

Reaching the next phase in IoT

Why corporates are best equipped to take the lead

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IN A BLINK:

In the last decades, the beginning of the digital era, the majority of radical innovations have been initiated by startups. Creating innovation in IoT is a different game. Corporates might not realize it yet, but they are well equipped to play this game. Creating IoT-based value propositions is often not rocket science from a technological point of view. However, to create value, it is essential that organizations start to develop new partnerships.

1 Introduction to the Internet of Things

1.1 What is IoT?

Internet of Things (IoT) is the network of physical objects or "things" that are connected to the internet. These objects or "things" can sense and/or control the environment through software, sensors, and electronics. IoT is sometimes also referred to as "Internet of Everything", "Web of Things", "Connected things" and "Machine to Machine". In this BlinkPaper we will refer to this phenomenon as Internet of Things (IoT).

Connecting physical objects to the internet creates a tremendous range of opportunities to integrate the physical world with computer-based systems. Although some might feel that our daily lives and the physical objects surrounding us are already strongly digitalized, we think that it is just the tip of the iceberg. Today we are at an early age of the digital era, and in the future our daily lives will become much more digital and connected¹. Billions of objects will become connected. IoT, combined with other emerging digital phenomena such as Big Data and Blockchain will inevitably lead to a much more digitalized world.

IoT is not limited to a certain context or setting such as your house. All kinds of objects and spaces that we use and interact with may eventually become connected and "smart", such as; transport, offices, education, healthcare, shops, warehouses, your house, factories, and cities.²



Figure 1. The Internet of Things is a cross-domain phenomenon³

Connected sensors make it possible to constantly monitor the state, performance, status, and variations in processes, machines, parts, and environments. This improved monitoring provides opportunities for increasing efficiency. For example, a reduction in downtime and operating costs could be achieved when connected sensors are embedded in operations, and manual checks become less necessary.

Radio Frequency Identification (RFID) is an important building block for IoT. RFID are wireless microchips used for tagging objects for automated identification. Passive RFID tags are already widely used. Semi passive and active RFID tags are both another type of RFID microchip, that can sense and send information using their own power supply. Another technology that could become an important building block in IoT is a long-range radio (LoRa) network. In 2016, a Dutch telecom company was the first to roll out a nationwide LoRa network.

Eventually, the improved technological possibilities in real time monitoring by IoT will have a major social impact. The responsibility for maintenance and repair of objects will shift from the user to the supplier, as suppliers become better in monitoring and intervening than users; they simply know what is going on with the object better than the user. As a consequence of that, products will no longer be sold, but services are provided. Operational costs and costs for maintenance and repair will be at the expense of the manufacturer. This will lead to a shift in focus as well as how businesses work, as product sustainability, durability, and reparability will become increasingly important.

After SaaS, PaaS, and IaaS, IoT will lead to "Anything-as-a-service"; also sometimes called "Everything-as-a-Service" or XaaS⁴. This means that customers pay monthly fees to have access to a value or service. Consequently, users no longer own products. The accountability for products and systems to function at the site of the provider will lead to a shift in focus of business models from price per unit and units sold to the number of users or subscribers and monthly compensations. Therefore, user experience and customer satisfaction will become paramount.

¹ Gartner, November 10, 2015, "6.4 Billion connected "things" will be in use in 2016, up 30 % from 2015"

² McKinsey, June 2015, "The Internet of Things: Mapping the value beyond the Hype"

³ Icons used in this paper are obtained from thenounproject.com

⁴ H. E. Schaffer; IT Professional (Volume 11, Issue 5), "X as a Service, Cloud Computing, and the Need for Good Judgment"



1.2 Current status of IoT

Currently, there are two major areas in which connected products are present to a reasonable extent. First, there is a significant amount of connected luxury products for consumers interested in the newest gadgets. Second, we see a number of connected products in industries that specifically aim for efficiency increase.

1.2.1 Luxury products for innovators

The first segment where a significant number of IoT products is emerging, is in luxury consumer products; or “gadgets”. Currently, these products are mainly for a group of consumers often referred to as early adaptors and are not yet being used by the majority of the consumers.

In the last years, lots of smart consumer products have been introduced to the market; smart watches, smart thermostats, smart washing machines and so on.

Digital innovations such as smartphone applications have gained millions and sometimes billions of users in only a few months. So far most IoT products are only used by a small group of consumers.

Some products with similar functionalities are on the market, however, for now these are only installed in the houses of the tech-savvy happy few, the so called “innovators” and “early adaptors,” according to Rogers theory of diffusion of innovations.

Tesla’s over-the-air (OTA) updates added new features such as automatic parallel parking and emergency steering to cars that were already sold and on the road. In the history of physical products, like automobiles, it is unprecedented that product quality improves over time. Cars have always been assets that depreciate rapidly, now Tesla just added value to your vehicle, for free.

While the 200.000⁵ Tesla Model S and X owners see great value in the fact that their car is a connected product that continuously improves without effort or costs, they only represent a tiny fraction of the billion plus cars on the globe today⁶.

1.2.2 Efficiency gains heavy industries

A second segment where a significant number of connected products is emerging are heavy industries, machinery and manufacturing. Here, sensors are used for the optimization of existing processes.

In the last decade, there has been an astonishing rate of innovation in the industrial sector. Equipping machines and machine parts with sensors has made predictive maintenance possible, drastically reducing downtimes and saving billions of Euros. Only a few percent of efficiency increase in capital intensive sectors has led to billions of cost savings. The technology that makes this possible can therefore be seen as extremely innovative.

However, these are not “quantum leaps” of efficiency increase, the machines still perform the same task. Rolls Royce manufactures engines for the naval and aviation industry. By adding hundreds of sensors to these engines, engineers have access to real time performance data⁷. This helps to schedule maintenance more effectively and thereby improve the safety of flights and reduce the chance of delays. Valuable improvements, however it does not get you to New York twice as fast.

The introduction of IoT technologies led to a change of business model. The fact that Philips sells lighting solutions instead of lighting products to cities does not affect the end users of street lighting; which are the people in the streets.

⁵ <https://cleantechnica.com/2017/01/03/teslas-2016-deliveries-production/>

⁶ http://wardsauto.com/ar/world_vehicle_population_110815/

⁷ <http://www.forbes.com/sites/bernardmarr/2015/06/01/how-big-data-drives-success-at-rolls-royce/#1bf339d03ac0>



2 Corporates are best equipped to lead IoT innovation

The popular video 'A Day Made of Glass', produced by glass manufacturing company Corning in 2011, shows a day in the life of a family in the 'near future'. In this 5-minute-long movie, one can see a number of examples how IoT technology could change our daily lives. The movie shows a bus stop that interacts with people in its vicinity, the bus schedule is represented in Mandarin to a Chinese woman and sends the details to her smartphone.

Six years later, this is far from reality. Although we all have the newest technology available in our bags and pockets by smartphones, tablets and laptops, a big part of daily life is still remarkably analog. Peter Thiel stated in his book 'Zero to One, Notes on Startups, or How to Build the Future' (2014) that "The smartphones that distract us from our surroundings also distract us from the fact that our surroundings are strangely old."

What are the reasons that the Internet of Things is not yet omnipresent and ubiquitous, but instead is still a novelty to lots of people and in most industries?

First, we hypothesize that it is not realistic to expect the same rate of innovation in IoT compared to software innovation. IoT covers a broader technology stack to connect physical objects to the internet. Apart from software, one needs connectivity, and hardware, such as sensors or actuators etc.

And secondly, the current paradigm is that startups will fuel innovation. We argue that this should change to reach the next phase in IoT, as in the context of IoT, corporates are way better equipped to create new value propositions.

2.1 IoT value propositions are multilayered

To construct an IoT value proposition, multiple layers of technology are needed. The large number of layers make IoT innovations and product development a technological and organizational challenge.

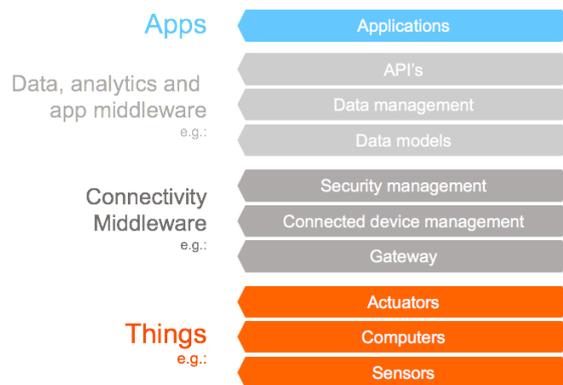


Figure 2. Example of an IoT technology stack

The technology used in IoT itself is not very complex nor new. However, what makes the technical complexity a challenge is the joint effort of different (technical) disciplines. From mechanical engineers, to software engineers, networking engineers, electrical engineer and designers, they all need to work together to create successful products and services. This needs to be considered when teams and departments are developing IoT value propositions. A small startup with a limited number of employees is less likely to be able to recruit all this expertise. With large pools of human resources, corporates likely have a wider range of backgrounds and expertise among their resources. Therefore, it will be much easier to start a successful multidisciplinary IoT team in a corporate.



2.2 The use of existing production and distribution channels

When we compare the rise of IoT with other technological and IT developments of the past decades, there is a discrepancy in scalability. By nature, duplicating and distributing 100% digital products is extremely easy. Hence, the diffusion of digital innovations can be extremely fast and is only limited by demand. Apps like WeChat, Instagram, Snapchat and others have consistently experienced the incredible growth rate of more than a million new users per month.

IoT concerns physical objects, the manufacturing and assembly of every new product costs money, recurses and time. And it must be shipped from the manufacturing facility to the end-user.

This limited scalability makes IoT less attractive for Venture Capitalist. Compared with IT ventures, IoT startups demand a bigger investment and the possible returns are smaller.

2.3 Predictable lifecycles of hardware products

When considering the connected objects that are already in use; most connected objects do not form completely new product categories and product families. Instead, connected objects will replace comparable non-connected objects. This leads to another type of sales dynamics in IoT compared to IT. For example; a few years ago, nobody owned a tablet, the iPad formed a new product family. Tablets did not replace an existing product and therefore, everyone who wanted a tablet acquired one. The number of tablets sold was spectacular in the first few years. Unfortunately, this can't be expected for most connected products. Most customers will only consider buying a connected object when the non-connected equivalent needs replacement. One buys a connected washing machine when the traditional, non-connected washing machine does not function properly anymore. Therefore, the current lifecycle of existing products will be a driver for the diffusion speed of innovation in IoT. Those lifecycles are quite predictable in most industries.

2.4 The power to leverage existing assets

In 2015, Audi, DHL and Amazon started a partnership for a pilot in parcel delivery. The system is called Audi Connect Easy Delivery. It allows car owners to have their packages delivered directly to the trunk of their cars –convenient, secure and discreet. The car owner will consent to GPS-based tracking during a specific delivery time frame. This triggers a digital access code for the DHL driver that unlocks the luggage compartment. Once the parcel is deposited in a car and the trunk is shut, entry is no longer granted.

Corporates can leverage existing assets to launch IoT value propositions. By connecting systems with Amazon and DHL, Audi added a feature to cars that are already on the road.

By adding sensors to existing assets products can get new functionalities, or these sensors can be the basis of a completely new value proposition. DHL added air quality sensors to its fleet of delivery vans and thereby created an additional business model. While these vans and their drivers do their regular work, delivering parcels to consumers and business, the sensors constantly measure the air quality. The development of the air quality is plotted on the map and helps cities to take measures to improve the air quality.

Startups do not have these assets and thereby cannot tap into such opportunities. Unless corporates seek partnerships and give third parties access to their assets, such as infrastructure and data.



3 Partnerships are key to the Internet of Things

The number of available connected objects for tech-savvy consumers and the rise of IoT in the heavy industries context is impressive, however the number of connected products in everyday life proves to be limited so far. We argue that more and smarter partnerships will change that and are the key to unlock the next phase in IoT.

In chapter 2 we described four reasons why corporates are best equipped to take the lead in IoT innovation. They have a significantly better starting point than startups. This does not mean that it is easy for corporates, however, these reasons do make clear why it is extremely difficult for startups to bring relevant connected products to the market. Joining forces from two or more organizations, and combining different capabilities and assets will significantly improve the chance of overcoming these hurdles.

Interview Philips's Ben-Zur:

"We should augment what we are doing with an ecosystem."

Liat Ben-Zur is Senior Vice President Digital Technology at Philips. She is responsible for driving the connectivity & digital strategy across the company. The authors of this paper interviewed her in February 2016 about her view on IoT and partnerships between corporates and startups.

"I was brought to Philips to help Philips transform from being a boxed goods company to being a digital company. I'm not necessarily working on one business, but helping all the different businesses."

Philips is a company born on the foundation of innovation. *"Philips is busy driving innovations that are transforming how healthcare is delivered around the world. Even great companies who have thousands of hardcore R&D engineers working on next gen innovations need to be open to the exciting things sprouting up in the startup world. The ability to innovate inside and outside is key, in my opinion."*

Ben-Zur is explaining her view on partnerships between startups and corporates: *"I think a lot of innovation is happening in startups, there is a role for big companies to play in distribution, brand, visibility and manufacturing. That is where big companies can partner up with small companies, and offer some great opportunities."*

This requires a shift in approach: *"Big companies have histories of doing everything by themselves. I think that is what a big company needs to do differently today. Go out, find the partners who are doing the stuff. You don't even need to acquire the startups you work with; it is about simple partnerships!"*

However, partnerships are not always easy: *"One of the biggest tactical challenges is for big businesses to be successful in ecosystems, with all of the partnerships. They need to streamline how they work with lots of small companies. It is hard, because big companies have a lot of systems and processes, and lots of lawyers. It is part of our job to transform startups to think about these things, and to work with legal, IP and procurement. The things that they are worried about are important things. You've got to think about security. A small company that has 10 employees, that has launched something through Kickstarter, doesn't really think about privacy, data security, all of that, they don't care because they have nothing to lose."*

Philips is creating such an ecosystem: *"It is not that we are not innovative, but we are not so blind to think that we can do everything by ourselves. And we think that there is so much innovation happening outside, so fast, that we should augment our innovation, we should augment what we are doing with that ecosystem. So it is a much more open environment than you may have seen in the past from big companies."*

Partnering with startups is not just for innovative tech companies: *"Companies that are not opening their eyes to the external opportunities, are going to miss this boat."*



Combining hardware and software makes the development of connected products exponentially more difficult than non-connected products that only cover either hardware or software. For corporates that are focused on producing hardware products, and have little or no experience in software products, it is wise to partner with a startup with a focus on software development. The complexity brought by the 'multilayered-ness' of IoT value propositions can be reduced by assigning the development of these layers to different parties. A clear example is described in the Clay case.

Interview Rick Voogt, Managing Director of Clay:

"I wanted to go fast, and therefore needed a partner"

Clay is a startup company that believes mechanical keys are a thing of the past and is on a mission to replace them all. Smart locks have numerous benefits; business owners can grant access to different users, for example cleaning people, at specific times. Home owners can open their door for visitors when they ran late being stuck in traffic.

Rick Voogt and Xander Heijman founded Clay in 2012. The founders have extensive experience in software development and the domain of security technologies.

Voogt motivates why their first step in the development of smart key products was to find a partner. *"European Venture capitalists do generally not invest in the creation of new channels from scratch. I wanted to go fast, and therefore needed a partner for production and distribution"*.

Simply put smart locks are mechanical locks plus electronics and cloud technology. Teaming up with a traditional lock company with international sales channels was a sensible move. In their quest for a partner, Voogt encountered what he calls 'dinosaur' companies. Established companies with a significant market share did not believe that anyone would ever want to connect locks to the internet. Even though Voogt was a well connected person in the industry, it was difficult for him to sit down with these companies. Voogt emphasizes that corporates should at least make sure that startups know how they can contact the organization and talk to someone who takes their ideas seriously.

Salto Systems, one of the world's top five manufacturers of electronic access control systems, did see the market opportunity of smart locks, however they acknowledged that development of cloud technology and user-friendly software is not their expertise, so in their turn they were looking for a partner. The two joined forces and the result is a partnership in which Clay can focus on software development, and Salto delivers hardware.

"The fusion of hardware and software doesn't make the development of new products twice as complex, the complexity grows exponentially." However, according to Voogt, technology and product development is not the main reason that the adoption of IoT products in general is slower than we would have hoped and expected a few years back: *"The distribution chain of hardware products such as locks consist of multiple links, the speed of the diffusion of innovation is determined by the slowest link. The infrastructure of an app is only one step: from the app store to the users smartphone."* *"IoT companies who are able to get their product to consumers fast, choose for non traditional distribution channels."*

Voogt warns against looking too much to the positive outliers. *"Companies such as Tesla and Square start with extremely exceptional conditions"*. His pragmatic advice: *"Study successful innovations that started with similar conditions as yours."*



Due to the high risk of technology startups, angel and early stage investors are looking for the possibility of extremely high returns. Due to the limited scalability of physical products, IoT startups need more funding and present business forecasts with lower returns than startups who develop platforms or apps without a hardware component. Also, the long lifecycle of existing products will limit the diffusion speed of IoT. Most connected objects will be acquainted as a replacement of a non-connected object, and due to this “replacement strategy” of most buyers, IoT roll out will be restrained. Corporates might have more patience than investors. Corporates often have large sums of cash available, a profitable business today and the uncomfortable outlook that their business might be disrupted in the next decades. In this situation corporates have the option to hope these potentially disrupting startups will fail, or to embrace the future and partner by supplying them with funds, knowledge, production assets and distribution recourses.

Partnering with startups is not the only way to make the development of IoT value propositions less complex. Sharing assets among corporates can be very powerful as well. Adding sensors to your assets might reveal tremendous value to organizations in a completely other business than yours.

The image below visualizes how such a partnership can be developed successfully. New business development starts with ideation. This phase is all about brainstorming, forming ideas and sketching concepts. After the ideation phase, the most promising ideas are selected and a for each idea potential partners are defined. Start the conversation with these potential partners, figure out if you want to work together and explore ways to shape the partnerships to realize the idea. When a suitable partner –corporate or startup- is found, a handshake, agreeing on intentions, is given. At this point, the incremental phase of development is reached. Testing prototypes, learning, and adapting is key for successful development. The learning and adapting does not only apply to the prototype, but also to the partnership; i.e. iterate how partners are working together. This will eliminate the need for extensive contract negotiation and expensive lawyers at the very start of the partnership, when there are still a great deal of uncertainties and no value is created yet. This is a lightweight approach to launch new co-developed IoT value propositions.

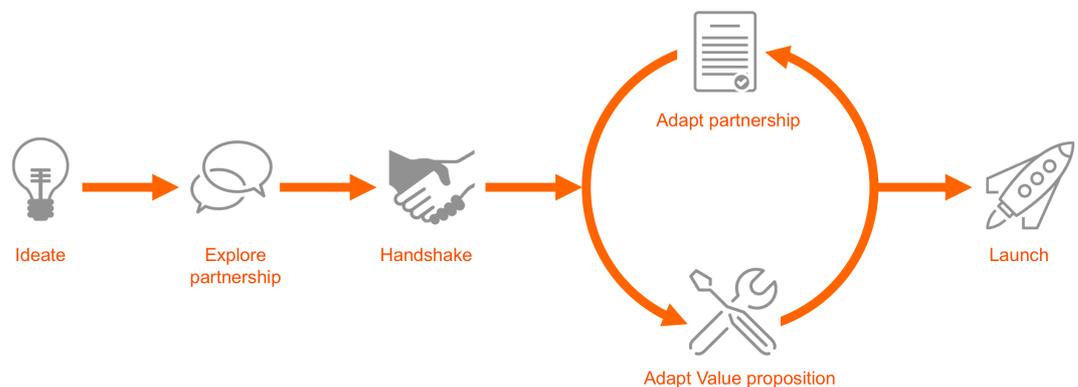


Figure 3. A lightweight approach to launch new co-developed IoT value propositions

3.1 Conclusion

Creating good partnerships between corporates and startups or corporates and other corporates is not easy, nonetheless, collaboration is essential to reach the next level in IoT. Contrary to what some might think, technology is not the limiting factor, humans and organizational boundaries are. The main challenges that can be expected when building sustainable partnerships are in the organizational and cultural domain.

Although the current paradigm is that startups fuel innovation, in the context of IoT, corporates should take the lead and partner with other companies; small or big. It is evident that these partnerships require organizational changes and a paradigm shift.



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- Strategic Sourcing
- Innovation & Growth
- Scaling Agile
- Digital Transformation

The authors

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Based on her technical background Irene is able to approach management issues from different views and can perform analyses on various facets. Irene has experience in change management, reorganizations, IT governance, contract management and offshoring, mainly in a corporate environment.



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