How to consider human factors in wearable design processes

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Reading time 9.5 mins

Key Points

- Consideration of human factors (e.g. attention span, forgetfulness) is essential for the design of successful wearables

- How do we make technology work better with humans
- Top factors to consider in the human-centered design of wearable applications include simplicity, intuitiveness, aesthetics, and customisation
- Interaction modalities (i.e. haptic, audio, graphic) have an impact on user engagement
- Discomforting challenges that wearables need to overcome include data protection and environmental sustainability

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Last updated Jun 27, 2023

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Humans, by nature, are imperfect beings. We can all be forgetful, make mistakes, have limited attention spans, overlook important information, and misunderstand. Human factors are concerned with understanding and managing people's limitations, capabilities, and preferences and designing services or products that take those into account. With an estimated $37,557 million people using wearable devices in 2022 and forecast to increase to 272,237 million by 2032, taking human factors

in wearable design into account is essential [1].

Consider, for example, the fatal flaws of Google Glass which ultimately caused the product to fail. These smart glasses were highly anticipated before their launch, and prototype exhibits drew massive crowds. Google is one of the dominant players in internet technologies and a well-established pioneer of numerous innovations, so these glasses should have been a hit. And yet, they failed to land a resounding punch – mostly because human factors in wearable design weren't taken into account:

- Users found that they didn't really do anything useful
- There was no real task or situation that made the glasses indispensable
- The camera was too awkwardly placed in the corner of the eye
- People felt stupid wearing it
- Camera placement was such that it took pictures from a vantage point that users found unappealing

Designing a human-centered wearable application

In a study conducted to quantify the similarities/differences between smartwatch and smartphone use, usage traces from 307 users – that included almost 3 million notifications and 800,000 screen events – were analysed. Results showed that smartwatches are used more briefly but more frequently throughout the day, with half the sessions lasting less than 5 seconds [2].

Thus, for the smartwatch, factors such as comfort, ease of use, simplicity, and intuitiveness were crucial in designing a product that would be used frequently but briefly over long periods. Other key factors to consider in designing human-centred wearables [3] include:

- Aesthetics: Attractive products are more desirable
- Affordance: Does the product look like what it's supposed to do, and will the user intuitively know what its function is? For example, a smartwatch that looks like a wristwatch
- Customisation: People come in all shapes and sizes; and have different preferences and interests. To engage users, the look and feel of wearable devices need to be customisable
- Ergonomy: What is the physical shape of the product and does it respect human anatomy? A smartwatch with a screen larger than the average wrist will be heavy, obtrusive, uncomfortable, and possibly lead to injury

- Privacy: A product intended for home use (e.g. therapeutic smart gloves for osteoarthritis) doesn't necessarily need to be subtle and discreet in the same way a hearing aid does
- Resistance: Consider the context in which the product will be used. Does it need to be waterproof? Will it need to withstand extreme temperatures, humidity, and laundry?
- Responsiveness: Users tend to be less patient when on the move than when at a desktop or at home. Mobile wearable devices need to provide feedback in near real-time as opposed to those designed for stationary use (e.g. vest that monitors sleep patterns)

Interaction modalities that impact human factors in wearable design

While a human-centered approach is essential to developing a successful wearable device, the senses we need to use them (i.e. sight, touch, sound, smell) are just as important. We engage with the real and virtual/online world with our senses, so the interaction modality of the device needs to correlate. For example, a smartwatch for blind people would need to focus more on touch, sound, and voice commands. In contrast, a smartwatch for deaf people would have to be more tactile and visual (i.e. notify and describe a sound by vibrating and displaying a message on the screen that says 'door knock soft' or 'car honk loud').

Because touch is a sensory feedback that most demographics have in common, wearable devices with a robust tactile component are very successful. This pioneered the development of haptic technology – a core interaction modality for most wearable devices.

Haptic feedback improves human factors in wearable design

Haptics are technologies that give a tactile response (i.e. a physical sensation) when you touch it e.g. when you touch an icon on a smartscreen and it vibrates to show it recognises your input. It allows users to engage with virtual objects, thereby enhancing their interactions with digital interfaces because it's interactive.

This functionality, especially with regards to human factors, becomes increasingly important when designing products for the elderly, people who are hearing or vision impaired, those being treated for – or recovering from – illness or injuries, athletes, students, and gamers. In other words: everyone.

Which in turn, explains why the haptics market is expected to grow by $15.84 billion by 2025 [4]. Some

of the best haptic devices and innovations for 2022 include:

- SenseGlove Nova is a haptic glove that uses force feedback systems to enhance training for industrial scenarios e.g. handling hazardous materials. When wearing the glove, users can perceive shape, texture, stiffness, impact, and resistance in VR without needing to touch a screen
- The University of Glasgow has invented aerohaptic technology – the world's first haptic hologram. It leverages airjets to provide feedback when they interact with a hologram. Prototypes consist of a 3D hologram basketball that users can pick up, bounce, and play with – despite it being a virtual entity

What are wearable's biggest discomforts?

One of the most important human factors in wearable design are privacy and ethical issues regarding data collection. Big Tech companies are under increased scrutiny for privacy infringements and a lack of transparency regarding how our data is used. In addition, numerous data breaches caused by cybercriminals hacking into systems and leaking customer information is troubling. This has led to consumers becoming increasingly wary, mistrustful, and uncomfortable with how much their devices know about them.

Lastly, we need to consider the environmental impact of products we design, especially regarding e-

waste. Not only do businesses need to take their climate responsibility seriously, but also respond to the human need for products that are environmentally sustainable. The Global Sustainability study of 2021 highlighted that while consumers in general see themselves as catalysts for environmental change, the younger generation are the most active.

“Millennials and Gen Z are becoming a force to be reckoned with as they continue to represent a larger share of the consumer demographic. Companies that don’t have sustainability as part of their core value proposition need to act now to protect against future reputational impacts and loss of market share,” said Shikha Jain, author of the study and Partner at Simon-Kucher & Partners.

What other discomforts do you think wearables need to overcome to ensure their continued success?

Are there other human factors in wearable design that we overlooked?

Please feel welcome to share your thoughts and opinions, or let us know if you have a design you’d like our feedback on!

1. Future Market Insights Global and Consulting Pvt. Ltd. (2022, August 16). Wearable Computing Devices Market is expected to reach a valuation of nearly US$ 217,237.2 Mn in 2032 – Future Market Insights, Inc. GlobeNewswire News Room. Retrieved 17 October 2022, from https://www.globenewswire.com/en/news-release/2022/08/16/2499409/0/en/Wearable-Computing-Devices-Market-is-expected-to-reach-a-valuation-of-nearly-US-217-237-2-Mn-in-2032-Future-Market-Insights-Inc.html
2. Visuri, A, Sarsenbayeva, Z. et. al (2017). Quantifying Sources and Types of Smartwatch Usage Sessions. Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems. https://doi.org/10.1145/3025453.3025817
3. Motti, V. (2014, November 3). Human Factors Considerations in the Design of Wearable Devices. Retrieved 17 October 2022, from https://www.academia.edu/9112664/Human_Factors_Considerations_in_the_Design_of_Wearable_Devices
4. Team, T. X. R. (2022, February 21). The Best Haptic VR Devices and Innovations for 2022. XR Today. Retrieved 17 October 2022, from https://www.xrtoday.com/virtual-reality/the-best-haptic-vr-devices-and-innovations-for-2022/

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