



# What **consumers** are looking for, when they buy a **smart apparel**

---

August 2018

## 1 Introduction

Dr. Michael Burrows, Global Venture Leader at DuPoint points out the obvious “Clothes will always outsell phones”. If clothing will always outsell phones, then they will also outsell any wearable gadgets. So the obvious questions are,

- (1) What can the maker of wearable devices learn from the clothing industry? *and*
- (2) Should wearable devices make their way into the clothing industry?

In 2019 it is expected that the global apparel industry will be valued at US\$ 2.2 trillion, however only a insignificant small fraction of that is being claimed by the smart apparel industry (Scet.berkeley.edu, 2018). Smart apparel is largely made from either smart fabric and/or multiple electrocardiograph (ECG) sensors embedded within a form-fitted technical apparel, which captures biometric data as well as movement and positional data. The datasets are then transmits via wireless technology such as Bluetooth to the user’s smart phone or cloud for storage and analysis. This translates into an easier overall user experience, compared to a wristband fitness tracker. However along with the advantages, there are also many expectations and complications with using smart apparel.

## 2 User Expectations with Smart Apparel

When a user purchases a smart apparel, their expectations are borrowed from both the garments and consumer electronics industries. It is perhaps these ambitions expectations, coupled with the extreme costs of incremental improvements of the available technology that makes designing the “correct” smart apparel a gargantuan task.

(1) Consumers have come to expect durability from the electronics they buy. People want smart apparels that will last for a long time and don’t have to be replaced often.

(2) Along with dependability a long battery life is a must for users, since consumers don’t like to be interrupted for charging their smart apparel, while they are using it. Charging takes time and the consumers don’t get to wear the apparel while it is charging. Also, if charging cycles takes an extended amount, it may result in gaping holes in continuous biometric data capture.

(3) Consumers don’t want their smart apparel to have technical failures, so manufacturers need to be able to seamlessly troubleshoot potential problems. However, “More and more customers prefer self-service over contacting a support agent” (Zendesk, 2018). If there are problems that they cannot fix without the manufacturer’s assistance, consumers prefer to fix it in their homes using online tutorials.

(4) Consumers also want their smart apparel to be comfortable. They aren’t going to use or recommend a smart apparel that irritates their skin or restricts their movements. A balance must be maintained to ensure that there is enough compression for the wearable device to measure biometric signals,

yet enough flexibility in the smart apparel to ensure comfort. It is a delicate balance that manufacturers have to be very conscientious about.

(5) Consumers want the biometric, positional and movement trackers in the smart apparel to be reasonably accurate. Consumers tend to trust products that have a FDA approval as a medical device.

(6) Consumers want the smart apparel they buy to be easy to use, so they don't have to spend a lot of time learning how to use it and can instead jump right into enjoying the product.

(7) Consumers want their smart apparel to have all of the qualities of a robust electronic device, but at the same time they do not want to sacrifice their style. "No matter how many interesting and technologically advanced the features the smart apparel has, consumers will not buy it if it isn't aesthetically pleasing" (Suh, Carroll and Cassill, 2018). Before buying wearable technology, users need their products to be comfortable, easy to use, and aesthetically pleasing.

(8) Consumers have come to expect their smart apparel like any other high end consumer electronic devices to have a large price tag attached to them, since it has been ingrained into their minds that the higher the cost, the better the product. Consumers are willing to pay a higher price for premium products as long as they can depend on those products to have a good battery life and a very limited amount of technical problems.

### ***Designing Challenges With Smart Apparel***

Some challenges designers have with smart apparel have to do with the apparel's heat production, comfort, and power storage.

(1) Designers also need to be mindful that smart apparel can get "too warm" very quickly as the electronics embedded within the apparel gives off heat.

(2) Designers also need to adhere to international textile standards such as STANDARD 100 by OEKO-TEX® takes account of banned Azo colourants, formaldehyde, pentachlorophenol, cadmium, nickel, etc. as well as requirements of Annexes XVII and XIV of the European Chemicals Regulation REACh.

(3) Designers need to also make sure that their smart apparel is light and breathable, but at the same time the material of the smart apparel needs to be rigid in order to harness the wearable sensors. The stiff areas could be the areas where sensors are located, or where the power supply is stored. The comfort of the user is key, so problems regarding heat production, extra weight, and limited mobility should be top priorities for smart apparel designers.

(4) Designers also need to understand that each new sensor added to the smart apparel, in turn adds more complexity to the design and manufacturing of the final clothing. This is particularly relevant if the underlying technology is multi-lead electrocardiography or electromyography.

(5) Designers should also ensure that each of the biometric sensor is in contact with the user's skin in order to collect the correct data. If the sensors are not positioned where they are supposed to, then the user won't receive the data they need, or they will receive incorrect data.

(6) Designers also need to remember that "If a specific body area is exposed to excessive loads, there can be mild to severe muscle fatigue. In addition, since metabolic rate increases when the body tries to work against the heavy and stiff clothing, unwanted heat production may also occur. "Continuous high pressure may develop of various tissue lesions, such as pressure sores and ulcers" (Suh, Carroll and Cassill, 2018).

### *Ease of Using A Smart Apparel*

(1) Consumers have to be careful to avoid sudden movement while capturing biometric data in order to avoid noisy data capture, particularly when the underlying biometric sensor is made out of smart fabrics. However, systems that have a contact based optical or ECG sensor module embedded into a form-fitted smart apparel, are the middle ground between smart fabric and wristband fitness trackers. An example of such smart-apparels are OMSignal's recording module, Hexoskin's smart device or Think Biosolution's QuasaR sensor.

(2) Device based solutions embedded in form-fitted clothing is also easier to use because the user only needs to maintain and re-charge a single detachable unit. Whereas the rest of the form-fitted clothing can be washed, and dried like a regular daily use garment. Whereas in the case of smart fabrics special care needs to be taken for washing and drying.

## 3 Conclusion

Even though wearable technology is relatively new, consumers have come to have many expectations. Consumers want their smart apparel to be comfortable to wear, easy to use and aesthetically pleasing. Through a survey of 706 people, it was found that accuracy, comfort, and battery life were the three most important features of wearable technology (Wearable, 2018). They want their smart apparel to better their lives but at the same time, they don't want their new technology to disrupt their daily routines too much. However, consumers are willing to pay a larger price, since it is assumed that the better the product, the higher the price.

Each of these expectations consequently becomes a design challenge for manufacturers. Designers have to make sure that the smart apparel is both comfortable and functional. They have to also make sure the sensors will be able to collect the biometric data, without irritating the user's skin.

It is clear that the ultimate wearable biometric tracker lies somewhere in between a typical wristband-based fitness tracker and what we today call smart clothing. Consumers want a smart apparel that allows them to retrieve useful information and insight without compromising the user's style or comfort. In summary the holy grain of smart apparel, is an easily rechargeable device that can be fitted into multiple custom designed apparels for different activities.

## References

- CNET. (2018). *Do wristband heart trackers actually work? A checkup.* [online] Available at: <https://www.cnet.com/news/how-accurate-are-wristband-heart-rate-monitors/> [Accessed 28 Jun. 2018].
- Nkonko, E. (2018). *Factors Influencing the purchase intention of Smart wearable technology.* [online] Wiredspace.wits.ac.za. Available at: <http://wiredspace.wits.ac.za/handle/10539/24128> [Accessed 3 Jul. 2018].
- Scet.berkeley.edu. (2018). [online] Available at: <https://scet.berkeley.edu/wp-content/uploads/Smart-Clothing-Market-Analysis-Report.pdf> [Accessed 28 Jun. 2018].
- Suh, M., Carroll, K. and Cassill, N. (2018). *Critical Review on Smart Clothing Product Development.* [online] Ojs.cnr.ncsu.edu. Available at: <http://ojs.cnr.ncsu.edu/index.php/JTATM/article/view/702/728> [Accessed 2 Jul. 2018].
- Wearable. (2018). *Accuracy should be a priority for wearable tech according to survey.* [online] Available at: <https://www.wearable.com/wearable-tech/accuracy-still-the-most-important-wearable-tech-feature-says-survey-2893> [Accessed 11 Jul. 2018].
- Zendesk. (2018). *Self-Service: Do Customers Want to Help Themselves?* (infographic). [online] Available at: <https://www.zendesk.com/resources/searching-for-self-service/> [Accessed 2 Jul. 2018].