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# Transforming Fashion: The Influence of Technology, Smart Clothing, and Historical Costumes

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**Abstract**

Every day, technology has an impact on our lives in a variety of ways. In this article, we'll discuss how technology advances the field of fashion design and development. One of the fundamental pillars that significantly influences both the Egyptian and worldwide economies is the textile and apparel industries. Thus, the notion of investigating the application of this technology to the garment industry and other vocations arose, necessitating the creation of clothes specifically tailored to the work, location, and surrounding conditions. It was thus dubbed "smart clothing" because of its versatility and capacity to address a wide range of issues. We have already discussed it. In order to include these areas in the field of garment design, we examine some of these areas in this research along with the challenges that workers encounter. A feasibility study was carried out by the researcher on a variety of industries, including building, mining, nursing, and medical apparel. In addition to producing technology, it doesn't have to be specialized employment; it might be for persons with special needs in the area of creating kid-friendly clothing that fits their developmental phases. In addition to the fantastical clothing that is made of numerous, cutting-edge materials to give it a unique aesthetic shape in line with the era's advancements in color and style, there are costumes from various ages.

Keywords: Design, fashion design, smart clothes, functional design.

## Introduction

The term "designer" in this search refers to an individual who, whether via education or viewpoint, works generally from an art school background. Design professionals in the fields of industry, interaction, product, furniture, fashion, and graphic design are among the examples. [1]

An overview of the education and training requirements for designers in the modern fashion business can be found by searching this term. Instead of providing in-depth analyses of any one topic, it aims to illustrate the industry's scope. It could never be totally comprehensive in its contents due to its physical constraints. The search's objective is to compile all of the fundamental information and abilities need to start designing into one place, “smart clothes” growth of creativity, experimentation, and adaptability, this search employs a range of ways for solving these problems. [2]

The concept of smart clothing is recognized as a subject of multidisciplinary study from various fields. Reviewing how various disciplines characterize the intelligence included into the items based on disparate research paradigms and how academics see smart clothing as research subjects is crucial. The convergence of design research, physiology, and textile technology is where smart clothing is found, according to Textile Institute.[3]

Smart clothing places a strong emphasis on clothes while incorporating sensing and communication features. Wearable computers connect readily available electronics and fasten them to clothing using standard technologies. The functional elements continue to be non-textile materials and large, heavy, transportable machineries. True "smart clothing" requires full textile materials for all components, even if continuous efforts have been made to miniaturize

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electronic components for wearable electronics. Since fabrics are more adaptable, cozy, lightweight, durable, and machine washable, people choose to wear them.

Smart clothes should be as simple to use and care for as regular fabrics. Therefore, to create smart clothes with true wearability, a combination of wearable technology and textile/clothing science is required. Smart clothing can be created to assist specialized activities and accomplish specific tasks, making it helpful in a variety of domains like healthcare and combat. It can also be used for sports and leisure, with a greater focus on convenience and aesthetics. [4-13]

## Understanding fashion design in general

Design: Discussions about design in a wider context are necessary before attempting to comprehend fashion design as a field. According to Margolin (1989), the discipline of design has arisen as a discrete and integrative field from a discourse that is just as diverse as the fashion industry. This perspective views the field of design as a single, comprehensive notion that unifies and incorporates all design disciplines. According to John Chris Jones, a Welsh designer with vast experience in design methodologies, there are nearly as many distinct approaches to design processes as there are writers in the subject. This is evident when examining the range of definitions and descriptions of designing.[14]

According to Jones, a more solid definition of the act of designing might be to consider the outcome of the series of actions that start with the sponsor's intention and continue through "the actions of designers, manufacturers, distribution and consumers" to the final impact that the designed object has on society as a whole. [14]

Eighty to ninety percent of environmental and financial expenditures are attributable to decisions made during the design phase. 'Planned obsolescence' has emerged as a key tactic in today's culture to guarantee a constant increase in demand. Fashion designers are in charge of much than only the selection of fabrics, forms, styles, and colors. They should consider the product's whole life cycle while developing their design strategy. From resource extraction to design, manufacturing, distribution, consumption, and end of life, each stage is significant. High quality and long-lasting design—as exemplified by renowned brands like Filippa K and Esprit—should be given top priority since they transcend fads and trends. [15]

Fashion design: In particular, we can characterize the process of "fashion design" as selecting a collection of lines, shapes, colors, or other artistic materials, then creatively arranging or shaping them to satisfy both functional and aesthetic needs while also satisfying human needs. At one time.( see figure 1). [1, 16-21]

In the setting of handicap, where prudence is valued highly, fashion may seem out of place. Some in the medical industry believe that good design is the opposite of being in fashion and that designs come and go. However, adopting more of fashion's principles in addition to its design elements may be necessary to learn from it. Fashion develops and demands a culture in addition to requiring a certain set of abilities. The process by which fashion design develops, whether in the context of haute couture or street fashion, produces radical designs that elicit both favorable and negative responses from various audiences. It might not be feasible to have one without the other, or to have the outcomes without the culture and the values .[1, 16]

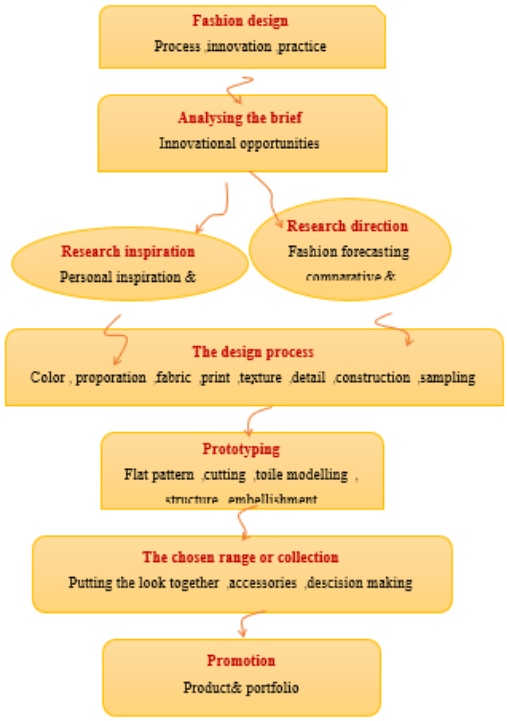


**Figure1**: the way the fashion design process works[2]

## Technology meets fashion

The globe is currently experiencing a new period marked by advancement and innovation in numerous fields as the third century approaches. This evolution has encompassed the fast-moving field of fashion design and execution, which has made use of all the latest technological advancements, scientific procedures, and artistic approaches of the day. Because of its constant state of invention, the fashion design industry is regarded as one of those that is changing the fastest. In order to create contemporary fibers and textile materials with aesthetically pleasing and useful qualities as well as high-quality performance, technological

advancement has also drawn attention from academic and scientific institutes. [22]

**What is the meaning of Techno fashion ؟**

The term "wearable technology" is too general and inclusive to capture the social, cultural, and aesthetic aspects of a more focused on fashion subgroup of electronic devices. Examples range from outdoor clothing, stylish ensembles, and practical workwear to wearable technology and accessories including jewelry, smart watches, wearable cameras, and medical equipment. **[23]**

***Technology in human body***

There has always been a close relationship between technology and the body. Since the dawn of time, people have used wearable or body-mounted devices to extend and amplify their abilities. Clothes plays a crucial role in mediating and regulating how we portray ourselves, whether it is for ornamentation and status projection, or for physical protection and comfort. Electronics and computing have been at the forefront of the body's integration with technology in recent times. This field, which is generally referred to as wearables, has expanded to include electronic and computational fashion, as well as technological equipment (such as smart watches and head-mounted exhibits [24]

Intelligent wearables can be used for nontherapeutic/enhancement purposes (e.g., exoskeletons and hazard detection) as well as therapeutic purposes (e.g., disease diagnosis, treatment, and rehabilitation) depending on the application settings. ( figure : 1 ) [25]

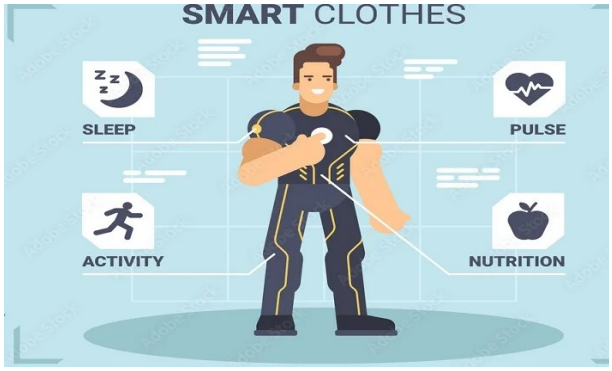


Figure: 1 human activity involving intelligent wearables

The human-centered wireless communication network known as BAN, or human-wireless local area network (LAN), is made up of several sensor nodes that are dispersed throughout the human body and on the surface to monitor physiological information and personal intelligent terminals. [26]

Many senses exist in the human body, but they all function separately and without communication. The availability of BANs, which allow sensors to exchange data over LANs, facilitates more efficient use of data.

The fusion of BAN and smart clothing represents the three-dimensional human-computer interaction between BAN and wearable sensors on human parameters, the external environment, and other devices. It also represents the interactive integration of science and technology with technology aesthetics. It must become a miniature network domain and sensor in the future.[26]

**Functional Design**

It is an innovative use of to create works of art that serve practical purposes for people and, beautify their surroundings, satisfying both practical and aesthetic needs at the same time , style The main focus is on the garment's functional component, which is directly tied to the design's function and intended purpose. The purpose of the object to be designed is kept in mind by the designer while they build the concept. [16, 27, 28]

Many body-worn technologies are available nowadays, from activity trackers and smart watches to medical equipment and responsive apparel.[23]

Modern, technological clothing Fashion products are designed and produced by high-tech fashion using scientific and technological advancements. High-tech fashion techniques draw inspiration from innovations in the domains of chemistry, computer science, aerospace engineering, automotive engineering, architecture, industrial textiles, and sportswear for competitive athletes. Using the newest innovations in production methods and materials is advantageous in the fashion industry, which is known for its quick changes and forward-thinking image. Technology continues to have an increasing impact on how people dress as it gets more ingrained in daily life. [29]

**Materials**

Material This refers to the cloth used to create a piece of clothing. The yarn type, yarn count, yarn twist, weft and warp density, weave structure, and other attributes are among those of the fabric. Changing one or more of these results in different types of cloth. The appearance and feel of the cloth are greatly altered, and this has an impact on emotions, fashion themes, colors, and so forth. [30]

The smart materials used in smart clothing may be made of the same fabric : a vast variety of material kinds, ranging from fibers to fabrics, coatings to stitches, can be found in e-textile sources, which can be numerous. The majority of materials, however, are synthetic, polymer-based

goods when we look at the essential components. Polymers serve as the fundamental building blocks of these materials, producing fibers and yarns that can be utilized for embroidery or sewing, as well as for forming the surface of knitted, woven, and nonwoven forms.[31]

Fibers and threads make up fabric on all scales, from microscopic to macroscopic. While the latter is a substance that lies in between fiber and fabrics and is made up of interlocked fibers, the former is the fundamental component of textile materials. Different methods can be used to make both components conductive; the most popular ones are depicted in( Figure 1).[32]

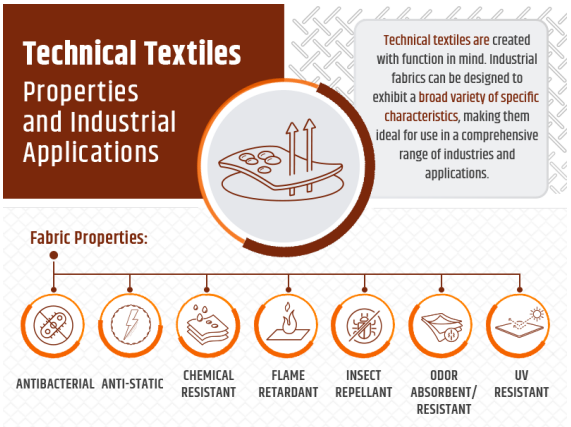


Figure :2 Technical Textiles: Industrial Applications & Types of Fabric

Or they may be electronic devices that are placed inside the clothing during the manufacturing stages. Examples of these devices include:[33]

***Microcontroller***

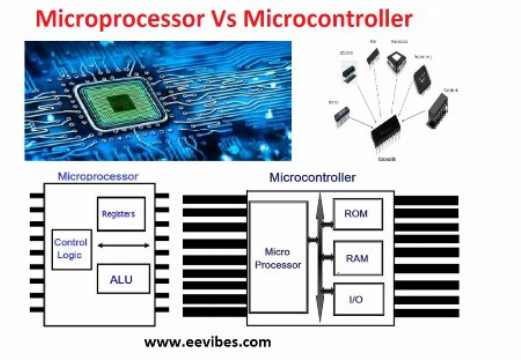


Figure :3

***Power Supply***

***Bluetooth Module***

Figure 4

***Hall Sensor***

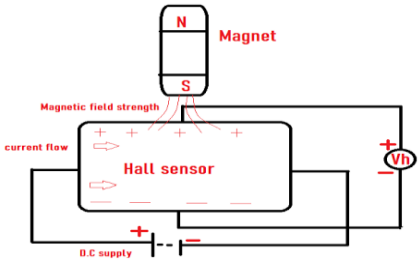


Figure 5

**Smart clothes**

The term "smart clothing" refers to the integration of wearable multimedia computing, wireless communications, and personal imaging (using one or more wearable video cameras) into a device that can be carried in a briefcase or similar container and is comfortably worn in an active "always ready" mode. This is proposed as an alternative to having to choose between PDAs and other environmental technologies like ubiquitous computing and surveillance technologies. video capability (e.g., digitizers, Linux, or corders) Through sea vista, picture c "Smart clothing" is a step toward less—or maybe none—reliance on a centralized infrastructure and more situational awareness through truly personal computing.[6, 34-40]

The merits of potent design are made manifest in smart clothing, where designers working with a variety of materials, technologies, and methods of production firmly bear in mind the end user and their patterns of behaviour. Made by people for people, this relationship demonstrates aesthetics to affect health and well-being and presents functions to assist endeavours. Design combines the versatility and imagination of conceptual creative minds with ever-increasing possibilities offered by new materials. technologies, and processes. Wearable technology specifically operates with complex physical/digital systems, embracing contexts of artificial intelligence (AD), Internet culture, and mobile applications (apps). Such systems are capable of intersecting tech nology with the human body in coherent ways.[41]

Additionally, textiles can have components that vibrate or offer biofeedback. One somewhat easy use case for smart fabrics is in fabric-based antennas. Just conductive threads cut to predetermined lengths can be woven or sewn into non-conductive materials to create basic fabric antennas.[33]

Smart clothing is a product of the Massachusetts Institute of Technology's research on functional military clothing for the U.S. Department of Defense. Its real progress began in 2015 and has since continued apace, with annual shipment and design case growth among its many achievements. [26]

**Use of technology in fashionable apparel**

The fashion sector holds the potential to significantly transform not only the front-end company operations, such as marketing and consumer interactions, but also the back-end operations through increased efficiency along the entire value chain. In particular, technology is viewed as disruptive and revolutionary in the fashion industry when contrasted to the current methods of product development and design. However, this business is still in its infancy when it comes to use, and significant technological breakthroughs will be required before it is widely accepted. As a result, it is a Journal of Fashion Marketing and a developing field of study where academic literature and empirical research are still few. [42, 43]

**Applications**

Wearable computing has several interesting and flexible application scenarios. Just a few of the numerous options that come to mind are watches that can understand gestures, lightning that adapts to the mood, and clothing that can detect heart attacks and help in situations. Applications for garments and accessories with intelligence were grouped.[44]

in various ways by a number of organizations and writers. Since there's no standard classification, the author is adopting one that resembles that of Lucy E. Dunne, the director of the University of Minnesota's "Wearable Technology Lab." Consequently, the application (see figure 6). [44]

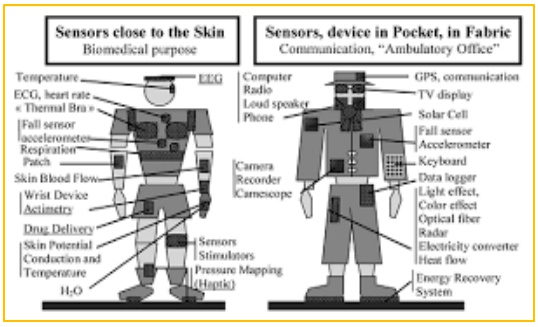


Figure :6 how technology works with clothes [45]

**Examples**

***Sensors***

The elements that change a signal type into another type of signal are called sensors. Though these systems work with the installation of conventional sensors in textiles, they are already capable of measuring heart rate, breathing rate, temperature, movement, and moisture. In the current iteration of intelligent textiles, heart, breath, and movement sensitive sensors have already been manufactured with satisfying outcomes, and the sensors are made from actual textile material. Additionally, a variety of materials and constructions possess the ability to modify signal ( see figure :1 ) [46]

*Application Situation: Health Monitoring for Diabetic Patients*

The Health0 platform is perfect for long-term medical analysis and patient monitoring, allowing a person to understand how his lifestyle impacts his health. Monitoring senior diabetes patients is one such medical application. One of the "heavy-hitter" chronic illnesses affecting the elderly population is diabetes. The Zaurus PDA is to be connected to an ECG sensor and a glucose monitoring sensor. By using ambient user interfaces such as the ambient orb, the information acquired can be presented to people who are in close contact with the individual. When it comes to making sure that the visual information being shown is meaningful solely to the person who is interacting with it, an ambient interface is especially effective.**[8, 12, 45, 47-51]**

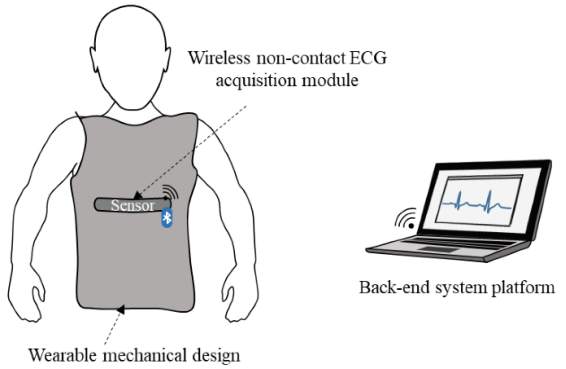


Figure 7 : wearable technical design using sensors

### *Temperature-Controlling Fabric Textiles*

The primary driving force behind temperature-controlled high-tech textiles is the need to maintain a comfortable temperature regardless of the surrounding conditions.

In the 1980s, NASA began developing materials having a phase transition brought on by heating or cooling; these materials had the ability to absorb or release massive amounts of The development of energy was accompanied by a phase shift from solid to liquid. Some technologies have temperature-sensitive pores that can open or close in reaction to the weather. This increases the textile's capacity to be waterproof and breathable since the pores can open in a warm, dry environment and close in a cold, wet one.( See figure : 2) [52]

### Biological clothes

A "bio-skin" fabric that peels in response to moisture and perspiration was created by the Massachusetts Institute of Technology Media Lab in partnership with the Royal College of Arts. The fabric is based on Bacillus subtilis, which are microscopic bacteria in the form of spores that resist heat and whose genes are easily manipulable. These bacteria were discovered 1,000 years ago in Japan and were used to ferment foods. The material covering the openings peels off the wearer when they perspire.( see figure :9) *[22]*

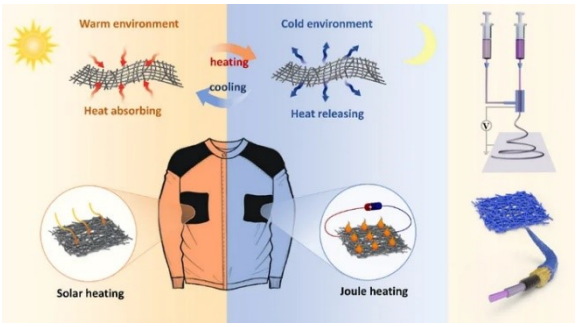


Figure : 8

### *Respiration measurements*

Another textile sensor is created that measures respiration.

***The "Respibelt" is likewise composed of stainless steel yarn that is knitted into a belt as a result of using the Respibelt to measure respiratory rate. The "long term" hypothesis . [53]***

even if the monitoring period is longer than thirty minutes, it is evident that a steady and consistent signal has been produced. xc( see figure :4) ***[53]***

breathing motion. One breathing cycle consists of one inhalation and one exhale . When inhaling, the chest constricts, and when exhaling, it expands.

Breathing activity can be measured in breaths per minute by observing the movement of the chest throughout this procedure. [54]

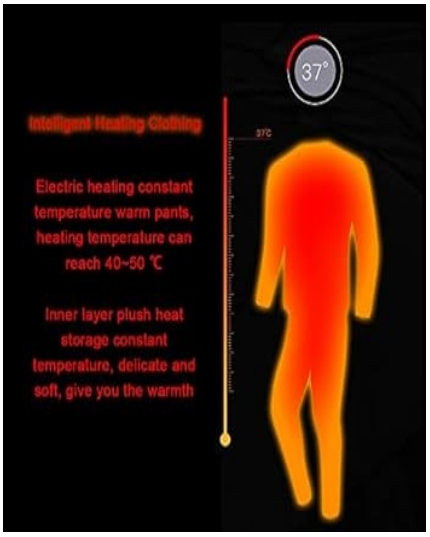


Figure :9

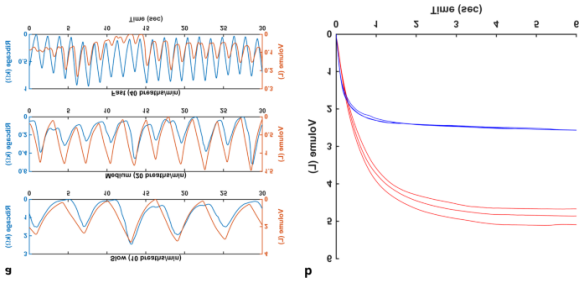

Figure : 10 Respiration rate and volume measurements using wearable strain sensors

### *4D Printing Technology*

Some experts contend that the term "intelligent materials" refers solely to materials that show There are some inherent qualities that can be used to create structures, systems, or goods that behave in a "intelligent" way. Behaviors like self-sensing, self-healing, self-actuating, self-diagnostic, and shape-changing in response to external stimuli are examples of this type of activity. That being said, intelligent materials can be defined as those that

offer a way to achieve an active "intelligent" response. [55]

*Application Situation: Space and Aviation Sector*

The fundamental needs for spacesuits in harsh space conditions are to remove carbon dioxide and create a pressurized atmosphere with an adequate supply of oxygen. Furthermore, there exist additional prerequisites that impact astronaut performance, such as temperature regulation, shielding against micrometeoritical impacts, radiation protection, facilitating unobstructed vision, and facilitating effortless body movement within the suit to execute mission-critical duties. Astronauts' movement is limited by the space suits' current state, which is technically sound but extremely badly constructed ergonomically. With the use of 4DP technology, we can create and expand pilot spacesuits and clothing to ensure that they carry out their responsibilities as effectively as possible. ( see figure :11 )[56]

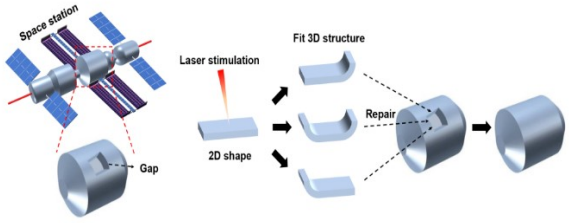


Figure :11 Laser-assisted 4D printing

## Market Opportunity

Smartwatches, smart bands, smart glasses, smart clothes, and smart jewelry are just a few of the wearable technology products that have been introduced globally in the previous few years. The previous section made it clear that smart clothing has a variety of uses, but the worldwide market for wearables is still in its infancy, with North America and Europe accounting for the majority of wearables' market traction. On the other hand, in other nations like China, where 43% of urban Chinese consumers would purchase wearable devices, the demand for smart wearables and clothing is being driven by increased ICT spending, growing health concerns, and an increase in smartphone users.[57]

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## Conflict of Interest

There is no conflict of interest in the publication of this article.

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# تحويل الموضة: تأثير التكنولوجيا والملابس الذكية والأزياء التاريخية

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**المستخلص:**

في يومنا هذا، تؤثر التكنولوجيا على حياتنا بعدة طرق. سنناقش في هذه المقالة كيف تعمل التكنولوجيا على تطوير مجال تصميم الأزياء وتطويرها. إحدى الركائز الأساسية التي تؤثر بشكل كبير على الاقتصاد المصري والعالمي هي صناعات النسيج والملابس. ومن هنا، ظهرت فكرة البحث في تطبيق هذه التكنولوجيا على صناعة الملابس والمهن الأخرى، مما استلزم إنشاء ملابس مصممة خصيصًا للعمل والموقع والظروف المحيطة. ولذلك أطلق عليها اسم "الملابس الذكية" بسبب تنوعها وقدرتها على معالجة مجموعة واسعة من القضايا. لقد ناقشناها بالفعل. ومن أجل إدراج هذه المجالات في مجال تصميم الملابس، قمنا بدراسة بعض هذه المجالات في هذا البحث إلى جانب التحديات التي يواجهها العاملون. أجرى الباحث دراسة جدوى لمجموعة متنوعة من الصناعات، بما في ذلك البناء والتعدين والتمريض والملابس الطبية. بالإضافة إلى إنتاج التكنولوجيا، ليس من الضروري أن تكون عمالة متخصصة؛ قد يكون للأشخاص ذوي الاحتياجات الخاصة في مجال تصميم الملابس المناسبة للأطفال والتي تناسب مراحل نموهم. وبالإضافة إلى الملابس الخيالية التي يتم تصنيعها من مواد عديدة ومتطورة لتعطيها شكلاً جمالياً فريداً يتماشى مع تطور العصر في اللون والأناقة، هناك أزياء من مختلف الأعمار.

الكلمات المفتاحية: التصميم، تصميم الأزياء، الملابس الذكية، التصميم الوظيفي.