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Modern Fibers: A Human-Centered Technology

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Clothing represents one of the most ancient forms of human expression and is a tool that an individual use to express his/her culture and social status in society. Since the dawn of civilization, humans have used fabrics to provide basic warmth and show aesthetics. People gradually added more patterns and styles, creating clothing out of different materials. Today, the U.S. fashion and apparel industry are a \$12 billion business, with the average American family spending \$1,700 on clothes annually (BLS Data 2018) [1]. The fiber sector of the clothing and textile industry has undergone substantial change in recent years, and the modern fibers have opened a whole new frontier for clothing products.

Modern fibers, also known as smart fibers, are becoming a human-centered technology. The smart fabrics will have the capability to see, hear, and sense their surroundings and to respond to the external stimulus through an active control mechanism [2]. They can also store information, convert energy, monitor health, control temperature, and change color. The development of the modern fibers has been applied to three main marketplaces: fitness and wellness area (i.e., smart sports shoe, smart bra, and life jacket), military area (i.e., wireless communication jacket and vest that senses toxic gases), and healthcare and medical area (i.e., shirt that measures heart rate).

In fitness and wellness areas, the smart clothing made with modern fibers can be used to monitor human activities and even emotion. For example, the Nadi X yoga pants with sensors and built-in haptic vibrations can gently pulse at the hips, knees, and ankles to encourage movement. In the military area, military forces

are very interested in exploring how modern fibers can increase their safety and effectiveness. The smart clothing made with the modern fibers is becoming a key component in the creation of new military uniforms designed to improve the health, protection, and survivability of a soldier. The University of Massachusetts Lowell has started to explore uniforms equipped with tracking devices to trace the locations of soldiers and to increase their protection in extreme environmental conditions and hazardous situations.

In healthcare and medical areas, the use of smart clothing made with the modern fibers has created benefits for patients and health service providers in the wearable monitoring system. For example, personal data collected from smart clothing, along with predictive analytics, can create a data-driven feedback and monitoring system that improve patient care.

With the economic, technological, and social development, humans are more likely to pursue higher level needs such as individual and emotional need. While clothing is not only a way to keep warm, it can also be used for entertainment, health care, fitness, medical care, and even military areas. The application of smart clothing with modern fibers is simply at its beginning. With the support of Internet development and big data analysis, this human-centered technology will have a vast market prospect.

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