Jose M. Souto **09/23/2026**

Topics:

Integration of AI into society.

Digitalizing society through the integration of 6G Open RAN and Cloud Data Centers

How will this affect our privacy individually as a person or collectively as society.

Intro:

First, let's start that this type of technology has been used and put in practice since 1950s but only for *clinical and medical* purposes into patients. Its called a **ECoG** (electrocorticography) machine/chip. A Brain-Computer Interface (BCIs) have made possible to translate cortical signals via **electrocorticography** (ECoG) into fluid, real time digital communication. Rather than reading "thoughts generically these devices function by placing a thin grid of electrodes directly onto the surface of the cerebral cortex. They intercept the fast, high frequency **motor-speech signals** your brain sends to your vocal tract (lips, toungs, jaw, and larynx) when you try or *imagine* speaking.

For example, in the book *The Future of the Mind*, by Michio Kaku outlines how electrocorticography allows a unconscious or locked-in patients to communicate by placing electrodes directly on the exposed brain surface to map neural signatures. By correlating brain activity with specific symbols during calibration process, computers can decode a patients focused thoughts with near-perfect accuracy. He discusses the use of this technology for communication in Chapter 3 under "Reading the Mind" and "Typing with the mind". He clarifies that these experiments, including the "mind typewriter" developed by Dr. Jerry Shih, were conducted on conscious epileptic patients rather than completely unconscious individuals.

Clinical Data:

How ECoG Restores Full Communication:

Direct Speech Synthesis: Advanced systems bypass the physical voice box entirely. Deep neural networks map ECoG data onto acoustic spectrograms, using Al voice synthesizers to reconstruct a user's actual spoken voice with natural inflection, tone, and near-zero delay.

High Vocabulary Accuracy: In clinical trials run by institutions like the UCS Chang Lab, paralyzed participants typing out phrases via ECOG reached 95% to 100% accuracy after machine learning models calibrated to their brain patterns.

Multimodal Avatars: Groundbreaking research funded by the NIH demonstrated that ECoG arrays can decode speech and physical gestures simultaneously. When a user tries to communicate, a digital full-body avatar can talk and realistically wave or give a thumbs-up in real time.

The Next Steps:

"We already know that this technology involves an invasive process—essentially requiring minor skull surgery to implant the ECoG chip—to make these kinds of clinical results possible for patients. Now, however, there is a commercial shift: the technology is being adapted for integration into everyday life without the need for that invasive procedure"

While these systems are incredibly successful in clinical trials for patients with severe paralysis or ALS, scientists are currently working on fully implantable, wireless versions. This will move the technology out of the lab and into everyday life, eliminating the need for data cables to physically exit the skull.

Apple acquired an Israeli AI startup named Q.ai for about $2 billion to integrate its advance silent speech and facial-tracking technology into future hardware like the I phone and Airpods. They are strictly developing technology that can read silent speech through facial micro-movements.

How it works:

Facial Cues: Tiny movements in your skin and face show what words you are trying to say.

No Sound Needed:

You do not need to make a sound or speak out load.

Sensors:

Future devices like AirPods or smart glasses use optical sensors to catch these tiny movements.

The relation/connection of ECog and the Q.ai:

The final goal commercial, non-invasive "mind reading"

While the ECog intercepts the signal straight from the brain, Apple's multibillion dollar acquisition of Q.ai read the *exact* same intent by looking at the outside of your face.

Here is how they connect and how Apple is bypassing the skull entirely.

The Biological Mirror: Intention vs. Action

The Brain Signal: Your cerebral cortex fires motor-speech signals. This is what an ECog grid captures inside a lab.

The Muscle Signal: Even if you do not open your mouth or make a sound, those neural impulses travel down your cranial nerves and cause micro-movements in your facial muscles, jaw, and throat (a phenomenon called subvocalization)

Apples Q.ai technology acts as a non-invasive camera bridge. Instead of cutting open the skull to read the brain's electricity, it uses the iPhone's advance optical and infrared sensors (the tech behind Face ID) to analyze these tiny, invisible facial twitches. Machine learning models then decode those movements back into words. In other words, by tracking the biological output of your thoughts on your skin, Apple is delivering a consumer-grade "mind reader" without ever needing a neural chip.

The Illusion of "Mind Reading"
Because Q.ai interprets micro-expressions and
6G dynamically adjusts to your behavior before you explicitly request a change, it can easily feel like the network is predicting your thoughts. The system is simply performing hyper-fast, localized analysis of tangible behavioral data (like touch, eye tracking, and context metrics) not intercepting cognitive neural signals.

Key Details

The Cost: The deal is worth $2 billion. It is Apple's second largest purchase ever after Beats.

The Team: Aviad Maizels leads Q.ai. He also created PrimeSense, the 3D sensing company Apple bought to build Face ID.

The Goal: Users can control Siri or other AI tools quietly in public without speaking.

Digitalizing society through the integration of 6G and data centers

Digitalizing society through the integration of 6G and data centers represents a fundamental architectural shift toward an "AI-native" cyber-physical world. Rather than just making smartphones faster, the convergence of 6G networks and advanced data center infrastructure bridges the gap between massive computing power and physical reality.

This infrastructure is engineered to completely transform how cities, industries, and daily human lives operate. And there are no research or poor investigation behind how can this technology radiation, signals and electromagnetism are involved or could damage or alter the health of people.

First lets talk about how the shift of 4G and actual 5G to 6G works.

“Data Centers and 6G don’t need the Ericsson BBU 6630”

The Ericsson Baseband 6630 is a hardware baseband unit (BBU) engineered primarily for 4G LTE and early 5G (NSA/SA) networks. It belongs to a legacy architectural generation that relies on dedicated proprietary telecom hardware.
The decoupling of 6G and modern data centers from this hardware is driven by key structural changes:

The Shift to Cloud RAN and vBBU

This equipments the BBU (Baseband Unit) is fundamentally the “brain” or CPU of cell tower site. And this way they provide internet in specific areas when you load a website on your phone your request travels as radio waves to the tower’s antennas. The antennas pass that signal to a *remote radio unit (RRU)*. Then the RRU converts the analog radio waves into digital data and passes it down via fiber optic cables to the BBU 6630. That’s the way they route the internet and translates the telecom (LTE, 5G,) and sends it via fiber backhaul networks out to the global internet.
Modern data centers do not use specialized, physical telecom boards like the BBU 6630. Instead, they rely on Virtual Baseband Units (vBBUs) and Cloud RAN (Radio Access Network) architectures. Network functions are cloudified, allowing standard Commercial Off-The-Shelf (COTS) servers (powered by standard x86 or ARM data center processors) to handle baseband processing entirely through software.

6G Architecture is "Al-Native" and Virtualized

By the time commercial 6G rolls out (expected around 2030), mobile network architecture will be completely virtualized and Al-native.

Hardware Limitations: The physical ASICs inside the BBU 6630 are mathematically incapable of handling the terabit-per-second processing speeds, sub-millisecond latencies, and Terahertz (THz) spectrum demands of 6G.

AI-RAN: 6G infrastructure relies heavily on
AI-RAN. Instead of *old BBU units*, base stations are transforming into "mini data centers" equipped with modern Al accelerators (GPUs/NPUs) to dynamically compute network workloads.

Open RAN (O-RAN) Protocols

The BBU 6630 relies largely on traditional, closed CPRI (Common Public Radio Interface) ports to connect to radios. 6G is moving strictly toward Open RAN standards using eCPRI and open interfaces. This breaks vendor lock-in, allowing operators to run network software natively on cloud data center hardware rather than buying proprietary Ericsson hardware.

So in other words the open ran 6g data centers will be like a 24/7 online wireless environment for society that’s what the vision for 6G is.

When you combine Open RAN, 6G, and cloud data centers, you aren't just looking at a faster cell phone network. You are looking at a unified, 24/7 digital fabric where the data center and the physical world blend into one seamless, wireless environment.

This transformation changes our relationship with technology in three fundamental ways:

1. **The Network Becomes "Sensor"(Sensing + Communicating) Today's networks only transmit data (like sending a text or streaming a video). 6G introduces Joint Communication and Sensing (JCAS).**

   -**Radar like capabilities:** the 6G wireless frequencies act like high-resolution radar.

   -**Spatial awareness:** the data center can track the position, speed, and movement of people, cars, and objects in the environment without needing dedicated cameras or GPS.

   -**Real-time map:** The physical environment effectively becomes an interactive digital twin inside the data center.

2. **Massive, Hyper-Low Latency "Digital Plumbing"**

Because 6G data centers run on flexible Open RAN software, they can process massive amounts of data at the edge of the network (right next to the cell towers).

-Zero-perceptible lag: Latency drops to sub-millisecond levels.

-Instant synchronization: This allows for a continuously synchronized environment where autonomous drones, self-driving transit systems, and industrial robots operate safely 24/7 without human intervention.

3. Ambient and Battery-Free lot in a 6G environment, the wireless signals themselves carry enough energy to power tiny devices.

-Zero-power devices: Smart tags on clothing, grocery items, or environmental sensors won't need batteries.

-Continuous connection: They will harvest energy directly from the ambient 6G wireless waves filling the air, staying online forever.

The vision for 6G is to be entirely AI-Native, seamlessly stitching together the device, the cell tower, and the cloud data center. 6G networks use "intent-awareness" to predict your application needs. For instance, if you start a cloud game, the phone and the 6G network cooperate to automatically allocate more bandwidth and lower latency before the game can even lag.

The Shift in Analogy

-4G & 5G: Like a highway system. You connect to it to get from point A to point B (downloading an app or watching a video).
-Open RAN 6G Data Centers: Like the atmosphere. It is an invisible, omnipresent layer that society constantly lives inside of, powering everything from smart cities to holographic communication in real time.

Privacy Issues:

I’d like to comment on a interesting part of the book In pages 132-139 in the book “The Future of the Mind, Michio Kaku mentions privacy issues regarding this topic of technology and thoughts.