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שמואל נאמן מוסד למחקר מדיניות לאומית בטכניון - 85300					



MARKETPLACE

# Internet of everything

Israeli start-ups are playing an important role in a burgeoning new industry known as the Internet of Things

**YOU WAKE** early on a crisp fall morning and your pill bottle makes sure you take the right medicine, in just the right dosage; it texts you if you forget. The toaster / coffee maker / egg maker fixes your breakfast exactly as you like it, asking you if you prefer marmalade or jam this morning.

You head for your car. It scans your face, opens the front door, turns on the ignition, and asks you, "Where to, sir?" while playing your favorite Bach partita, based on your prevailing mood (on bad days you hear Chopin's Funeral March).

"Work," you reply. It drives you to your destination safely and quickly, while communicating thousands of times each second with hundreds of other self-drive vehicles. Your hands never touch the steering wheel, because there is none. You wonder why humans were trusted for more than a century to operate potentially lethal weapons known as automobiles.

During the short drive, you ask your computer (woven into your attractive green blazer) to tell you your day's schedule. You view it on your eyeglasses. At work, you take an urgent call from a call center.

"Sir, how do you feel?"

"Fine," you say.

"Your monitor indicates cardiac irregularities. We're sending an ambulance. It will be there in moments." At the hospital, an arterial blockage is removed, which might have caused a serious heart attack. You are soon back at work.

Science fiction? Not at all. Everything described above exists or will soon. It is part of a burgeoning new industry known as the Internet of Things (IoT), in which Israeli start-ups are playing an important role.

IoT is the network of Internet-enabled objects, or things, which are able to transfer data to one another to do tasks without human intervention.

The global consulting firm McKinsey recently prepared an extensive report on IoT. According to the report, "The Internet of Things has the potential to dramatically improve health outcomes, particularly in the treatment of chronic diseases such as diabetes that now take an enormous human and economic toll... Technology suppliers... are working to fill the gap between the ability to collect data from the physical world and the capacity to capture and analyze it in a timely way."

According to the study, IoT has a po-



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tential economic impact of \$3.9 trillion to \$11.1 trillion per year in 2025. At the extreme, the global IoT industry could be as large as 11 percent of the world economy by that year when a wide range of devices that talk to one another will exist, on our bodies, in our homes, shops, offices, factories, work sites, cars, cities, and outdoors.

Economic and geopolitical forecasts always seem to go awry. But, surprisingly,

technology trends signal their arrival long in advance. The basic ideas for IoT have been around for decades. A glimpse of things to come came in 1982, when engineers at Carnegie Mellon University, in Pittsburgh, Pennsylvania, built an Internet-connected Coke machine that reported how many Cokes were sold and whether they were cold enough. Today, that Coke machine has descendants growing expo-

nentially in numbers.

The first IoT conference held in Israel was in December 2013. In the ensuing two years, the pace of innovation has accelerated.

"IoT is going to be the biggest wave of the Internet we've ever seen," said Inbar Lasser-Raab, an Israel-based executive who heads global IoT marketing for Cisco, a global hi-tech giant. She was quoted by

Chris Urmson, director of Google's Self-Driving Cars Project, seen at a demonstration of a prototype self-driving car in Mountain View, California, September 29

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the Israel21c website.

Some 26 billion objects (not including phones or PCs) will be Internet-connected in a decade. A whole new Internet protocol will be needed to provide sufficient Internet addresses for them all. And our cars? Road accidents and fatalities will decline by 80 percent – no IoT machine ever imbibed too much alcohol and ran off the road or into an oncoming vehicle.

**I GOT** an intriguing glimpse into the IoT future at the Global Semiconductor Alliance (GSA) Executive Forum gathering in Herzliya, on October 14, where I chaired a panel discussion. GSA is a group of 400 companies who, together, seek to improve the semiconductor ecosystem through innovation and collaboration. The topic of my panel was “Emerging Technologies for the Hyper-connected World.”

The first speaker was David Rubin, President and CEO of Holon-based Aerotel Medical Systems, which provides “personal telemedicine solutions” – a variety of remote diagnostic, emergency services, rehabilitation and monitoring applications. He began by noting that more than 300 million Chinese have cardiovascular ailments. The Aerotel device could save many lives there.

Rubin described an event like the one that opens this column. At an Aerotel gathering, a client was speaking and paused to take a cell phone call. The Aerotel device had detected a heart irregularity and the call center was informing him. A quick trip to hospital solved the problem, before it became a damaging heart attack.

Rubin noted that 60 percent of the delay in getting heart-attack patients to medical attention (often, over two hours) is due to the patients themselves, who hesitate, unsure of what is happening. By signaling distress to a call center, the Aerotel device can eliminate that delay, initiate emergency dispatch and save lives.

Zvika Orron, an Israel Air Force reserves pilot, is a cofounder of LifeBEAM, a wearable sensor company based in north Tel Aviv’s Atidim science park. The company’s “smart helmet” monitors the vital signs of pilots and astronauts and is part of Elbit Systems’ world-leading “heads up display” helmet. It can help prevent



COURTESY: AEROTEL

David Rubin’s Aerotel Medical Systems provides ‘personal telemedicine solutions’

death due to G-loc (G-force induced loss of consciousness), where pilots pass out owing to severe G forces. It is now metamorphosing into a civilian device for monitoring vital signs in general.

Opher Kinrot, CEO of OTM Technologies, described his company’s innovative product called phree, an electronic pen that can “write” on any surface. A 3D laser interferometer sensor measures your hand’s motion and records the result on your phone, tablet or PC. If, like many, you believe that handwriting is a more natural way to write, rather than typing letters on a keyboard, phree is for you. It enables you to write anytime, anywhere. OTM is funded by the crowd-sourcing website Kickstart and many have already preordered the device.

The heart of phree is a unique tiny sensor. From this, we learn that sensor technology – devices that measure everything, are miniscule, inexpensive and highly creative – has become the heart of IoT.

We also learn that an enormous and exploding quantity of data are now being generated, creating a spin-off industry, big data analysis, and a new scientific discipline. My university, Technion, is developing an innovative undergraduate data-science program to train engineers

to analyze these data.

In the ensuing discussion, Eli Hadad, a start-up entrepreneur who now heads Intel’s “perceptual computing group,” noted that significant infrastructure will be needed to enable IoT. For Intel, he is working on computing directed by hand motions and facial expressions.

## INTERNET OF THINGS IS HERE, NOW. IT IS FOR CERTAIN THE NEXT BIG THING AND IT IS CHANGING OUR LIVES

Start-up entrepreneurs who want to succeed in the brave new IoT world should remember a key fact – in the end, IoT devices provide services. The product itself is just a vehicle for doing so.

Do people really need the service? Does it meet a real want? IoT business models must be designed for services or solutions, not as products. Just because devices can talk to one another does not mean they should.

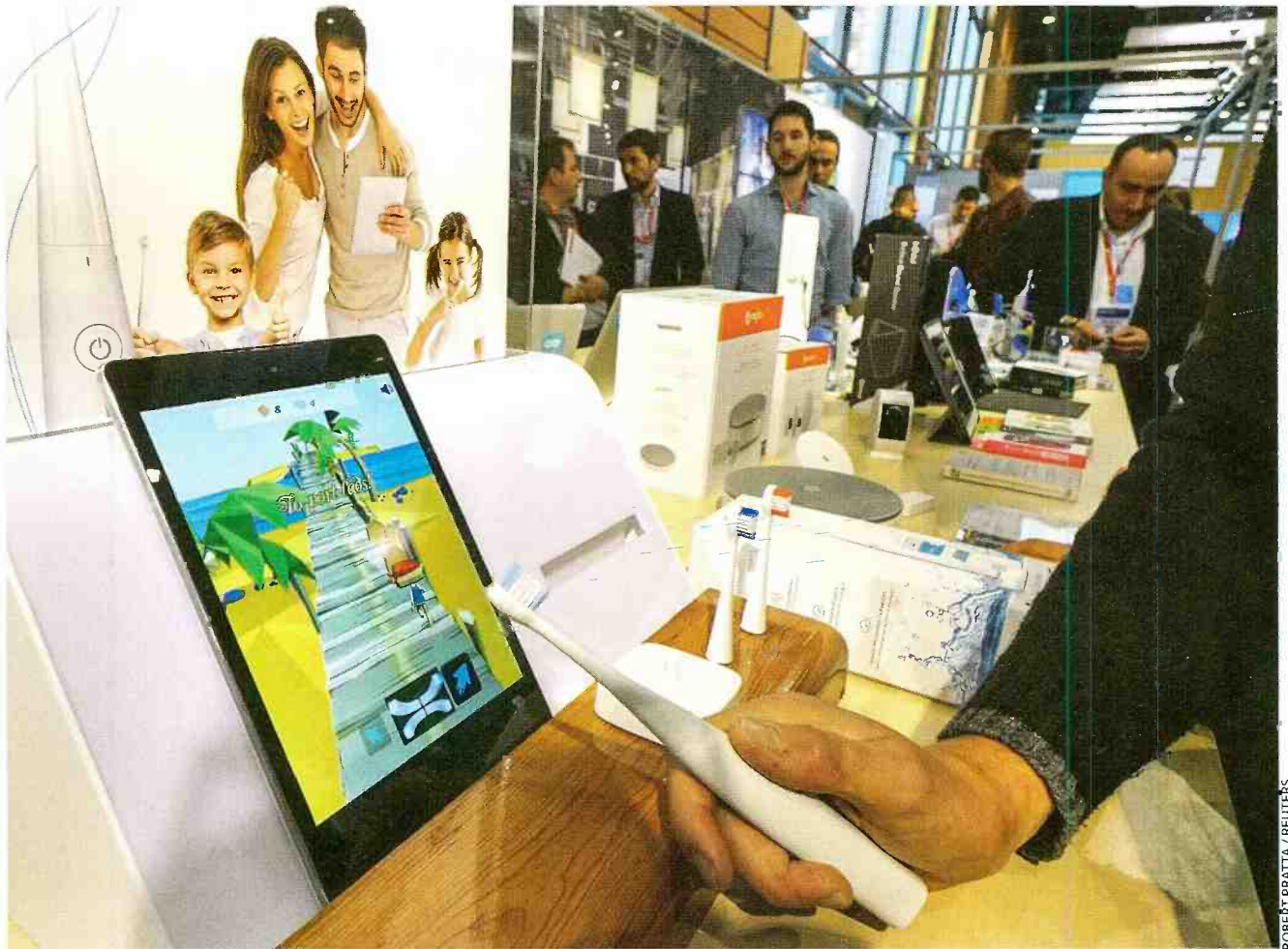
Like all new technologies, IoT has a human downside, or cost. First, we must remember that there are some four billion people, over half the world, without Internet; 730 million of them are in China. For them, IoT is irrelevant. Should we not bring them Internet before connecting devices of mostly the rich? Will IoT become just another domain that widens the rich-poor gap?

Second, security. Speaking to the GSA group, Hagai Bar-El, vice president of ARM, a US-based security firm, observed “we have never been good at incorporating security from the start of a new technology.” For instance, ATMs (automatic teller machines) were horribly insecure at first. He noted that companies tend to ignore security, then try to fix it later and pass the cost on to the consumer.

**“WE MUST** not mess up IoT security this time,” he said, emphatically. When every possible scrap of information about everyone exists everywhere, all the time, the potential for hacking, theft and other mischief is enormous.

And third, perhaps worst of all, is hu-

18.86x23.18	4/4	37 עמוד	the jerusalem report	28/10/2015	50227709-2
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An electric toothbrush is connected to a tablet device at SIdO, an event dedicated to the Internet of Things in Lyon, France, on April 7

man empathy. Will dependence on devices mean we no longer know how to engage, befriend and converse with live humans? Will IoT kill empathy?

In her latest book, "Reclaiming Conversation: The Power of Talk in a Digital Age," MIT Prof. Sherry Turkle, a sociologist and clinical psychologist, decries the decline of simple human contact.

"We're talking all the time," she writes. "We text, post and chat. ... Among family and friends, we turn to our phones instead of each other."

The result? "Our young people would rather send an electronic message than commit to a face-to-face meeting or even a telephone call." The resulting "flight from conversation" damages what is most human about us – our ability to form relationships, empathize, sympathize, understand, collaborate.

In the world of IoT, will "things" com-

municate in place of people? And will we, as a result, lose much of our essential humanity?

The 2013 movie "Her" follows Theodore Twombly, played by Joaquin Phoenix, as he falls in love with Samantha, a computer operating system, whose silky voice is that of Scarlett Johansson. Are we already falling in love with our "things"? I am told that depriving teenagers of their cell phones, as a punishment, is regarded by them as life-threatening.

An extremely important insight into IoT comes from Dave Evans, who has the intriguing title of Chief Futurist for Cisco. (I wonder, if soon, CFO will become Chief Futures Officer, displacing Chief Financial Officer.) He says, in the Huffington Post, that IoT is just one aspect of IoE, Internet of Everything. Not only things communicate, he observes. So do people, processes and data.

Evans thinks wearable technology will change our lives, and everything will be wearable. Sensors and videos now help stores adjust front cash registers and avoid lines. Sensors are even placed on food to alert customers and stores before it spoils. Sensors will help farmers and ranchers know when to irrigate, fertilize and move their herds.

I asked the GSA panel whether Israeli hi-tech will be prominent in the burgeoning global IoE industry. The answer was, yes and no. No, because Israel has never excelled in consumer products. Yes, because Israeli technology in sensors, software, data analysis and other technologies will help build the IoE infrastructure crucial for its success. ■

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