper patterns can be converted into digital format for additional editing and manipulation using certain GT CAD software.
 - e) 3D Visualization: Before creating actual samples, designers can see how clothing will fit and appear on virtual models thanks to the 3D simulation features that advanced GT CAD software may provide.
 - f) Integration with other software: Throughout the product development and manufacturing processes, workflows and data interchange can be streamlined by integrating with other software systems like ERP (Enterprise Resource Planning) or PLM (Product Lifecycle Management).
- GT CAD software provides efficiency, precision, and flexibility to garment designers and manufacturers, and is essential to the modernization and optimization of garment design and production processes.
- 6) Etelestia: A company called Etelestia focuses on offering software for creating patterns and fashion designs. Their program is made to help fashion designers, pattern makers, and production process optimizers create clothes. Etelestia provides a range of information and tools catered to distinct facets of the fashion industry, such as pattern grading, modification, and sketching.
- Typical characteristics of their software include:
- a) Tools for pattern drafting: With the help of these tools, users can design patterns for a variety of clothing items, such as dresses, skirts, shirts, pants, and more. Measurements and design requirements can be entered by users to create personalized patterns.
 - b) Grading functionality: Grading features let users adjust the size of patterns, so they can create different sizes for a single clothing design.
 - c) Design customization options: Options for modifying patterns and designs to suit personal tastes include modifying seam allowances, adding or deleting design components, and experimenting with various shapes and styles.
 - d) Virtual Prototyping: Options for modifying patterns and designs to suit personal tastes include modifying seam allowances, adding or deleting design components, and experimenting with various shapes and styles.

- e) Production optimization: Etelestia software may include features aimed at streamlining the production process, such as marker making tools for efficient fabric cutting and material utilization.

The overall goal of Etelestia software is to provide fashion professionals with the instruments and resources they need to optimize the design and production process, cut down on waste, and more effectively realize their creative ambitions.

- 7) Gemini CAD system: Gemini CAD offers students the chance to explore diverse tools and technologies, empowering them to unleash their creativity and take charge of their learning journey. Their software is primarily focused on pattern making, grading, and marker making for the apparel industry. Gemini CAD Systems offers various products tailored to different needs within these industries, including:

- a) Gemini Pattern Designer: Gemini Pattern Designer software enables designers and pattern creators to produce digital patterns, modify them as needed, and produce markers to optimize fabric usage effectively.
- b) Gemini Nest Expert: This module is focus on designed to enhance material efficiency by automatically arranging patterns within a marker, thereby minimizing wastage and improving overall productivity.
- c) Gemini Cut Plan: Gemini Cut Plan aids in orchestrating the cutting process by arranging markers efficiently, optimizing cutting sequences, and furnishing comprehensive reports essential for production planning.
- d) Gemini Marker Making: Gemini Marker Making is a specialized software designed to craft markers, considering fabric properties, cutting limitations, and production specifications

In essence, Gemini CAD Systems' software is geared towards simplifying the design and manufacturing workflow in sectors heavily reliant on pattern creation and cutting, thereby aiding businesses in boosting efficiency, minimizing wastage, and elevating productivity levels.

Advantage

- a) Streamlined Workflow: The program makes pattern-making, grading, marker development, and cutting planning more efficient by streamlining the design and production processes.
- b) Enhanced Efficiency: Gemini CAD Systems software helps organizations run more efficiently by saving time and money by automating operations like nesting patterns, optimizing marker layouts, and coordinating cutting sequences.
- c) Reduced Waste: The program reduces fabric waste with features like automatic nesting and marking optimization, which saves money and helps the environment.
- d) Enhanced Precision: Gemini CAD Systems software makes it possible to create and modify patterns precisely, guaranteeing correct fit and fitting for clothing and other products.

- e) Customization & Flexibility: The program can be tailored to meet the demands of a particular industry and production standards, giving it adaptability for a range of project kinds.

- f) Integration Capabilities: Gemini CAD Systems software boasts robust integration capabilities, often seamlessly interfacing with other essential systems like ERP (Enterprise Resource Planning), PLM (Product Lifecycle Management), and cutting machines. This interoperability facilitates a smooth workflow from initial design stages through to production, enhancing collaboration and efficiency across the entire process.

- g) Training and Support: Gemini CAD Systems typically offers comprehensive training and support services aimed at assisting users in fully harnessing the capabilities of their software. This ensures that businesses receive the necessary guidance and assistance to optimize their usage of the software and capitalize on its benefits to the fullest extent possible

- h) Romans CAD: Popular computer-aided design (CAD) software designed especially for the clothing and fashion industries is called Romans CAD. From initial design concepts to production, it provides a range of features and tools to support designers and manufacturers at different stages of the product development process.

Among the main attributes of Romans CAD software are:

- a) Pattern Design: For the creation and editing of digital clothing patterns, Romans CAD offers a range of robust capabilities. Designers can digitize pre-existing patterns for additional customization or start from beginning when creating new ones.
- b) Grading: Grading is the process of efficiently resizing patterns to achieve different sizes using software. Grading rules can be specified by different sizes using software. Grading rules can be specified by designers, and graded patterns can be produced automatically.
- c) Romans CAD: Facilitates the creation of marker patterns that reduce material loss during cutting, hence optimizing fabric consumption. It maximizes cutting productivity and lowers production costs by arranging pattern elements on rolls or sheets of cloth.
- d) Integration with other systems: To enable data interchange and optimize workflow procedures across the many phases of clothing production, Romans CAD software can be integrated with other software systems like PLM (Product Lifecycle Management) or ERP (Enterprise Resource Planning).
- e) Digital Printing and Embroidery: Some Romans CAD versions come with tools for creating and displaying designs for digital printing and embroidery patterns on clothing. This makes it simple for designers to produce complex and personalized designs.

In general, Romans CAD software is made to increase efficiency, innovation, and production in the

clothing and fashion sector. It is an invaluable resource for designers and manufacturers looking to improve workflow and maintain their competitiveness in the market because it offers extensive capabilities for pattern design, grading, marker creation, 3D visualization, and system integration.

V. DIMENSION CAD

A. Wild Ginger:

A company called Wild Ginger Software focuses on creating software for the clothing and fashion sectors. It provides a selection of goods suited to different facets of pattern drafting, apparel design, and garment manufacturing. The company's software gives professionals, enthusiasts, and home sewers the tools they need to make precisely and quickly customized clothing.

"PatternMaster," the main product of Wild Ginger Software, is well-known for its extensive feature set for pattern generation, grading, style customization, fit changes, and other related tasks. Different versions of PatternMaster are available to meet the needs of varying user groups, ranging from home sewers to small-scale apparel designers and manufacturers.

Apart from PatternMaster, Wild Ginger Software provides many products and services associated with sewing and apparel design, such as:

- a) Cameo: A piece of software that makes paper patterns to fit specific measurements for apparel and home decor.
- b) A professional-grade version of PatternMaster designed specifically for custom and small-scale clothiers is called PatternMaster Boutique.
- c) The Wild Ginger Community is an online forum and community where members can exchange sewing and pattern design-related ideas, advice, and tools.

In general, the goal of Wild Ginger Software is to provide users with the instruments and materials they need to let their imaginations run wild and produce sewing and design projects of a high caliber. Their software solutions are renowned for their comprehensive functionality, easy-to-use interfaces, and commitment to fulfilling the many needs of fashion aficionados and home sewers.

Some of the computer application for developing patterns like optitex, gerber, lectra, pad tuchtech, Investronica. Digitizer is the device the pattern can be digitized with the help of mouse. The pattern marking like grain line, notches, pockets can be marked while digitizing. Nested digitization can be done for graded patterns. 3D body scanner are used to scan the models. Then the models are imported in virtual sampling application.

Objective of Pattern making:

- 1) To know the principals of pattern making.
- 2) To understand the drafting and flat pattern techniques.
- 3) To comprehend the draping method of pattern making
- 4) To understand methods of body measurements for various garments

Sewing patterns is a fundamental part of sewing clothes since it gives you the templates you need to cut and

assemble fabric into something that fits. As technology and industrialization have advanced throughout history, pattern making has changed from being done by hand using individual measurement-based procedures to using standardized patterns for mass production. Fashion designers and manufacturers can make garments that are fitted to specific body dimensions or standardized sizes with the flexibility provided by pattern creating techniques, such as drafting or draping. Furthermore, pattern making has been transformed by the introduction of computer-aided design (CAD) software, which has streamlined the design process, improved accuracy, and maximized production efficiency.

In the clothing industry, the importance of pattern making cannot be emphasized enough. It acts as a guide for converting design ideas into tangible clothing, empowering manufacturers to create high-quality apparel on a large scale and designers to achieve their imaginative ambitions. Additionally, pattern-making is essential to guaranteeing that clothes fit, feel comfortable, and operate properly, which improves customer happiness and brand reputation. Essentially, pattern-making bridges the gap between creativity and pragmatism, tradition and innovation, and is an essential component of the fashion ecosystem. The future of pattern making is full with exciting possibilities as technology develops further, offering the textile sector more opportunities to improve sustainability, customisation, and precision.

REFERENCE

- [1] Dibyendu Bikash Datta, 1. P. (2018). Various approaches in pattern making for garment sector. *Journal of Textile Engineering & Fashion Technology*, 1-6.
- [2] institute, T. T. (2012). use Lectra Modaris pattern cutting software. Retrieved July 28, 2023, from The Textile Institute series Elsevier: <https://www.textileinstitute.org/product/pattern-cutting-for-clothing-using-cad-how-to-use-lectra-modaris-pattern-cutting-software/>
- [3] Rashid, B. (2021). Pattern Digitizing by Using Gerber Scientific's Digitizer and AccuMark Software. *Textile Learner*.
- [4] Armstrong, H. (2014). Pattern making for fashion design. Pearson Education.
- [5] Gwilt, A., & Rissanen, T. (2011). Shaping sustainable fashion: Changing the way we make and use clothes. Earthscan.
- [6] Kadolph, S. J., & Langford, A. L. (2012). *Textiles* (11th ed.). Pearson Education.
- [7] Kim, M. J., & Cho, M. (2014). Development of the personalized shoe last by digitization and 3D printing. *Journal of Textile and Apparel, Technology and Management*, 8(4), 1-13.
- [8] Kukkapalli, A. R., & Sharma, D. (2017). A review on pattern recognition techniques for apparel and textile industries. *International Journal of Engineering Research and Applications*, 7(2), 26-29.
- [9] Lee, K., Hong, S. H., & Lim, H. (2019). Development of 3D virtual fitting room system based on avatar personalization. *Fashion and Textiles*, 6(1), 1-16.

- [10] Mullet, K., & Mullet, R. (1997). Designing visual interfaces: Communication oriented techniques. Prentice Hall.
- [11] Nayak, R. K., & Shishoo, R. (2003). Apparel manufacturing technology. CRC Press.
- [12] O'Mahony, M., & McNary, J. (2015). Why fashion matters. Bloomsbury Publishing.
- [13] Shishoo, R. (2017). Apparel manufacturing technology (2nd ed.). CRC Press.

