

Digital Exhaust: The Innovation That Could Make Your Doctor Irrelevant

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We're used to the idea of "going to the doctor". But, in future, our digital devices may watch out for conditions we've previously relied on healthcare professionals to diagnose. We're never really satisfied by five-minute consultations with overstretched medical staff – so this may be a Great Leap Forward. However, the reality may end up being rather more complicated...

Let's look at the future of online healthcare

You might think of digital medicine as being all about enabling easier access to conventional services. Indeed, there are firms that do exactly this. One, [PlusGuidance, we've interviewed before](#) – and its model is a Skype-like connection to a qualified counsellor. An alternative approach is to create a system that does not rely on real-time human intervention. There are many firms using such an "expert system" approach – with Ada and Babylon being two of the better-known examples. This strategy is based on getting patients to manually report their symptoms and history. This data enables the apps to diagnose problems – in much the same way a human doctor might. Ada's chatbot-interface has a number of advantages. Cost is an obvious benefit, but it's not the only one. Such apps are better able to diagnose rare diseases, which family doctors are unused to seeing.

However, there's an alternative vision. It's far more powerful, but much more ethically troubling. We all now produce a stream of data, as we carry on our lives. This is sometimes known as "digital exhaust". Tracking this data can give important insights into our health. Everything from flu epidemics to mental health problems can be tracked in various ways. Some, such as social media mentions of "flu", are obvious. The US's for Disease Control relies on these kinds of overt monitoring techniques, for checking up on flu outbreaks. Other approaches, such as tracking who-met-whom, are more oblique indicators of an illness' spread. Such inferred methods are particularly informative when data is aggregated across multiple individuals – as this irones out the reliability issues affecting individual people. For example, watching when students switch off social media at night has been found to be a good proxy for the spread of seasonal flu. It seems they're just not so chatty, when they're going down with a bug.

However, it's not just public bodies that have access to this information. Employers can also monitor behaviour, for signs of illness. For example, Soma Analytics aims to detect which employees are suffering from stress. That approach could work well, if an employer is supportive. But with a zero-hours contract, employees might never get asked back. This raises real questions regarding the reach of employers into our private time. Do we really want our boss to know if we stay up drinking whisky until 3am, or if we're suffering from post-traumatic stress disorder after an assault? Expect legislation controlling potential overreach to be just around the corner, if you're an investor in this sector.

Of course, there's more to this field than just the tech in our pockets. Beyond our smartphones, there's a wealth of data that is open to environmental monitoring.

Facial recognition technology is coming along in leaps and bounds, and one benefit of this is that it is becoming easier to diagnose conditions that manifest themselves in facial gestures, expressions and emotions.

One appropriate use case is monitoring children suspected of having attention deficit hyperactivity disorder or autism. In a clinical setting, facial recognition and monitoring improves the accuracy of diagnosis. However, what's much more interesting – and worrying – is that this technology could potentially recognise and diagnose mental illnesses, via pervasive real-world surveillance. Ubiquitous cameras, and low-cost computing power, enable a world where our every move is watched for signs of ill health. Just as our browsers track our journey around the internet, we can expect a future where our behaviour and health could be monitored pervasively by technology. We might leave home with a snuffle, and be presented with a personalised advert for a flu remedy as we sit down on the bus. Is that creepy, or useful? I'll let you decide. Whatever your answer was, it might change if the condition was skin cancer or schizophrenia, rather than a snuffle. If you'd like to invest, there are a myriad of firms working on personalised out-of-home (OOH) advertising – and a medical upgrade to their technology is a real possibility, in coming years.

Degenerative conditions are particularly amenable to pervasive monitoring. One particular example is Parkinson's disease – which results in a steady softening of speech. Canary Speech is a firm that's aiming to commercialise monitoring of this change. In future, firms such as banks and insurance companies may deploy this technology routinely on phone systems – as may many employers.

It's conceivable that schools, workplaces and doctors' surgeries may soon be equipped with technology to flag potential sufferers of mental and neurological illness as they go about their daily lives. Devolving this down to our personal devices is logical. Disorders such as seasonal affective disorder are potentially easy to spot. If someone is wide awake at 5am in June, but never touches their phone before 10am in January, it's likely there's a problem. Presently, we're not even taking such simple monitoring steps as a matter of routine. That will change – as will the degree of sophistication of the monitoring. Apple's new sleep tracker is an example of how such technology approaches have reached the highest echelons of Big Tech. It's already

likely that these tech majors are impacting on your investment portfolio – as well as on your life.

Is pervasive monitoring sinister, or helpful?

It's certainly helpful to know if you might be getting sick – but I'm not sure we'd all like to share that information with the government, advertisers, or employers.

While such technology may help with healthcare diagnosis and monitoring, it may break down the barrier between healthcare and the wider world. If the doctor is always watching, this may make over-diagnosis a bigger problem. It may also be seen as intrusive, by people who view their inner life as a private matter – not a medical one, or one they'd care to share with their employer.

For example: a friend of mine had hypomania, and he never forgave me for trying to get him help. He viewed it as “taking away [his] sunshine” – but those affected by his reckless, dangerous behaviour saw it very differently. However, in subtler cases, it's harder to determine where the limits on medicine should be placed. Who's truly depressed, and who's simply cautious, withdrawn and prone to being slightly glum? It's not always clear.

Having labels for people at the edge of normal functioning may sometimes be helpful. But the flipside is that it may diminish the agency of individuals. Ubiquitous diagnosis will plainly tend to worsen this problem. Unusual actions may then be viewed as a product of illness – rather than a product of choice or personality. Furthermore, by labelling people with conditions that are widely seen as being disordered, the natural diversity of human cognition and emotion becomes medicalised. We may soon frame difference as deviance, and become tempted to treat people accordingly. Encouragement can quickly drift into coercion and compulsion. We may insist on people being medicated to keep their jobs or freedom. Ultimately, we may insist on editing their genes to “protect” their children – from natural variance, inappropriately medicalised. Technology doesn't always facilitate a libertarian trend – and in future we may have to get used to far more invasive health monitoring: from medics, educators and employers.

This is a fascinating field, with much investment promise. Nevertheless, it is mired in ethical and legal problems. Don't overlook these, if you're keen to buy the sector.

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Best,

Andrew Lockley
Exponential Investor