

global conglomerates and governments alike have consistently focused their interests around building island-based solutions or standards. For instance, there is no single unified electrical plug to date – the IoT will change that. Nobody can truly predict how, but if IoT actually works (and I don't think that this movement can be stopped now), it will break down those barriers by demands from all sides: consumers, companies and eventually governments themselves.

Whether the IoT actually helps us to progress as a society will depend on a variety of factors. History has shown that technology does not automatically makes us better or worse, but that it depends on our ability to foresee which principles and policies we adopt will eventually lead to either an ascending or a descending path. One aspect technology has always had is the ability to accelerate existing and ongoing developments. From a security and privacy point of view, we're likely to see much more transparency in the future, but we'll also be at great risk of losing the democratic freedoms previous generations have worked and fought very hard for.

In fact, the chances that the divide between rich and poor gets greater and that technologically advanced nations continue to lead the race even further, making it near impossible for others to catch up in the not so distant future, are pretty high. Of course, the opposite is also true: nations which take too much time to come to terms and agreements on IoT-related policies could lose out considerably during this industrial and internet-based evolution of technology.

IoT leadership

IoT is about the psychological acceptance of having tools available that will simplify our daily tasks and help us focus on complex matters that require our full neural attention. For more than a century, the United States was considered fertile ground for innovations and business. Europe should learn those lessons and open doors to an active, pan-European living lab that will enable the whole continent to be the best place to innovate and start business.

Many infrastructural/development projects are lacking on the use of the technology and, by the time it gets too late, there's no possibility of integrating IoT into the deliverables, so we are lacking new standards – something to make Europe one of the best places to live. What if the EU could be at the forefront of this 'new



In order to realise the full benefits of AI, 'things need to be connected first'

internet' which is interconnected, intercompatible and ultimately ruled by machines and not humans anymore?

The key to the IoT is identity management: you either own the system or be owned. If the EU wants to lead, it has to integrate from identity management and create IoT platforms and databases, as well as its own Ubers, Googles and Airbnbs, thus creating pragmatic cybernetics in a population of 500 million people.

The IoT is in essence the seamless flow between the:

- BAN (body area network): the ambient hearing aid, the smart t-shirt;
- LAN (local area network): the smart meter as a home interface;
- WAN (wide area network): telematics, intelligent transport systems and the connected car; and
- WWAN (very wide area network): the smart city, as e-government services everywhere are no longer tied to physical locations.

Whoever ensures traceability, sustainability and security linking up to the gateways (the Fog and the Cloud) is able to offer the best possible feedback on physical and mental health; the best possible household decisions based on real-time monitoring for resource allocation; the best possible decision making based on real-time data and information from open sources; and the best possible alignments of local energy providers with the global potential of wider communities. Google is rolling out Google Glass, Google Contact Lens, Nest, car and automotive technology, open data initiatives, and also cultural hegemony, through Google.org.

Yet these gateways, the platform and the 'app' or service store model, should be in public hands. This is only realistic by using identity management as a lever. We build a secure, stable and innovative device that acts as a passport as well as a controller to which appliances in the home can be assigned. This device talks specifically to European platforms and a so-called 'EU cloud'. Citizens gradually manage more of their everyday services in the European service store. Eventually, this pragmatic clean slate approach allows for the creation of a specific European pace in the digital transition, much like the success of the Estonian e-card, and

creates a real multibillion market, initiating and integrating new currencies (Bitcoin, free coin), eradicating the black market and corruption and allowing for new forms of direct democracy.

EU impact

The EU has identified the innovation potential of IoT since the Seventh Framework Programme for Research and Technological Development. At that time, the commission invested €100m for R&D and the piloting of IoT projects. In 2015 its successor Horizon 2020 added €51m in funding for creating IoT innovation ecosystems and complementary programmes that support IoT modularity, for example, €300m for FIWARE community creation in 2011 and €80m for engaging European SMEs and start-ups in 2014.

However, an outstanding mindset shift has been realised in 2016 as the commission wants to build upon the previous extensive resources allocation and, after establishing large scale pilot frameworks, it now calls for certain IoT implementations to scale and expand in various EU and international markets. Consequently, only for 2016-2017, €140m in commission funding will be available solely in IoT pilot development (not research). These funds address all the hot areas for massive IoT projects adoption, such as smart farming, home, wearables, health, cities, vehicles and manufacturing. Furthermore, the commission prepared the local strategic partnership agenda topics in collaboration with the Alliance for Internet of Things Innovation (AIOTI).

As far as the national policies are concerned, there is not any 'one-size-fits-all' solution. However, the technologically advanced EU member states have already precisely set their national agendas/strategy plans/initiatives for the Smart 2020 era. It is important to underline the paradigms of Germany, the UK and the Netherlands.

National ambitions

The IoT is a main focus of Germany's 'Industry 4.0' plan to modernise its manufacturing sector. Germany has devoted €201m to support industry, academic and government R&D efforts to advance 'smart factory' technologies ranging from sensor-embedded systems to AI

The IoT: a 'seamless flow' connecting BAN, LAN, WAN and VWAN



platforms that can help operate internet-connected machinery.

The UK started pushing a national IoT agenda in 2013 when the Technology Strategy Board, later absorbed by InnovateUK, created the IoT Demonstrator Phase I Clusters. Now, these partners constitute part of Hypercat Consortium, which is an inclusive one stop shop of best practice in IoT implementations.

IoTUK is another national programme designed to accelerate the UK's IoT capability, launched as part of the government's £40m (~€51m) investment into the IoT. Its aim is to advance the UK's global leadership in the domain and increase the adoption of high quality technologies and services throughout businesses and the public sector. It is powered by the Digital Catapult and the Future Cities Catapult.

Furthermore, the UK's Government Office for Science made recommendations about the programmes and leadership roles the government takes control of, namely to foster and promote a clear aspiration and vision for the Internet of Things and to deliver the vision and the high ambitions while removing barriers and providing catalysis.

The Netherlands set up the BigT&U project, a Dutch public private partnership for aggregating market information for the horticulture sector to meet the Big Data challenges of all relevant stakeholders. These data sources come from social media, mappings between classifications of products, uniform interfaces with standard classifications and more. The goal is to boost applications of market data, enhance market orientation and data-based supply planning, and minimise investment costs for individual SMEs.

In respect to why nations need an IoT strategy and what further steps would be needed, the Centre for Data Innovation and the AIOTI say: 'A national strategy for the IoT, if designed and implemented correctly, would maximise the opportunity for the IoT to deliver substantial social and economic benefits that will overcome three IoT-related critical factors: market failures, the need for an innovation-friendly regulatory environment, and the need to promote equity.'

Finally, AIOTI's response to the European Commission's Digitising European Industry consultation before establishing the 'IoT innovation ecosystems for Europe' underlines four pre-conditions:

- Secure funding with the exploitation of tools such as the European Agricultural Fund for Rural Development for smart farming, structural funds such as the European Regional Development Fund, and Smart Specialisation strategies;
- Funding mechanisms for shorter development timelines and faster deployment for ambitious IoT innovation;
- Frequent assessments with cascade funding mechanisms and fewer resource diversions for successful project teams; and
- Proposal evaluations based on the innovation potential and the impact they would create in the innovation ecosystem.

IoT 2016

Looking ahead, several key themes dominate the IoT (notably security, advanced analytics and event management, and software/application platforms). Regarding security, this is the most important trend that only increases the urgency associated with a secure connection and remote control IoT devices. Meanwhile, in the field of advanced analytics and event management, there is a shift from just looking at historical data and what happened in the past, to using prescriptive analytics to understand what will happen next. There is an emphasis on creating new insights, new business models and new ways of staying ahead of competition, with businesses learning and adapting to give themselves the best possible chance.

Moving to the IoT software/application platforms, there is a need for the use of software for device management to grow in 2016, especially when dealing with devices which transmit data at different transmission protocols. In Blockchain, despite now actively used in Bitcoin, there is the need for a decentralised approach which increases the IoT. Its use will enable the industry to maintain a large amount of money at the expense of this approach.

LPWAN (low power wide area network) technology is still developing in Europe and will need time to cover a sufficient number of areas. 2016 will probably be the year of LPWAN partnerships, consolidation and marketing wars to determine which of the many players and standards will be winners.



© European Union, 2016

Both Germany and the EU are making key investments in the IoT

New world order

As with any technology that is as hyped as the IoT, there involuntarily comes a slowdown in interest when the realisation sets in that it will take more time than expected, is more complicated to execute, and that there are significant risks associated with it (which were simply brushed away during the euphoric phase that any hype starts off with).

That said, in comparison to the rise of mobile (where telecom towers had to be built, chips needed to be smaller, batteries needed a longer lifetime), the internet (where modems and an internet access needed to be sold, access needed to be accelerated, the number of websites was limited, plus it was all new for the user) and the e-commerce industry (the trust factor, online payment methods, delivery/logistical challenges, etc.), for the IoT, everything is more or less already 'in place'. Whilst there are a few serious challenges that will need to be overcome, they pale when compared to other technological breakthroughs.

The IoT is not just a new paradigm, it is a new world order, not so much in the political sense but in the nature of the term: 'order' as in 'hierarchy', reciprocity and communicative relations. We are entering a world in which the environment becomes the interface, and there will be no more dual relations (me and you, me and an object), but there will be always a third party (sensor-database) involved.

Alexander Grankin
Damir Čaušević
Gérald Santucci
Harris Moysiadis
Rob van Kranenburg
Toby Ruckert
The Internet of Things Council

www.theinternetofthings.eu