



IoT is Turning the World into a Soft Machine

Dave Aron, Global Research Director, dave.aron@leadingedgeforum.com

If I took a tablet computer back to the 1600s using a time machine, I would probably be killed as a witch. I probably wouldn't fare much better at any time in the next few hundred years. Even showing up in the early 20th century with a tablet would probably result in a rather unpleasant fate involving secret government agencies and probes in uncomfortable places.

Even though other machines and objects throughout history have been powerful and influential (check out Tim Harford's cool book *Fifty Things That Made the Modern Economy* for some good examples), the computer is the most magical and scary. Why? Because it is a *soft machine*. Imagine if you will, showing your great-great-grandparents a connected tablet computer that is a calculator one second, a movie theatre the next, a jukebox the next, a typewriter the next, a window on an almost infinitely large library the next, then a shopping mall, then a telephone, then a language translator, then a virtual classroom, then a dating agency, then a casino, and then, of course, inevitably, Candy Crush. (Other games are available.)

Computers are amazing because they are extensively fungible devices. Any idea that can be expressed using logic can quickly be programmed and become one of the identities of a computer. We can monitor and change almost everything to do with a computer in near real-time.

The physical world, on the other hand, has historically been much harder to monitor and change. You can't easily change a hill into flat terrain, increase your own fitness in a flash, clean up the oceans overnight, or rebuild a derelict factory in a day.

The Internet of Things (IoT) is an umbrella term for instrumenting, sensing and sometimes controlling physical things by embedding information technology in them. It typically includes operational technology (OT), such as factory automation systems, telecom networks and medical machines, and also things that have never been digitally connected before, such as our bodies (think Fitbit, etc.), our homes (think Hive, Nest, etc.), our cars and other vehicles, and even our clothes. Let's call them NT (standing for New Technology or Non-Technology).

There are a million and one potential use cases for IoT. One of my personal favourites is the move from Time-Based Maintenance (TBM) to Condition-Based Maintenance (CBM), where rather than following a fixed schedule, we empty the trash cans when they need emptying, maintain the railway points because they need maintaining, water the plants because they need watering, etc. I also love the use of IoT to allow business models to shift from one-off product sales to usage-based service value streams, for example car-tyres-as-a-service and jet-engines-as-a-service.

The opportunities and challenges in each organization are different. Governments have the array of possibilities that smart cities represent. Companies with manufacturing plants have real-time operational intelligence and optimization opportunities. Hospitals can drive benefits for all stakeholders – patients, visitors, nurses and doctors. Transport companies can optimize routes in real time, and manage and track temperature and other physical conditions with much more accuracy.

In general, IoT is driven by low-power wireless connectivity; miniaturization of technology so that it can be embedded in large numbers of small, cheap, light devices; analytics and intelligence at the edge and in the core; and platforms that allow this all to happen.

But if we are going to have IoT in our business models, we need to architect it in. And that means thinking about the special considerations of the types of IoT we are considering, for example:

1. How to integrate traditional enterprise IT with the OT and other IoT devices, data and networks that your use cases will involve.
2. How to handle the data volumes involved. There are typically much higher volumes of data coming from IoT than from conventional IT applications.
3. How to evolve your risk management, regulatory and legal compliance approach to include IoT.
4. How to cater for the new attack surfaces and attack vectors that your IoT use cases open up, and the often much more immediate and severe consequences of an IoT incident. (Think nuclear plant meltdown, invasive digital device failing whilst inside the body, connected car going haywire whilst driving.)
5. The time nature of IoT, and whether that works in your current architecture. Specifically, the need for true real-time responses.

On our coming LEF study tour *Re-Architecting for a Smarter World*, we will discuss all of these issues, and a few more, with a wide variety of big companies, VCs and startups in Seattle, Silicon Valley and (virtually) Israel. These include Amazon, GE, Hitachi, Intel, Madrona Ventures, Seeq, XNOR.ai, M87, Rigado, Resin.io, Swim, Andreessen Horowitz, Mesosphere, IFTTT, Lookout, Dangerous Things, SCADAfence, Presenso and PointGrab.

But, as well as thinking about the realities of integrating IoT, as digital leaders we must bear in mind and steer the big vision of where things are going. Everything will be smart – cities, cars, factories, robots, humans. Everything will be connected. Everything will be inspectable. Many things will be electronically controllable. In essence, the world itself will become a computer, a soft machine, infinitely controllable, highly changeable. This vision clearly has both powerful potential and scary risks.

For those who don't mind looking a bit further out, the full potential of virtual/augmented reality, 3D printing, robotics, artificial intelligence, human augmentation, and perhaps even teleportation will increase the degrees of freedom we have in monitoring, controlling, destroying and creating the physical world from the digital world. The soft machine will become more and more flexible and powerful.

Another way of saying 'soft machine' is 'anything is possible'. That means we'd better get very good at creativity, innovation and strategy. If you can imagine it, you will be able to do it, see it, buy it. Arguably, the only sustainable competitive advantage becomes the ability to imagine. So whilst we are busy engineering the near future, we have to make sure we are ready to be imagining the medium- to long-term future too.

See you on the study tour in a couple of weeks!

About Leading Edge Forum

Leading Edge Forum (LEF) is a global research and thought leadership programme dedicated to helping clients reimagine their organizations and leadership for a tech-driven future. We serve as a strategic touchpoint for CXO teams to provoke and challenge their thinking to help them win in the 21st century.

We believe that as business and IT become inseparable, virtually every aspect of work and the modern firm will need to be reimaged, and this creates exciting new digital opportunities.

Through an annual membership programme of research, events, onsite workshops and advisory services, we support senior leaders in areas such as strategy, organizational change, executive education, talent development and the future of the IT function. Members enjoy personalized access to our global network of thought leaders, clients and leading practitioners.

Leading Edge Forum is part of DXC Technology. For more information, visit leadingedgeforum.com.