



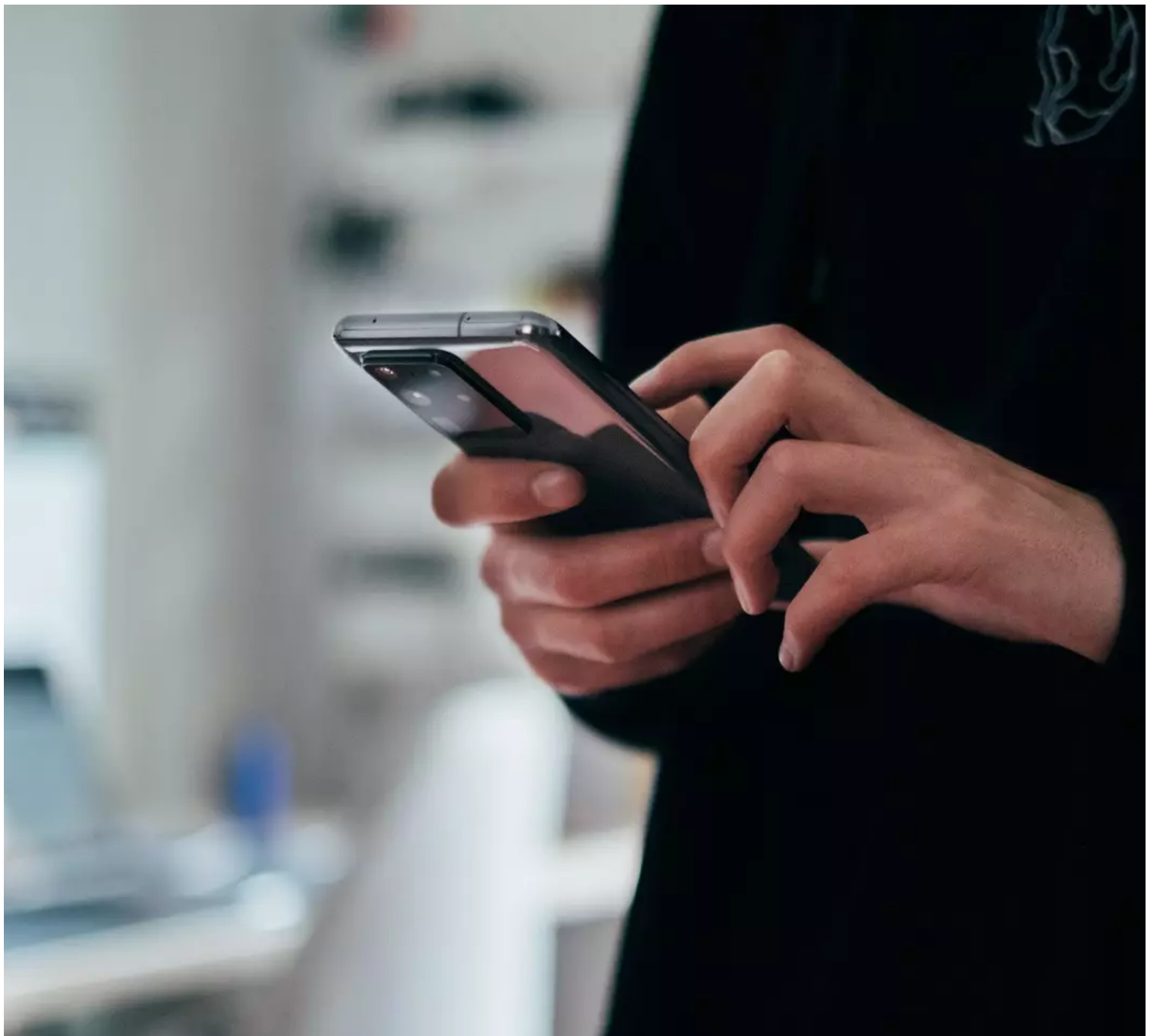
VIRTUAL AND AUGMENTED REALITY

Augmented tech can change the way we live, but only with the right support and vision



OPINION

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Augmented reality technology has the ability to transform society and individual lives, particularly in health care and mobility.
Image: Jonas Leupe/Unsplash

Kathleen Philips

Vice President R&D, imec



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- Augmented reality technology has the ability to transform society and individual lives, particularly in health care and mobility.
- As much as visual and hearing aids are a part of our lives today, implant technologies could become the norm in future.
- Stakeholders in society will need to agree on how to ethically make these amazing technologies a part of our lives.

Superheroes have been dominating big and small screens for a while, but there's a subtle change happening. Many children expect to develop superpowers themselves.

These expectations may sound unattainable, but we're already making the first strides towards an "augmented society". Trade fairs are boasting augmented reality (AR) goggles that show technicians where a particular screw should go. Your own phone gives you information about your fitness in real time or tells you about the latest fad.

Augmentation can be defined as the extension of rehabilitation where technological aids such as glasses, cochlear implants or prosthetics are designed to restore a lost or impaired function. Add it to completely healthy individuals and such technology can augment. Night goggles, exoskeletons and brain-computer interfaces build up the picture. The augmenting technology will help in all stages of life: children in a learning environment, professionals at work and ambitious senior citizens. There are many possibilities.

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What augmented reality can do

Picture this scenario. You're talking to someone in a noisy setting, at a bar, at a party. Even though your hearing is fine, the situation makes it extremely difficult to understand your companion. Imagine you could just put on glasses or earbuds that offer the same sound directionality as a hearing aid.

Or another example: many children with attention deficit struggle in school. In the best case, they get special education services or classroom accommodations. However, with extra visual and audio guidance that blocks off excess stimuli, an otherwise-enabled child can cope with a standard school environment. And when class is over and playtime begins, they can just take the aids off.

Augmented reality doesn't end there. Your phone might feel like part of your body, but it's not put in through surgery. Technology will become more intertwined with the body in the form of implants, but it will also seamlessly integrate with the environment – you might have sensors in a chair, for example.

Are we moving towards a 'brave new world'? As scary as chip implants may sound, they form part of a natural evolution that wearables once underwent. Hearing aids or glasses no longer carry a stigma. They are accessories and are even considered a fashion item. Likewise, implants will evolve into a commodity. If that sounds unlikely, then consider the alternatives we currently use. Drugs often show unwanted effects because they affect multiple biological processes at the same time. Someone on long-term medication may want to try an implant that sends very precise electrical or optical pulses instead.

Getting an implant is obviously more invasive than picking up a pair of glasses. Generally, implants will be linked to medical conditions. The extent to which a particular device becomes common will depend on the technology's functionality and how far it's integrated into your body and daily life(style).

Carrying around the equivalent of a dog's nose in a gadget like your phone or a wearable like a necklace can be handy to sniff out COVID-19 or food allergens. In those cases, it is usually enough that your phone pings whenever you're in the vicinity of whatever you're guarding against. There is no immediate reason to implant this extra sense into your body. However, a deadly peanut allergy may justify a more

permanent solution.

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All in the mind

Brain implants take us one step further and allow us to tap straight into the body's "operating system". We have already started interfacing with the brain using neural probes to mitigate symptoms of epilepsy, Parkinson's disease or depression. Most applications will remain based on medical necessity rather than a mind reading tool. While it is true that companies like [Neuralink](#) have been targeting the brain from the get-go, brain implants may not be the first choice in our augmented society.

An indispensable wearable device may be implanted under the skin as a first approach or in the belly if needed. For example, for patients suffering from urine loss, a small stimulation device tucked away in the pelvic area constitutes a more elegant and comfortable solution than wearing incontinence pads. Next, there may be other implants that influence the nerves of the peripheral nervous system or the information highways that connect the spinal cord and brain to organs and limbs.

Electrical stimulation of the vagus nerve, the superhighway that originates in the brain, is rumoured to be a miracle therapy for treatment-resistant depression, an ever-growing problem. Despite all these options, some therapies will only be effective in the brain, but would you walk around with a chip in your head?

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Just as with wearables, no one turns their head anymore for medical necessities like hearing aids or pulse monitors. Even in an educational and professional setting, smart goggles, phones, wristbands and the like are commonplace. Gaming is the next target. The question is whether implants will follow a similar evolution. Health? Plausible. Education and profession? Potentially.

We may wish to give dyslectic children new opportunities through implants that translate in real-time. On the other hand, dyslexia is a personal trait. Do we want to change that? As a society, we need to make a choice: do we want to accept human limitations associated with learning or ageing? The final application realms, gaming and even intelligence augmentation, may seem farfetched, but only the future can tell.

If the idea of a chip in your body makes you cringe, consider all the pharmaceuticals you take without question. The [‘Cradle to Grave’](#) art installation in the British museum confronts us visually with our pill-popping behaviour. It displays a 13-m long fabric interwoven with 14,000 pills, the estimated average prescribed to a British person in a lifetime. Around 65% of American children and teens with ADHD, meanwhile, are prescribed stimulant medication.

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We often forget that these drugs are related to amphetamines. They affect the brain and have (long-term) side effects. We may consider ‘electroceuticals’, small implants that mitigate symptoms of various disorders by sending out small electrical pulses. One compelling argument in favour of bioelectronic medicine is that the stimuli can be stopped at a flick of a switch, while drug effects linger in the body for a longer time

The limits on implants are going to be set by ethical arguments rather than scientific capacity. For example, should you implant a tracking chip in your child? There are solid, rational reasons for it, like safety. Would you actually do it? Is it a bridge too far? Another important element is security. Remember when Former American Vice President Dick

Cheney's [pacemaker was modified to prevent hacking](#)? Even for lifesaving technologies, proper ethical counselling and legal framing are a must.

Ethics should not be preached from an academic ivory tower. Rather, overarching or independent institutions should guide policymakers and researchers in the augmented society on the do's and don't's and help build the ethical framework on societal aspects of augmented reality technology.

The Council of Europe [recently launched](#) a strategic action plan tackling issues raised by the application of neurotechnologies. Another example, [Rathenau Institute](#) founded by the Dutch government, operates as an independent institution to reflect on questions related to the impact of technology on our lives.

Chile is already a step ahead. Last year, the country pioneered a bill to amend its constitution to protect personal brain data. [Several countries](#) are now exploring how to address these issues surrounding (brain) implants. The task is daunting as ethicists will not only need to scrutinize blooming technology but also potential future applications.

Augmented reality technology and ethics

With the right support, vision, and audacity, these transformative technologies – that go beyond augmentation – become possible. When do we enter the grey zone? Ethics will advise us. The technology optimists show what is possible with augmented reality. Technology has always had the potential to transform society and improve our daily and professional lives. So does augmentation technology. It goes hand in hand with an evolution from health care to ‘well care’, where it’s not just about solving an impairment anymore. It’s about technology that supports you and improves your overall quality of life.

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