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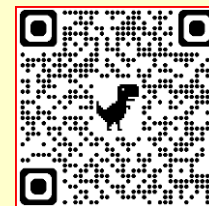
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Research on Professional Garment Pattern Design and Process Innovation

Wu Bingyuan¹, Tang Haiqin², Xu Benqing³, Li Yi⁴, Zhu Xiaohong^{5*}

¹ Pattern Maker, Xiameng Yijie Garment Co., Ltd. Wenzhou, Zhejiang, 325000, China

² Pattern Maker, Eral Fashion Co., Ltd., Lishui, Zhejiang, 323000, China.

³ Pattern Maker, Zhongfu Chengzhi Artificial Intelligence Technology (Hangzhou) Co., Ltd., Hangzhou, Zhejiang, 310000, China.

⁴ Pattern Maker, Hangzhou Xingyou Garment Co., Ltd. Hangzhou, Zhejiang, 310000, China

⁵ Pattern Maker, Zhejiang Qiaodun Clothing Co., Ltd. Wenzhou, Zhejiang, 325000, China

Corresponding Author: Zhu Xiaohong

ABSTRACT

Against the backdrop of simultaneously increasing demands from workplace populations for comfort, functionality, and aesthetics in professional garments, traditional professional garment design faces three core contradictions: "structural rigidity vs. mobility needs," "formality vs. casualization," and "standardization vs. personalization." Based on the technical practices of a leading company in the industry, this paper systematically analyzes its pattern design concepts and process innovations across categories including men's wear, women's wear, trousers, jackets (workwear), suits, overcoats, and shirts. The research shows that "lightweight" structural design, cross-border process integration, three-dimensional cutting technology, and digital intelligent manufacturing are four key directions for professional garment technological upgrading. The company's original core technologies such as "accordion pleat," "compound bow shoulder," "seahorse back," "extreme hourglass," "leg-of-mutton sleeve," "warp-weft unhindered desk-work" and other core technologies, as well as the cross-border integration of Zhongshan collar style, Chinese standing collar craftsmanship, and men's suit sleeve style in the jacket category, provide replicable and scalable technical models for the professional garment industry.

KEY WORDS: Professional Garment; Pattern Design; Lightweight; Process Innovation; Cross-border Integration; Intelligent Manufacturing

1. Introduction

As the material carrier of workplace culture, professional garments' design and manufacturing quality directly affect the work efficiency and quality of life of workplace populations. Industry data shows that China's professional garment market size has exceeded 250 billion yuan, with an annual growth rate of over 8%. However, in

contrast to the rapid market growth, the level of technological innovation in professional garments remains relatively lagging.

Industry research indicates that over 70% of business professionals believe traditional suits cause significant shoulder and back restriction when working at desks; over 60% of working women report that professional women's wear struggles to balance

"professionalism" with "comfort" in pattern design. Additionally, traditional professional garments are prone to issues such as loose collars, deformed cuffs, and upturned hems after prolonged wear.

These figures indicate that the professional garment industry is facing a profound technological transformation. How to significantly enhance wearing comfort and fashion appeal while maintaining the professional attributes of professional garments through pattern design and process innovation has become a core problem urgently needing resolution in the industry.

This paper systematically reviews the technical pathways and practical achievements in pattern design and process innovation from seven dimensions: men's wear, women's wear, trousers, jackets, suits, overcoats, and shirts.

2. Men's Wear Pattern Design: Integration of Lightweight and Ergonomics

2.1 "Lightweight" Design Concept

The core trend in men's wear pattern design for 2024 is "lightweight." This concept is not simply "weight reduction" but rather minimizing the burden on the wearer through systematic structural optimization while maintaining the garment's shape^[1]. Traditional suits, due to multi-layer linings and thick shoulder pads, result in heavy weight, restricted movement, and a stuffy wearing experience. To address this, lightweight design adopts thin shoulder pads to replace traditional thick ones, reduces the number of layers of chest linings and sleeve head linings while making the materials thinner and more elastic, strictly selects auxiliary materials to minimize the area and number of lining layers on the basis of ensuring "shape," chooses soft, lightweight, and elastic lining materials, and modifies the pattern by adjusting the balance of shoulders, back width, armholes, and sleeves to increase fit and ease. The final effect presents a natural, comfortable, and neat style—simple yet not simplistic. The natural stiffness of the fabric highlights the overall texture, abandoning the overemphasized "ritual sense" of traditional suits, highlighting a Japanese and casual style, creating all-weather fashionable business men's wear suitable for commuting.

2.2 Narrow-Shoulder Three-Dimensional Fitted Suit

Addressing the problem that traditional suits have excessively wide shoulders, which does not meet the aesthetic demand of young consumers for "fitted but not tight," the narrow-shoulder three-dimensional fitted suit develops a new pattern template that narrows the shoulder width while using three-dimensional cutting technology to make the shoulder curve better conform to the natural human form^[1], thereby avoiding the visual problem of "broad shoulders looking bulky," making the transition between chest and waist more natural and fluid, both showcasing the wearer's body lines without

creating a tight feeling, becoming a representative product of the new style of suits.

3. Women's Wear Pattern Design: Diverse Styles and Body Inclusivity

3.1 Classic Business Women's Wear

Classic business women's wear is positioned for high-end, serious business scenarios. Its technical features include distinct shoulder angles, fitted chest shaping, X-shaped waist suppression, and smooth sleeve shapes. The overall style is capable and neutral, suitable for workplace scenarios requiring professional authority. The core technical challenge of this design is how to maintain a structured silhouette without sacrificing wearing comfort. This balance is effectively achieved through precise control of chest, waist, and hip proportions and high-precision three-dimensional cutting.

3.2 Fashion Women's Wear

Fashion women's wear is positioned for semi-formal occasions or daily commuting, incorporating current fashion elements including streamlined shoulder lines, soft shoulder angles, appropriate relaxation at the chest and waist, comfortable and natural sleeve shapes, and simple length proportions, fully reflecting the softness of the female body shape.

3.3 H-Shape Slightly Oversized Women's Wear

The H-shape slightly oversized women's wear is a very popular style in recent years, commonly seen in double-breasted designs. Its technical feature is appropriately increased shoulder width, with no emphasis on fit at the chest and waist. To ensure garment balance and aesthetics, the length is also appropriately increased. This design has high body inclusivity and can well modify different body type imperfections. The design sense of the silhouette makes women's temperament more elegant and intellectual, revealing stronger fashion appeal within a stable framework.

3.4 Chanel-Style Box-Shaped Design

The Chanel-style box-shaped design gathers fashion, elegance, and temperament. Its technical feature is the complete relaxation of the overall structure at the chest and waist, extremely highlighting a fashionable and casual feel. This "unfitted" silhouette design is rarely used in traditional professional wear but has important demonstrative significance for high-end fashionable professional women's wear.

4. Women's Trousers Design: Balance of Fit and Comfort

Women's trousers pattern design can be classified according to the following dimensions: tightness (tight, fitted, regular, loose), leg shape (straight, tapered, flared, wide-leg), waistline position, and material drape^[1]. In professional wear design, the following three trouser styles are most common.

Table 1: Comparison of Common Women's Trousers Styles in Professional Wear

Style	Tightness	Suitable Body Type	Core Advantage	Precautions
Skinny Trousers	Tight	Thin, straight legs	Neat and slimming	High requirements for leg shape
Straight Trousers	Regular to Loose	Widest audience	Strong inclusivity	Choose looser style for thicker legs

Style	Tightness	Suitable Body Type	Core Advantage	Precautions
Wide-leg Trousers	Loose	All body types	Modifies leg shape, waist-cinching and slimming	Pay attention to proportions when matching

Skinny trousers are a tight style suitable for those with thin, straight legs. They look very neat and slimming when paired with outerwear, especially suitable for autumn and winter, but have high requirements for the wearer's leg shape. Straight trousers are the most inclusive style, able to modify various leg shape imperfections, with the widest audience. Those with thicker legs can choose a slightly looser straight style for better modification. Wide-leg trousers have wide legs. Their design advantage is that the wide legs can modify imperfect leg shapes, while the waist-cinching and abdominal-control design makes the overall look very slimming.

They appear frequently in many international brands, showcasing feminine charm.

5. Jacket (Workwear) Pattern and Process Innovation

Jackets (workwear), as a special category of professional wear, must satisfy both practical needs in work scenarios and meet certain aesthetic requirements. The company has achieved multiple cross-border integration innovations in this field.

Table 2: Summary of Jacket (Workwear) Pattern and Process Innovations

Innovation Area	Technical Source	Core Method	Achieved Effect
Collar	Zhongshan suit double-curve fold collar	Hundreds of draping adjustments to lapel and collar stand	Excellent fit and comfortable experience
Shoulder and Back	Chinese standing collar shoulder-back process	Integration of formal wear structure into casual jacket shoulder-back	Casual and natural with good three-dimensional wrapping
Sleeve	Men's suit sleeve style	Armhole curve approaching formal wear state	Increased mobility, integration of three sleeve potentials
Garment Body	Draped three-dimensional shaping	Addition of scapula volume in back yoke seam	Solves common problem of front-back imbalance

In collar design, drawing on the Zhongshan suit double-curve fold collar process, the lapel and collar stand were optimized through hundreds of draping adjustments, achieving excellent fit and comfort for the workwear collar. In shoulder and back design, the shoulder-back process of the Chinese standing collar is integrated, innovatively incorporating formal wear structure and craftsmanship into the three-dimensional design of the casual jacket shoulder and back, reflecting leisure, nature, and comfort while ensuring good three-dimensional wrapping of the shoulder and back area. In sleeve design, men's suit sleeve design is applied to the cross-border design of the jacket armhole, with the armhole curve approaching the formal wear armhole state, not only increasing sleeve mobility but also giving the sleeve smooth curved potential, button potential, and forward potential, achieving the "integration of three potentials." In garment body balance, a draped three-dimensional shaping design is adopted for front-back balance, adding scapula volume in the back yoke seam, cleverly solving the common problem of front protrusion and back lifting caused by abdominal protrusion.

close to the neck without pressing. The front lapel forms a close-fitting curve with the chest, fitting without bulging. The chest is full, firm, and three-dimensional.

Through the above systematic innovations, the collar, shoulders, sleeves, and front-back body achieve high unity at the level of garment structural engineering and aesthetics, creating a natural effect when worn. The casual feel of the jacket faintly reveals the backbone of formal wear, possessing both ample mobility and three-dimensional ease.

6. Suit Core Technology System

6.1 Collar: Double-Curve Collar Shape

The collar holds the soul of a good suit. The double-curve collar shape appropriately embraces the neck, fitting and standing taller,

6.2 Sleeves: Accordion Pleat and Leg-of-Mutton Sleeve

When designing sleeves and armholes, a people-oriented design concept is followed, optimizing the overall structure to gain mobility from the structure. The "accordion pleat" design concept emerged—while ensuring the back sides and underarms are smooth, an original active pleat design resembling the opening and closing state of an accordion is created, giving the suit better mobility.

The sleeve adopts a leg-of-mutton sleeve shape, achieving the "integration of three potentials": the sleeve barrel potential conforms to ergonomics, making the sleeve cap full and smooth, and the cuff capable and refined; the sleeve forward potential fully matches the curve of the human arm; the sleeve button potential fits the forearm and arm structure, creating a unity of garment and person when worn. The upper part of the leg-of-mutton sleeve reflects roundness and ease, while the lower part shows a clean and neat fashion shape, with arm and sleeve integrated as one, moving freely.

6.3 Front Chest: Double "V" Design

The chest adopts a front double "V" design, appearing younger and more stylish with strong visual impact. The lower "V" (large opening) reveals the waistband, visually elongating the lower body proportion and highlighting the golden ratio of the figure. The hem edge is designed in a V-shape, giving more spatial feel to the waist and hips, echoing the lapel vertically, better conforming to the aesthetic sense and model of industrial design. The small "V" represents solemnity and business, while the large "V" represents openness and fashion.

6.4 Shoulder: Compound Bow Shoulder

The original compound bow shoulder increases ease for the upper body. When working at a desk, the shoulder state is relatively flat, the back does not ride up, and the shoulder presents a smooth and elegant Milan style, with the shoulder shape conforming to the human body. Only when the garment conforms to the human body can it maintain a certain level of smoothness and fit during movement.

6.5 Back: Seahorse Back and Extreme Hourglass

Garments should not only fit but also modify body shape. The seahorse back shape vividly outlines the beauty of the human back curve, giving the wearer a more elegant, dignified, and fashionable professional attribute.

The back "X" (extreme hourglass) shape particularly strengthens the visual impact of shoulders, waist, and hips, modifying the figure to be elegant and stylish, fully displaying the demeanor of workplace elites.

6.6 Desk-Work Design: Warp-Weft Unhindered

The design concept of "warp-weft unhindered and stylish desk-work" has optimized the ergonomic data of the back width, armhole, and sleeve cap curve to a great extent, with a precise fit to the millimeter. When working seriously at a desk, writing, the sleeves and back no longer cause any binding or hindrance, allowing one to truly experience the subtlety of garment-person unity.

6.7 Process Details

Imitation Hand-Stitched Hem: The imitation hand-stitched suit has accurate stitching between the lining and garment pieces, simple to make, making the hem look natural and fluid, wrapping the hips with a three-dimensional feel^[1].

Pocket Flap Anti-Warping: Through the use of anti-shrink lining, a certain inward contraction force is generated on the pocket flap surface, keeping the flap close to the garment body. The flap maintains a consistent streamlined shape with the garment body, moving elegantly as it follows the contours of the front.

Adjustable Waist: The waist has a hidden adjustable waistband, enhancing the aesthetics of the waistband while retaining 3 inches of adjustment space, eliminating tightness at the waist during movement and business travel. It can adapt to the needs of different body types wearing the same size, automatically stretching the waistband to increase width after a full meal.

Radiation-Proof Pocket Fabric: When a phone is kept in the pocket for a long time, the radiation-proof pocket fabric can effectively reduce electromagnetic radiation to the human body, ensuring health. In an era of constant electronic device use, it minimizes the impact of electromagnetic radiation on the human body.

6.8 Women's Wear Technology System

Currently, most men's wear enterprises do not achieve ideal results in professional women's wear because professional women's wear belongs to a cross-border category between formal wear and fashion, making style design difficult to grasp. Through technical theory research synchronized with international standards, strengthening interaction with research institutions and universities, enhancing the transformation of new technologies and materials in practical enterprise applications, and carrying out product iteration upgrades, the company maintains a leading market position.

Through long-term in-depth research on professional wear trends and international top women's wear brands, a unique and effective set of pattern-making design methods has been summarized.

Drawing on the eighth-generation cultural prototype drafting theory newly launched by the Bunka Fashion College in Japan, the company uses three-dimensional cutting methods alongside flat pattern cutting, allowing many effects that seem impossible with flat pattern cutting to be achieved through three-dimensional cutting, greatly realizing designers' design effects^[2]. Design development is standardized and normalized, pattern making is integrated and modular, and men's suit high-precision shaping processes are used to handle local shaping and details of women's wear, making professional women's wear contain fashion within restraint and exhibit the rigor of high-end industrial design within fashion.

6.9 Digitalization and Intelligent Manufacturing

In the cutting stage, advanced digital cutting technology is adopted, using high-precision laser measurement and computer-aided design to ensure precise cutting of each piece of fabric, with error controlled at the millimeter level. The sewing stage introduces intelligent sewing equipment with the function of automatically adjusting stitch, tension, and speed, and multi-axis linked sewing robots can complete complex sewing processes. Laser cutting technology has the advantages of high precision, high efficiency, good quality, and wide applicability. The production line is equipped with a comprehensive quality inspection system, using high-definition cameras and intelligent image recognition technology to conduct comprehensive inspections of each suit.

7. Overcoat and Shirt Technological Breakthroughs

7.1 Overcoat

The overcoat has achieved multiple breakthroughs in pattern design. The collar incorporates the Burberry trench coat double-curve collar structure, fitting the neck appropriately, fitting and standing taller, with appropriate standing and folding. The front collar looks elegant and stylish, while the side view is fluid and natural, achieving a cohesive look.

The sleeve adopts a leg-of-mutton sleeve shape, full and round, conforming to ergonomics with a refined cuff; the sleeve forward potential fully matches the curve of the human arm; the sleeve button potential fits the forearm and arm structure, with arm and sleeve integrated as one, moving freely, creating a unity of garment and person when worn.

The "warp-weft unhindered and stylish desk-work" design concept has optimized the ergonomic data of the back width, armhole, and sleeve cap curve to a great extent. The seated posture looks stylish, and the garment fibers do not deform due to prolonged stretching, instantly returning to their natural state when relaxed, thus maintaining the garment's shape.

The front chest point position is accurate, with appropriate size, and the transitions between chest, waist, and hips are natural, reflecting an extremely charming curved beauty. The back "X" (extreme hourglass) shape particularly strengthens the visual impact of shoulders, waist, and hips, making the back view curvaceous and graceful. The front and back garment bodies are balanced, with the hem distributed evenly around the body, naturally balanced, possessing both strong fit and mobility.

7.2 Shirt

Shirts also have significant advantages in pattern and process. The collar uses a three-dimensional double-curve cross-connecting structure of the collar band and collar leaf, combined with the Chinese standing collar sewing method, completely solving the

industry-wide problem of shirt collars "flying" and not fitting the neck, making the collar structure conform to ergonomics to the greatest extent.

The collar insert process uses nylon material, available in two methods: external insertion and edge cut-in, keeping the perfect collar state longer. The use of anti-exposure strips and hidden buttons allows the wearer to move freely in the workplace. The second-to-last buttonhole on the placket is designed as a horizontal buttonhole, solving the embarrassing situation of the button coming undone due to excessive tension at the second-to-last button caused by abdominal expansion when sitting. The shirt armhole and sleeve incorporate the fitted armhole structure of suits, a revolutionary innovation that is both fitted and comfortable, completely liberating both arms.

In terms of non-iron technology, a brand new physical non-iron technology is adopted, maintaining excellent wrinkle resistance after multiple washes, with a fabric wrinkle rating of 3.5 or higher. To ensure the garment is natural, flowing, and environmentally friendly, an original physical non-iron process was created, using very few chemical non-iron tapes. Synchronized sewing equipment ensures natural smoothness between the upper and lower pieces of each seam. In collaboration with well-known professional sewing thread manufacturers at home and abroad, sewing threads for different fabric compositions have been co-developed, ensuring consistent heat shrinkage and water shrinkage rates between fabric and thread, maintaining smooth and beautiful seams. Through strengthening the quality awareness of skilled operators and strict quality control, the human factor is brought to its fullest potential.

Fibers are fully interwoven and shaped at high temperatures, forming a memory shape that allows wrinkles to naturally recover. The constant temperature recovery technology allows the shirt to be worn immediately after drying, saving time and worry.

8. Conclusion and Outlook

8.1 Research Conclusions

Based on a systematic analysis of professional garment pattern design and process innovation, this paper draws the following main conclusions:

First, "lightweight" is the core trend in professional garment pattern design. Through thin shoulder pads, reduced linings, and pattern optimization, wearing comfort can be significantly improved while maintaining shape^[1].

Second, cross-border integration is an important pathway for process innovation. The integration of Zhongshan suit collar style, Chinese standing collar craftsmanship, and men's suit sleeve style in the jacket category proves that formal wear structure and casual style can be organically combined.

Third, systematic optimization of key areas is crucial for improving product performance. The double-curve design of the collar, the accordion pleat and leg-of-mutton sleeve, the compound bow shoulder, and the seahorse back and extreme hourglass constitute the core technology system of suits.

Fourth, digitalization and intelligent manufacturing are important supports for technological upgrading. The application of digital cutting, intelligent sewing, laser cutting, and intelligent quality inspection provides reliable assurance for product quality.

8.2 Theoretical Contributions and Practical Value

In terms of theoretical contributions, this paper mainly makes three achievements:

First, it proposes a "Problem-Method-Effect" framework for professional garment technology analysis. This framework requires that each technical point answer three questions: what pain point does it solve? what method does it use? what effect does it achieve? This framework helps establish the causal chain of technological innovation and provides a reusable analytical tool for professional garment technology research.

Second, it establishes a cross-category key area technology comparison system. This paper deconstructs professional garments into four key areas—collar, shoulder, sleeve, and body—examining how technology is implemented in different categories, revealing the transfer patterns and applicability boundaries of technologies.

Third, it distills three core principles of professional garment technological innovation: "unity of form and volume," "balance of static and dynamic," and "integration of tradition and fashion," forming a theoretical framework to guide product development.

In terms of practical value, this paper mainly manifests in three aspects:

First, it systematically sorts out the pattern technologies and process innovations across seven categories, forming a complete technical roadmap from design concept to process implementation, which can serve as a reference manual for enterprise technology research and development.

Second, it provides replicable and scalable technical models, covering key area optimization methods and key technical pathways such as lightweight design, cross-border integration, three-dimensional cutting, and intelligent manufacturing.

Third, it reveals that professional garment technological upgrading follows the law of multi-objective system balance, providing warning and guidance for avoiding extreme tendencies in design.

In summary, this paper constructs analytical frameworks and core principles at the theoretical level and sorts out technical pathways and models at the practical level. The organic combination of theoretical tools and practical pathways gives this paper both academic research value and industrial application value^[2].

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