Healthcare

Semiconductors in Healthcare

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The medical community is catching up and healthcare professionals understand the value of remote access for their patients.

SEMICONDUCTORS IN HEALTHCARE HAS been the dream of many of us in the industry for at least 20 years. The increased analytical power enabled by artificial intelligence (AI) hardware and software, greater data storage capacity, and better network connectivity will impact medical breakthroughs, pushing the medical technology (MedTech) movement forward. The pandemic accelerated the push and helped identify a host of new applications propelled by miniaturized remote computational engines.

As early-stage investors, we regularly meet with entrepreneurs, so many of whom have creative, innovative ideas. Some of these ideas are new, while others are significant upgrades to existing applications. A good number of them are at the point where semiconductors and MedTech intersect.

Conventional wisdom suggests that the cloud is the future of healthcare. We believe the real MedTech innovation is at the edge. Traditionally, it's been medical devices that measure glucose or monitor a heart. Now the line is blurring between medical devices, wearables, a patient's medical records and user data, redefining how the patient interacts with the medical system, including doctors.

While centralized computers kicked off MedTech many years ago and the PC's impact on society is vast,

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intelligent entities at the edge are making constant healthcare a reality. A complex computer that understands human needs for medical care connects computing to medical. Distance is dead and the computing power that AI allows at the periphery will make the concept of healthcare evolve rapidly and significantly, placing the patient in the center.

"The Deloitte 2020 Survey of US Health Care Consumers" reinforced many of our conclusions. It identified key trends in consumer engagement, virtual health, remote monitoring and data-sharing.

Pandemic-accelerated trends in consumer behavior have the potential to transform various aspects of the health care system. For example, consumers:
- Are increasingly engaged in their healthcare
- Increasingly are using technology and apps to measure and maintain their health
- Believe that devices help them change their behavior

In a more recent survey from Accenture, healthcare executives across six countries noted that the pace of digital transformation for their organizations is accelerating, an impact of the pandemic. Healthcare executives now understand every business is a digital business, according to "Accenture Digital Health

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Technology Vision 2021" that cited several emerging trends. Several are untapped opportunities for the semiconductor industry.

The first is a change from legacy systems to a technology architecture that includes social, mobile, analytics and cloud. By embracing new digital services and remote work, a healthcare organization's mission will be expanded. A digital twin strategy — the virtual representation of a real-time digital counterpart — strategy will intelligently monitor, simulate and streamline data from devices. Natural language processing, low-code platforms and robotic process automation will help democratize technology to make it more accessible to healthcare professionals and their patients to the point where "patient" becomes "consumer." Adoption of multiparty systems that use a shared data platform will allow healthcare partners to transact and share seamlessly and securely.

Telehealth — The future is now
Telehealth came into its own during the pandemic, hastening the move to virtual, distributed healthcare away from the traditional hospital-centric medical care system.

This shift is enabled by advances that leverage the latest semiconductor

technologies around sensors, AI, data analytics and mobile apps for home-based healthcare. Telehealth would not be possible without these technologies and further advances in computing power, network connectivity, hardware miniaturization and data storage. These same technologies drove remote work while solving and prioritizing a host of underlying technical challenges related to connectivity, reliability, security and privacy.

Telehealth is a meaningful change in the healthcare model and it's not just primary care provider/patient interactions. Data moves from being potentially inaccurate gauge at a single point in time to a continuous one. Blood pressure or heart rate, for example, are known to be inaccurate in a doctor's office where it's difficult to get an average, minimum or maximum of either.

Personalization of healthcare is coming quickly and several non-traditional systems companies like Google and Apple are moving in that direction with the goal to get people healthier. For instance, AI is now applied to more individualized care so that the same cure will not be prescribed for everyone. The fundamental characteristics of every consumer who uses remote telehealth will connect them with the medical assistance they need. Importantly, the unlimited compute power at the periphery will help understand when something is wrong or needs to be optimized for a specific patient.

Drug discovery is driving much of the change through the massive amount of collected data at the periphery and will continue evolving because of infinite computing. Labs today use intelligent compute power to look at millions of compounds. An AI processor will soon be able to identify a remedy through a specific mix of compounds for a certain illness tailored to a patient's DNA, personal parameters and other unique characteristics. Even breath could be used to get information as computing gets as smart as it needs to be.

The telehealth charter is much broader than it was and becomes a way to manage good health versus prescribing medicine based on experience, intuition and/or episodic interactions. Ultimately, telehealth will become healthcare and not sickness care, tracking with consumer behaviors and attitudes identified by the Deloitte survey.

The telehealth infrastructure

While telehealth is moving forward and the technology is available, the infrastructure is only now catching up. Peripheralization is extremely important and the key to a robust telehealth infrastructure.

Advantages in convenience and lack of exposure for the consumer and efficiency and lack of overhead for doctors, for instance, maximizes the value of in-person visits and increases consumer compliance. A patient's specific needs can be addressed, through the availability of powerful processor capabilities to support AI at the edge. It won't be sensors but intelligent devices able to analyze data and that intelligence will grow exponentially as the machine continues learning. A remote connection with a primary care provider won't need to be fast. It's more important that the data is available locally.

With time, valuable healthcare will be available to societies that may not have access to local care or telecommunications and the impact will be incredible.

A call to action for the semiconductor industry

The medical community is catching up and healthcare professionals understand the value of remote access for their patients. The new methodology moves processing to the periphery and is done where data is collected, a shift from the more conventional centralized computing-in-the-cloud methodology, though it produces huge amounts of streaming data, some that requires processing from wearables. Moving from the center to the edge is a major market shift and requires

technological innovation, including the ability to manage real-time encryption to protect privacy. It is also a shift from specialized silos of medical knowledge to accessible knowledge centers.

Opportunities in MedTech for the semiconductor industry are great and unlimited. Of course, it's already supporting applications as diverse as sensors, AI hardware and software, 5G and high performance. All of them can be applied to healthcare. The semiconductor industry can capitalize on the market shifts and look at MedTech as the next application space through investments in new technologies, and partnerships and alliances.

As an industry, we have an obligation to take care of people. For so long, we produced "things" or devices and yet, we have the information and knowhow capable of detecting disease and helping consumers stay healthy. Therefore, the new application space should be taking care of people. Consider for a moment the impact that EDA and the semiconductor industry can have on billions of people with clever use of the technology and devices to advance society. It will bring good health to billions of people worldwide.

Let's become citizens of society using the massive intelligence and infinite computing power capabilities we have available to transform healthcare and place the consumer at the center of telehealth. If we do, we will usher in the era of Medical Design Automation that will lead to Health-Maintenance Design Automation.

Conclusion

World-changing technology at the edge leveraging compute power and AI is astonishing and society will be the beneficiary as every need for everybody will be satisfied. Healthcare is only the beginning of new interactions that will offer continuous connection, not episodic events. No need to be "patient" any longer — human beings will be in control of their health. s⊡