

## How the Internet of Things is going to change our lives

The Internet of Things (IoT) and the Big Data seem to be the two current fads of the digital world.

But make no mistake: they are not just hyped phenomenon. They are going to change our lives and the lives of a series of companies.

The IoT transforms inanimate objects into clever objects, able not only to retrieve information but to treat information and to react to those information. For instance a bracelet which counts your cardiac pulse will register it in real time, treat it with an algorithm to detect anomalies, and warn you with a push SMS or a ring if there is a risk, for instance if you are running too quickly.

Basically the IoT is a powerful combination of three parameters: sensors, which retrieve information, algorithms, to analyze it, and interfaces, to communicate the results to either human beings or to machines.

The recent innovation in the IoT is the interface with human beings. Sensors, algorithms and interface have been used for a long time, for instance in car electronics. The retrieval of physical or physiological information, their real time analysis and the ultimate interface with human beings is on the contrary rather new, and has stupendous implications.

In B2C, IoT is opening for instance the immense field of e-health, in which prevention supersedes cure, which is the only way to solve the impossible problem of health costs, which enrich



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physicians, clinics and drug companies but dramatically impoverish the rest of the population.

Wearable device, on the model the Nike or the Fitbit bracelets, but more sophisticated, will continuously measure physiological parameters, analyze it, and will warn in advance the user of health problems, which can either be avoided by a change in behavior or cured more cheaply and more efficiently it at a very early stage. One may imagine that in the future a sensor will measure the quantity of bad fat in the blood and advise the user: don't go Mac Donalds for one month! Instead of letting her or him eat huge amount of trans fat and prescribe useless but lucrative anticholesterol drugs.

But there will be also more and more non wearable devices, such as the Nest smoke detector, the Netatmo carbon oxide detector or the Withings scale, able to detect and analyze information either physical in real time or physiological when used, and to transmit to the user the result of the analysis of the information, and eventually advise her or him to take an action or automatically trigger the action if time is of the essence. In wearable devices, parameters such as weight, size, convenience and design are paramount, even if design is clearly a priority of all connected objects, as demonstrated by Nest or Withings.

And finally robots can also be considered as autonomous connected devices. The recent progress in robotics proceeds directly from Moore's law (the computing power of chips double every eighteen months) and Gilder's law (the bandwidth capacity double every six months), as well as from the progress in digital sensors. The acquisition of eight robotics start-up by Google is the signal of a new age in which robots will fulfill all sorts of needs, like the robot Baxter which can move things, the Paro robots which is a companion for the elderly, the drones being developed for military or civil uses, or even the Google which replaces the car's driver.

The IoT is the main leap in the e-information age. The printing press was a first step to the information revolution, but the Chinese invented it in the 10<sup>th</sup> century, and it was the movable type invented in Europe during the Renaissance changed the paradigm of printing, and thus of information distribution, long before the revolution of digitalization.

In the digital age, Google give us access to all the public information worldwide, Facebook gives us access to the private information anyone decides to offer to the world, but the IoT creates terabytes of additional information, such as the cardiac rhythm of potentially billion of people, or the room temperature or fridge content of millions of households. No wonder that Google acquired Nest. IoT is the next digital revolution, after the search engine and the social network.

Information in itself is valueless. Information has value only if it is analyzed and leads to action. The IoT creates gigantic amount of information through the development of sensors, but the keys are storing the information, developing algorithms to analyze it and derive useful predictions or actions from

this analysis, presented in a ergonomic interface (such as the Apple apps, which were a giant progress in machine to human interfaces).

The IoT can be used by an individual, for instance to monitor her or his health, but may also be used collectively, to benchmark individuals, or to reach global conclusions or actions from a mass of individual measures, as in the example of the Waze GPS informing in real time on the speed of traffic.

IoT and Big Data are thus close relatives, because the IoT will be the major source of big data in the future. We will evolve in an information maze, information will be everywhere on everyone and on everything, and the key issue will be to make sense of this tremendous mass of information, both individually and collectively. IoT, will impact transportation, energy, health, work, all facets of our daily life. Disney parks' MyMagic+, an RFID connected bracelet, "allows employees to address a child by name or wish someone an happy birthday", and "changes the interaction between customers and the company", an experiment which could spread to museum, cruise ships, or holiday resorts.

In B2B, the IoT might also lead to very powerful development, for instance to detect and prevent accidents to improve security or diagnosis. Google glasses, worn by a surgeon, enable her or him to share the operations with colleagues or ask a remote specialist to advise in case of complication. Google glasss worn by the pilot of the lost Malaysian Airline plane, transmitting in real time in the cloud through two-ways satellites the visual and sound data as perceived by him could have helped eventually to prevent a strange accident and at least contributed to explain it and to identify the localization of the drama...

It is Time Equity's belief that the IoT, and the Ubiquitous Information Age (UIA), will bring immense benefits and that a wealth of new companies will develop in this field. We intend, as growth capital investors, to participate actively to this shift.

However let's remember there is always a dark side to any technology, and we have to anticipate, regulate and cure the

threats in advance. The NSA leaks remind us that our smartphones are perfect tracking tools, for content as well as location. Disney parks' MyMagic bracelets are called "spychips" because they intrude on customers' intimacy. The key issue of the IoT and the resulting "big data torrent" is: who will own, who will use, who will share the big data with whom...

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