How do wearables fuel big data

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Reading time 9.5 mins

Key Points

- A booming tech market – which includes wearables, e-textiles and other smart devices – results in the collection of massive amounts of data
- These large data sets can be analysed computationally to reveal a variety of patterns, trends, and predictions regarding human behaviour
- IoT devices could generate 79.4 zettabytes (a zettabyte equals 1 trillion gigabytes or 1

billion terabytes) of data by 2025

- Both the private sector and governments can use this information to deliver products and services tailored to suit consumer needs and preferences
  Data collection and predictive analytics help to inform better decision-making
- Information is power. Data protection, consumer consent, privacy and ethical issues remain regarding how data is owned, stored, shared, or sold

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Civilisations throughout history have survived or perished based on data analytics. Whether it was analysing weather patterns to determine the optimal time to plant, store, or sell crops; or deciding which borders to fortify to guard against invasion, knowledge has always meant power. Wearable devices, by nature, are data collection tools that take decision-making to a whole new level. Not only can wearables fuel big data by predicting future health outcomes [1], but they can also inform us of

what we need to do now, e.g. smartwatches to monitor blood sugar that alert users in real-time when their glucose levels are too high.

The intrinsic link between smart devices, IoT and big data

Big data refers to large data sets we can analyse computationally to reveal patterns, trends and associations relating to human behaviour. It's important to note that size doesn't matter with big data – it's what one does with it [2]. Astrophysics organisations, for example, generate and process millions of gigabytes of data every year. This isn't big data because they aren't necessarily looking for patterns or trends. However, examining financial records that indicate fraud does – even though these data sets are smaller than those generated by telescopes.

The Internet of Things, or IoT, is a system of interrelated computing devices that can transfer data over a network without human-to-human or human-to-computer interaction. Most of us have at least two smart devices (i.e. phone, computer, TV, tablet, fridge) synced to each other that can communicate without needing our intervention. For example, a smart coffee machine turns itself on once your morning alarm goes off.

Naturally, these devices are constantly collecting information about our habits and preferences. How long do we sleep? What's our favourite music? What kind of coffee do we buy? What's our political affiliation? How many children do we have? Do we have pets? Where do we go on holiday?

According to a forecast by International Data Corporation (IDC), there will be 41.6 billion IoT devices in use worldwide by 2025 – capable of generating 79.4 zettabytes (ZB) of data [3]. Seagate explains that a "zettabyte is enough storage for 30 billion 4K movies, 60 billion video games, or 7.5 trillion MP3 songs." [4].

What makes the IoT devices listed in the examples above different from wearables is that they collect information regarding external preferences (e.g. a soy milk drinker who buys a lot of yoga wear and takes frequent holidays in Costa Rica).

Wearables, however, collect information regarding our internal activities and are therefore capable of collecting massive amounts of biometric data (e.g. cardiovascular performance, blood pressure, blood glucose levels, and daily levels of physical activity). This increases the speed, volume, and variety of the data collected.

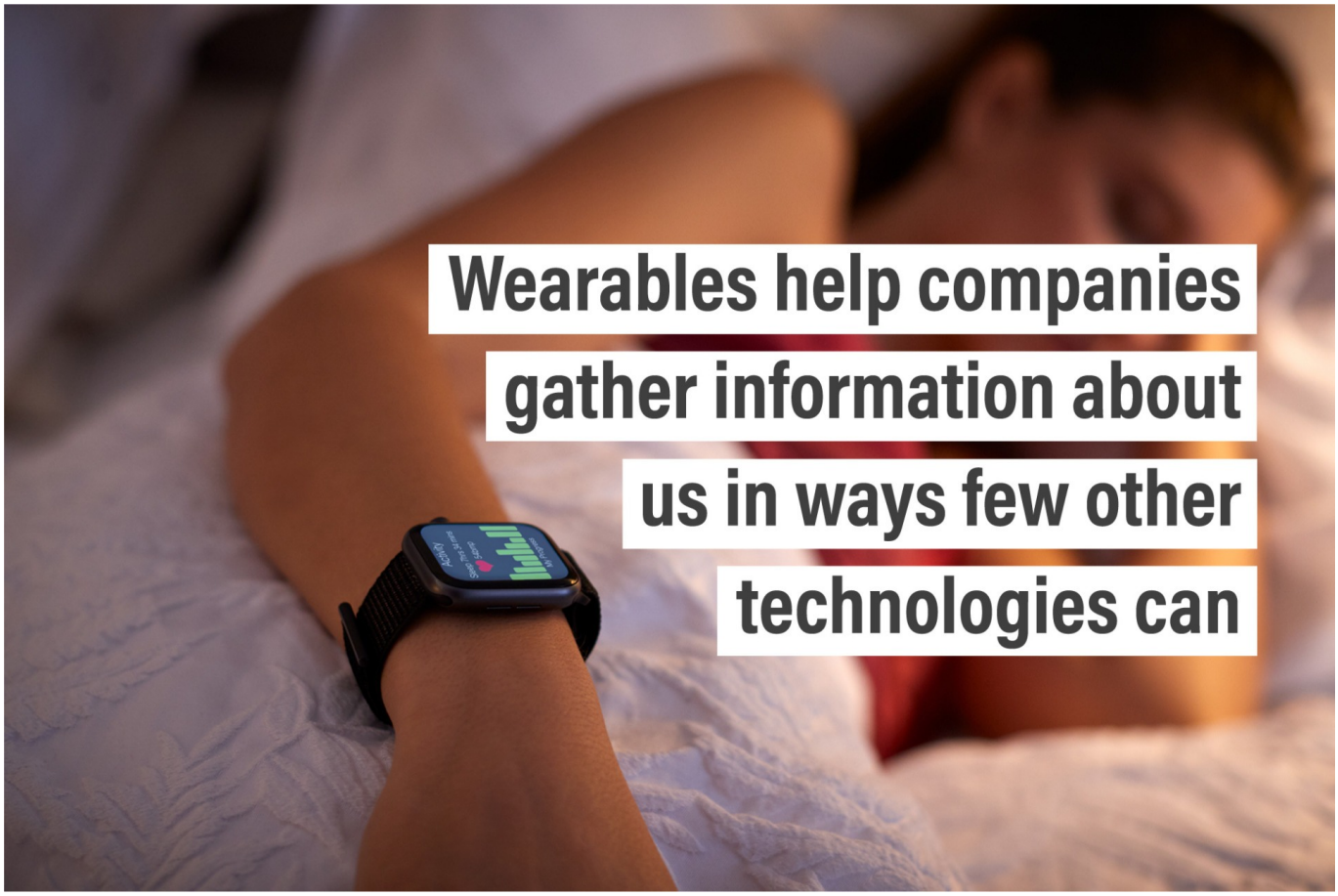
Wearable devices and biometric data

Wearables' biometric data has proved helpful in healthcare, personal fitness, and sport. The analysis of biometric data has led to:

- Wearable pharmaceuticals that positively impact medical interventions and provide better outcomes
- E-textiles that enhance healthcare by helping with diagnostics, prevention, and treatment
- Wearable stress-relief devices that pickup biological responses to stress (e.g. temperature, heart rate, respiration rate, sweat) and offer techniques to calm the nervous system in real-time, thereby boosting the immune system in the long run
- Fitness and sports wearables that improve performance

Creating these devices – and countless others – is possible because wearables fuel big data. And the data shows that the UK wearable sensors market for 2020-2025 [5] forecasts a 39.5% growth rate and increasing adoption of wearable devices due to:

- Rising awareness of health and fitness
- The ability of wearables to continuously monitor vital signs
- AI-powered healthcare services, including home-based diagnostics and virtual health assistants, allow users to monitor and manage their health autonomously
- A reduction of time and costs related to doctor's visits



Knowledge is power: The dangers when wearables fuel big data

Wearables are a significant data gold mine.

The more devices connected to the internet, the more data we create. Wearables help companies gather information about us in ways few other technologies can. For example, if you're wearing a smartwatch that tracks your sleep patterns and activity levels, the parent company can use this data to determine how well you sleep, how much exercise you get, or how stressed you might be and tailor their advertising based on those factors and implied vulnerabilities [6].

Another way wearables fuel big data is through machine learning. Machine learning is when computers learn from experience rather than just following instructions or rules as humans do; it's how AI works. Machine learning allows computers to make predictions based on past experiences. Human Activity Recognition (HAR) uses machine learning techniques to describe, analyse, and predict data based on the information received by the wearable (when the wearer is walking, running, sitting, sleeping, etc.) [7].

That data provided by wearable devices leads to developing technologies that serve people's needs is indisputable. However, when wearables fuel big data, it presents a problem. Big data is also big business and a valuable commodity that everyone, from private enterprises and cyber criminals to governments and surveillance agencies, wants to get their hands on. As we move towards the 'datafication' of society, how information is used needs to take place within an ethically sound framework [8]. Failure to do so can result in:

- Surveillance tools that infringe upon our right to privacy
- High-tech profiling, automated decision-making, and discriminatory practices
- Secret predictive analytics can be applied to data to determine who – within a dataset – has value and create scoring systems that can be exclusionary
- 'Social cooling': An unintended big data side-effect whereby people start modifying their online behaviour because they know they're being watched and don't want to limit their opportunities or be punished because of their 'digital reputation'
- No formal or legislative clarity on who owns data – even personal data collected by our wearables – makes it challenging to regulate how this data is used

Do big data benefits outweigh the pitfalls?

Big data, as a tool, is not inherently dangerous. Instead, it's how it can be used that presents problems. As we've seen in previous posts, big data can help us to cut down household waste, protect ecosystems, and manage natural disasters. Using wearables to fuel big data also led to the

development of technologies such as e-textiles and smart fabrics that have improved countless lives across different sectors.

On the other hand, consumers and product developers must ensure that what they're using or creating can be trusted. This includes staying a step ahead of hackers and keeping personal data protected, as well as giving/obtaining informed consent regarding the use of data by third-party applications.

What are your thoughts on the wearables that fuel big data?

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