

CHAPTER 12

DRESS AND TECHNOLOGY

Kimberly A. Miller-Spillman

After you have read this chapter, you will understand:

- Where research on apparel technology is performed
- The variety of innovation within the apparel industry
- How technology, status, and time intersect
- Consumer preferences for apparel technology
- How tradition and technology are related to culture

In this chapter we observe the many effects that technology has on dress and fashion. For example, prior to the 1850s the method of obtaining clothing was to visit a seamstress or tailor and to sew by hand at home to mend and keep clothes up-to-date. However, the invention of the sewing machine changed the social custom of visiting a seamstress or tailor to going to a store for readymade clothing. Later, women could purchase a home sewing machine and paper patterns (available in the 1860s) to create their own clothing at home. The invention of the sewing machine also made mass production of apparel possible and created a new social class of factory workers. At the conclusion of this chapter you will have the opportunity to reflect on the changes brought about by the Industrial Revolution in the late 1800s and early 1900s and compare those changes to the current state of the apparel industry.

Technology and fashion both change rapidly, replacing the old with the new. For instance, the invention of the cage crinoline in the 1850s offered women a lightweight alternative to expand skirt widths without layers of heavy, starched petticoats (Tortora & Eubank, 2010). The weight of the petticoats had become a health and safety concern for women as they moved through daily tasks. In this case, innovation in women's support garments allowed women healthier and safer lives (see Figure 12.1).

During any given era, there are consumers who will embrace new technology and those who reject it.

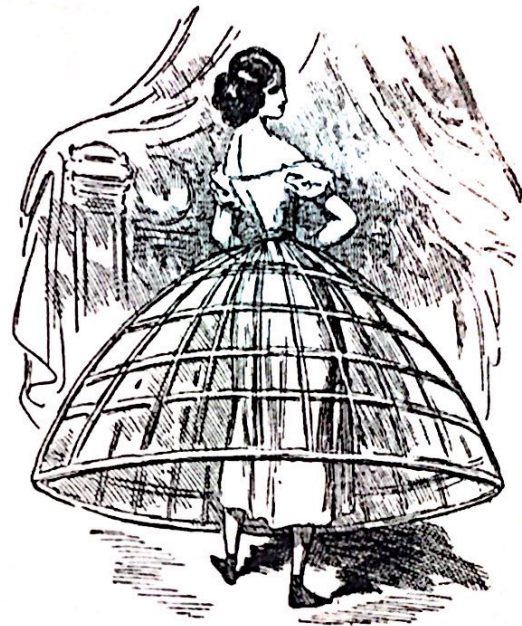


Figure 12.1 Early technology: the cage crinoline (1850s–1870s) provided women with the desired silhouette without weighing down the wearer.

Technophobes come in all ages, but, in general, older consumers tend to stick with familiar processes while younger consumers embrace new technology (see Figure 12.2). A consumer's adaptation of technology is influenced by their generational cohort. **Generation Z** refers to people born between the early to mid-1990s through 2010 (also known as the Internet Generation). They were born after the World Wide Web became increasingly available, and they are the first generation to be born completely in an era of postmodernism and globalism. College students today have grown up with mobile technology, thus creating a consumer who expects technology to continue making life easier, faster, and convenient.



Figure 12.2 Today's college students have always had technology as a part of their lives.

RESEARCH IN THE APPAREL INDUSTRY

Innovation is the development of something new, whether a thought or idea, a practice, or a tool or implement. Technological advances in apparel can be found in a variety of places. **University faculty** is one group that conducts research on apparel technology by obtaining funding from the government, corporations, and the military. **Entrepreneurs** who have a hot idea for the latest in wearable electronics merge nanotechnology with apparel. The **U.S. Military** is one of the largest producers and consumers of apparel and has a vested interest in researching wearable technology to assist soldiers in the field. For more information on technology and the fashion industry, see the reading "5 Technology Trends Transforming the Fashion Industry" at the end of this chapter.

VARIETY OF INNOVATIONS IN THE APPAREL INDUSTRY

Nanotechnology is the science of making electronics as tiny as possible. When nanotechnology companies partner with apparel companies, it results in the development of **wearable electronics**. Everything you can imagine—and probably a few things that you can't—has been tried or is in the process of being tested (Warren, 2001). From clothes that "talk" to washing machines, telling the washer how the garment should be cleaned, to a global positioning system woven into a jacket collar to track a wandering child or an Alzheimer's patient, wearable electronics can do amazing

things. There's clothing that adjusts to your changes in size, clothes that change color to match another garment in your closet, children's sleepwear that sounds an alarm if a baby stops breathing, gym-suit fabrics that absorb odors and can be worn three or four times without offending other exercisers, and fiber-optic wedding dresses or disco trousers that sparkle.

Other innovations in the apparel industry can be found in **clothing for specific needs**, a segment of the apparel industry that accommodates consumers outside of the mainstream (Watkins, 1995a). Clothing for specific needs includes astronauts, firefighters, disabled individuals, and older adults. Any specialized occupation, such as football players, motocross riders, hockey players, people in the microchip manufacturing industry, and underwater divers, could fit under the broad umbrella of clothing for specific needs. For example, "smart" spacesuits can monitor an astronaut's physical condition. This once sophisticated and expensive technology is trickling down to consumers who are willing to pay \$20 to \$60 for a T-shirt (or running bra) that monitors heart rate, body temperature, respiration, and number of calories burned and can warn the wearer of a potential heart attack or heat stroke (accessed on November 17, 2017, at <https://inhabitat.com/ecouterre/electronic-sports-bra-monitors-vital-signs-communicates-with-smartphones/>).

A new technology that can make textiles germ-free was developed by a researcher at the University of Georgia. This inexpensive technology can be applied to medical linens and clothing, face masks, athletic socks, and diapers. Given that many "new" technologies are initially expensive and are not available at the price points the public can afford, it will be interesting to see how rapidly this technology will become available (UGA News Service).

New technologies target Generation Z consumers, which include having clothing that changes color from day to night, trousers that multitask by doubling as keyboards, and iPod or GPS systems built directly into their designs at the fiber level. Instead of having pockets sized for electronic devices in your clothing, your wardrobe will actually be your BlackBerry. Of course, the challenge is to manufacture these garments in quantities so that they are affordable. Companies can be encouraged to develop these designs if there is enough consumer demand.

Another innovation was developed by a former consumer economics student at the University of Georgia. Justin Niefer used his marketing skills to become

an entrepreneur. Niefer is cofounder of the company **Evoshield**, which produces a lightweight, malleable substance that hardens to fit the wearer's body and disperses impact. The primary application for the product is in sports, namely baseball and football. A YouTube video features Niefer demonstrating the product's effectiveness (www.youtube.com/watch?v=KUjSylfDcgw).

Innovations in digital technology are revolutionizing the process of design by using digital methods rather than **screen printing** methods. Apparel designers are happy to no longer be limited by screen printing. **Digital printing** has given designers the ability to produce a fabric pattern that will follow the shape of the body, thus looking less "flat" and more natural. Screen prints restrict the complexity of prints as well as the number of colors that can be produced on a garment. (You may want to count the number of colors on your favorite T-shirt.) There is much more flexibility with digital printing, and designers are thrilled to have more choices (see Figure 12.3).

Other designers are excited by innovations in electronics added to dress. The Galaxy Dress (www.youtube.com/watch?v=rX9FOGFxN9A) was the commissioned centerpiece of the "Fast Forward: Inventing the Future" exhibit at the Museum of Science and Industry in Chicago in 2009. The Galaxy Dress is one example of the many developments in clothing technology. Turkish designer and two-time winner of the British Designer of the

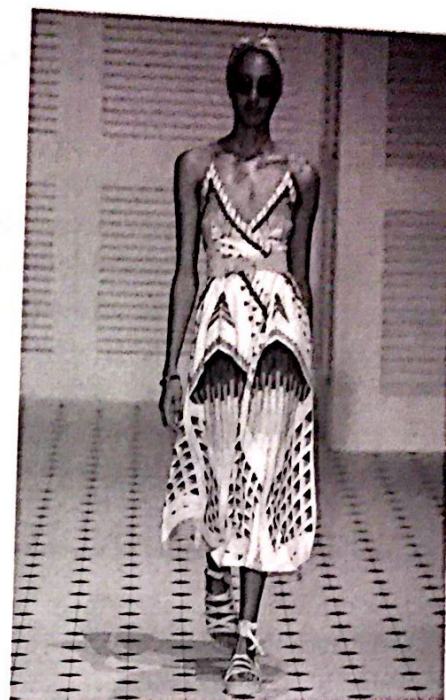


Figure 12.3 This digital print follows body contours.

Year award Hussein Chalayan is a staunch supporter of technology in fashion and has created dresses that glow with built-in LEDs or emit spectacular red lasers. For Chalayan, the future of technology and dress is already here. For example, **STEM** programs in Kentucky with middle-school students are increasing interest in technology and fashion careers. (See reading "Middle-School Kids, Sewing, and STEM" at the end of this chapter.) (See Figure 12.4.)

Still other designers prefer to experiment with eco-friendly methods to create clothing. Designer Suzanne Lee discusses how a person can grow his or her own clothes at www.ted.com/talks/suzanne_lee_grow_your_own_clothes.html. Still others show how clothes can be differently applied. See a demonstration at www.youtube.com/watch?v=ScvdFeh1aOw. The concept that clothing is nondiscursive (McCracken, 1988)—or fixed for several hours at a time—may be obsolete by 2020 if these technologies appeal to consumers.



Figure 12.4 This 3-D printed shoe design is an example of technology and fashion.

TECHNOLOGY, STATUS, AND TIMING

Technology and fashion have a lot in common. Both thrive on the status of being the latest "it" item. Therefore, the friend with the latest technology for his or her iPhone holds

a certain status among friends. The same phenomenon occurs in fashion when one member of a group shows up wearing the latest fashion. Technology as well as fashion depends on timing to achieve status. For example, timing was critical for Target customers to purchase a Missoni item in 2011. Customers employed the technology of the Internet to purchase a reasonably priced Missoni outfit that was fashionable. Target customers were so excited by the Missoni sale that they shut down the retailer's website from an overwhelming number of orders.

CONSUMER PREFERENCES FOR APPAREL TECHNOLOGY

Given enough consumer demand, more innovative technologies will reach the mass consumer. For example, one technology is already available—however, not widespread—computerized **body scanners** take 10 seconds to collect thousands of body measurements to produce a garment that fits an individual precisely (see Figure 12.5). The individual steps into a cylinder (much like the airport scanner), fully clothed, for 10 seconds and a computer prints out her exact measurements. With the measurements, a company can produce a perfect-fitting pair of jeans for between \$160 and \$180. If women complain that finding well-fitting jeans are hard to find, why are they not demanding this technology at an affordable price? Consumer acceptance is one reason and price is another. Perhaps the average-size woman is not

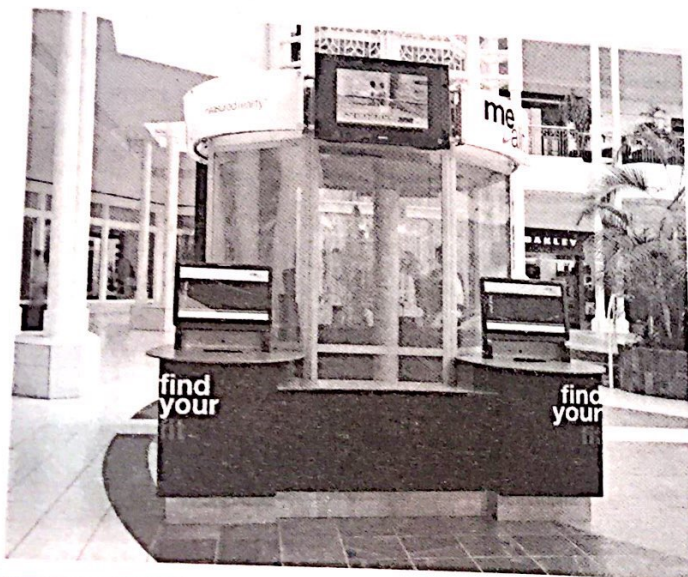


Figure 12.5 Computerized body scanners can take a customer's precise body measurements.

comfortable knowing that all of her body measurements can be seen by store employees, nor does she want to invest \$160 on a pair of jeans.

The next step in this technology would allow the customer to select fabric, color, and style details such as pant leg fullness and pocket style from an array of options. Not only would the garment be customized to fit precisely, but also the consumer would take part in designing the style of garments she or he wants. This process is called **co-design** (Fiore, Lee, & Kunz, 2004; Lee et al., 2002; Lee et al., 2011). Apparel industry experts often refer to custom-fit garments ordered through a mass retailer or producer as "**made-to-measure**" (Gellers, 1998). Garments ordered through a mass retailer or producer for which the consumer has made personal style design choices are referred to as **mass customized** (Pine, 1993).

Made-to-measure and mass-customized apparel is already available (Coia, 2003; Lee & Chen, 1999), but advances in computerized imaging and production systems probably will make customized apparel more readily accessible and less expensive sometime around the year 2020.

Only a small minority of consumers (about 9 percent) had purchased apparel through the Internet by early 1999 (Yoh et al., 2003). But more than one-third of shoppers had purchased apparel via the Internet by 2001 (Pastore, 2001), and apparel is now one of the top five most purchased product categories ("Online Spending," 2003). Why shouldn't we believe that these modes of shopping will play a more substantial role in how consumers shop by 2020?

Mass customization of fit is beginning to attract more customers; Lands' End has found that four of its top-selling products are in the customized-fit category (Coia, 2003). And the chances are good that a variety of modes of shopping will continue to be used through the next 10 years. Made-to-measure apparel will require extensive development of computer systems and new retail systems. The eventual changes in the fashion system that could result from widespread use of made-to-measure and mass-customized ordering are almost too immense to comprehend, but certainly intriguing. Increased variety and diversity in appearances and more uniqueness in what can be purchased could certainly emerge. The fashion system will become increasingly complex during the 21st century and consumers will determine which technologies are implemented and which are not.

TECHNOLOGY, TRADITION, AND CULTURE

Tradition in all fields has a habit of slowing things down. The terms *Western* and *non-Western* are often used interchangeably with *industrial* and *non-industrial* and create boundaries between cultures that embrace technology and those that do not. Cultures are often described by their level of technology. Think of the Egyptian pyramids and the roads and bridges engineered by the ancient Romans. In the apparel industry, one can create a technology continuum with a back-strap loom on one end and computer-operated industrial looms on the opposite end (see Figure 1.2b in Chapter 1 to view these looms side-by-side). What one gains in speed and standardization with computer-operated looms, one loses in creativity and variation of handmade items.

Is tradition gender-specific? Women in most developing countries are considered more traditional than men. Women are often the last to give up their traditional dress and their cultural traditions because women are more likely than men to stay at home with children while men are more likely to seek employment away from the home. In fact, "women's work" often invokes images of slow, repetitive, low-tech labor that takes place in the home while women tend children. "Men's work" invokes images that are fast paced and include high production. Although not all developing countries divide labor between the private sphere (female) and the public sphere (male), many do (Barnes & Eicher, 1992).

Tradition is naturally resistant to innovation, and technological change is not always embraced with open arms. However, preserving traditions is valuable to cultural richness and to maintaining the history of a culture. In the reading "For Dignity and Development, East Africa Curbs Used Clothes Imports" (at the end of this chapter), author Kimiko de Freytas-Tamura describes how imports of secondhand clothes from the United States undermine efforts in East Africa to develop their own textile industry.

Summary

Technology and dress is a wide-ranging topic with many avenues for innovation. Many groups and individuals are currently involved in the research and development of new technologies in dress. Many innovations are in the works that join nanotechnology

On the other end of the technology continuum is a computerized loom used in most industrialized countries. This loom requires human intervention only when there is a problem (i.e., a thread has broken). The computerized loom needs to be programmed and maintained by a human, but the actual work of producing the cloth is done by the machine.

The apparel industry itself is resistant to change. Susan Watkins provides two examples, heat sealing and molding, as possible alternatives for the American apparel industry (Watkins, 1995b). Some of these processes have been around since the 1950s and were perfected after initial endeavors. These processes, which are practiced in European apparel industries, are time-efficient and economical. However, adopting these processes would mean changing the way clothing is designed, produced, and marketed in the United States. The American apparel industry evidently is not ready for these changes.

More recently, clothing researchers Armstrong and LeHew have considered the impact of the apparel industry on the environment and recommend a new dominant social paradigm for the apparel industry (see the reading "Shifting the Dominant Social Paradigm in the Apparel Industry: Acknowledging the Pink Elephant"). A **paradigm** is defined as an assembly of practices and protocols characterizing a discipline or field (Kuhn, 1996). Beginning with the Industrial Revolution the apparel industry's paradigm has dictated the exploitation of the earth's resources, which is now taking its toll on the environment. This mind-set of the apparel industry, to produce new fashions quickly while ignoring the earth's limits, is now being called into question by eco-conscious consumers. How can the apparel industry re-create itself so that it will be profitable and eco-friendly? Tradition has prevented the industry from changing and consumers are just now realizing that the costs of their consumer goods include costs to the earth. Armstrong and LeHew admit that changing the apparel industry will be difficult—but it can be done.

and clothing to create wearable electronics. Time and status are important elements of both technology and fashion. Consumers may not be uniformly receptive of new technology and may reject technology or take time to adopt new technologies. However, new technology

connected to dress will undoubtedly appeal to those who can afford it and eventually trickle down to the mass consumer. Both technology and traditions to

create dress are uniquely tied to culture. Interventions into cultural groups with new technology should be considered carefully before moving forward.

Key Terms

Clothing for specific needs
Co-design
Body scanners
Digital printing
Entrepreneurs

Evoshield
Generation Z
Innovation
Made-to-measure
Mass customized

Nanotechnology
Paradigm
Screen printing
Spray-on clothes
STEM

Technophobe
University faculty
U.S. Military
Wearable electronics

Learning Activity 12.1

DRESS AND TECHNOLOGY

Objective

To find the most current information on wearable electronics.

Procedure

Given how quickly technology changes you would want to do this often: do an online search to find out what is currently available in technology and dress. Use the following terms or a combination of terms to search for current information. You should prepare a report on your findings to share with the class. This can also be done in groups.

CuteCircuit
DuPont and smart garments
Fiber-optics and dress
ICD+ Smart garments
Levi-Strauss
Luminex
M-Dress
Nanotechnology and clothing
Philips NV
Smart fabrics
Technology and clothing
Textronics
Wearable electronics

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