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## DESIGN OF FASHION MODERN CLOTHING USING INNOVATION TECHNOLOGIES

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*This paper explores the application of innovation technologies in the design of modern fashion clothing. It delves into aspects such as smart materials, 3D printing, and digital design tools, analyzing their impact on enhancing clothing functionality, aesthetics, and sustainability. Through case studies and experimental designs, it presents how these technologies transform the design process and meet the evolving demands of consumers in the modern era.*

**Key words:** Fashion design; Innovation technologies; Smart Materials; 3D printing; Digital Design Tools

### INTRODUCTION

In the highly competitive landscape of the fashion industry, innovation technologies have emerged as game-changers. The integration of these technologies into modern clothing design not only offers enhanced creative possibilities but also addresses contemporary challenges such as environmental concerns and the need for personalized apparel. This paper aims to comprehensively examine the multifaceted role of innovation technologies in shaping the future of fashion design.

### PURPOSE

The primary aim of this paper is to comprehensively explore the application of innovation technologies in modern fashion clothing design. We strive systematically analyze the potential and impact of technologies such as smart materials, 3D printing, and digital design tools. By doing so, to demonstrate how these technologies can enhance clothing functionality, aesthetics, and sustainability. Through practical case studies and experimental designs, we seek to provide valuable insights and strategies for designers to effectively integrate these technologies.

### RESULTS AND DISCUSSION

Innovation Technologies in Fashion Design

#### 1. Smart Materials

Smart materials, including conductive fabrics, shape-memory alloys, and phase-change materials, are revolutionizing clothing design. Conductive fabrics enable the integration of electronic components, facilitating functions like health monitoring and interactive communication. Shape-memory alloys can adapt to body



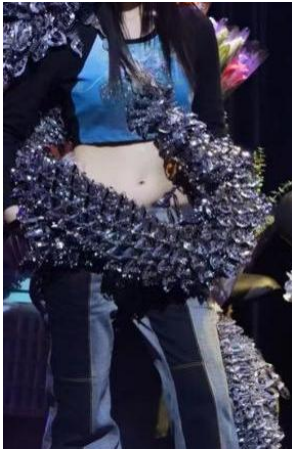
movements and environmental conditions, providing both comfort and style. Phase-change materials regulate body temperature, ensuring optimal thermal comfort. For instance, in athletic wear, smart fabrics can monitor athletes' vital signs and adjust garment properties accordingly, enhancing performance and safety.

## 2. 3D Printing

3D printing technology allows for the creation of complex and customized garment structures with minimal waste. Designers can translate intricate digital designs into physical prototypes rapidly. This technology also enables on-demand production, reducing inventory costs and shortening supply chains. In haute couture, 3D printing has been utilized to produce unique and avant-garde designs that were previously unattainable through traditional manufacturing methods.

## 3. Digital Design Tools

Advanced software such as CAD (Computer-Aided Design) and 3D modeling programs empower designers with precise control over every aspect of the design. Virtual reality (VR) and augmented reality (AR) technologies offer immersive experiences, enabling designers to visualize and modify designs in real-time. These tools enhance collaboration between designers, manufacturers, and clients, streamlining the design process and ensuring seamless communication.



**Fig. 1.** YUEQI QI, F2024  
(Weaving New Dimensions)  
<https://www.vogue.com/fashion-shows/shanghai-fall-2024/yueqi-qi>



**Fig. 2.** Riz Poli, Winter Fashion Week, 2024  
<https://nowfashion.com/fashion-tag/riz-poli/>

## Sustainability and Innovation

Innovation technologies also contribute significantly to sustainable fashion. By reducing material waste through 3D printing and utilizing eco-friendly smart materials, designers can minimize the environmental footprint of clothing production. Additionally, technologies that enable garment recycling and upcycling



are being developed, further promoting a circular economy within the fashion sector. For instance, some companies are using biodegradable smart materials that decompose harmlessly after the garment's end-of-life (**fig. 1**).

1. Case Study 1: Riz Poli Tech-Enabled Activewear (**fig. 2**).

Riz Poli has successfully integrated smart fabrics into its activewear line. The garments feature built-in sensors that track heart rate, muscle activity, and hydration levels. The design seamlessly incorporates these sensors, with the fabric's texture and color remaining unaffected. This has led to increased customer satisfaction and a competitive edge in the sportswear market.

2. Case Study 2: 3D Printed Sustainable Fashion Collection by Iris van Herpen (**fig. 3**). Iris van Herpen launched a collection crafted entirely through 3D printing. The designs utilized recycled materials and showcased intricate geometries that were both visually striking and structurally sound. The collection received acclaim for its innovative approach to sustainable design, challenging traditional manufacturing norms [1].

3. Experimental Design: Interactive Fashion with AR Integration (**fig. 4**). An experimental design explored the integration of AR technology into evening wear. By using a smartphone application, wearers could activate interactive elements on the garment, such as changing patterns and colors. This not only enhanced the wearer's experience but also opened new avenues for self-expression and customization [2].



**Fig. 3.** Iris van Herpen, Haute Couture FW 2022

<https://fashionotography.com/iris-van-herpen-couture-fall-winter-2022/>



**Fig. 4.** Anrealage, SS 2024 PVC  
<https://ua.fashionnetwork.com>



## CONCLUSION

Despite the numerous benefits, the implementation of innovation technologies in fashion design faces challenges. These include high production costs, limited material options, and the need for specialized technical knowledge. However, continuous research and development are expected to overcome these hurdles. In the future, we anticipate more advanced and affordable technologies, further blurring the boundaries between fashion and technology. The integration of artificial intelligence in design processes, enabling predictive design and personalized recommendations, holds great promise.

## REFERENCES

1. Kim, M., Joo, M., & Han, K. (2025). Understanding the Differences in an AI-Based Creativity Support Tool Between Creativity Types in Fashion Design. *International Journal of Human-Computer Interaction*, 预印本 (提前在线发表). <https://doi.org/10.1080/10447318.2024.2448484>
2. Sun, Y., He, W., Jiang, C., Li, J., Liu, J., & Liu, M. (2025). Wearable Biodevices Based on Two-Dimensional Materials: From Flexible Sensors to Smart Integrated Systems. *Nano-Micro Letters*, 17(1), 109. <https://doi.org/10.1007/s40820-024-01597-w>

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## **ДИЗАЙН МОДНОГО СУЧАСНОГО ОДЯГУ ЗА ІННОВАЦІЙНИМИ ТЕХНОЛОГІЯМИ**

У роботі досліджено застосування інноваційних технологій у дизайні сучасного модного одягу. Розглянуто інтелектуальні матеріали, 3D-друк та інструменти цифрового дизайну, застосування яких впливає на покращення функціональності одягу, естетики та екологічності.

**Ключові слова:** дизайн одягу; інноваційні технології; розумні матеріали; 3D друк; інструменти цифрового дизайну.