

IoT Driving Social Innovations

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ABSTRACT

We have come a long way from 2014 where the world has been moving from the Internet of Things (IoT) to the Internet of Everything (IoE). The Internet of Things or Everything (IoT or IoE) has the potential to digitally transform our very existence in more ways than any of us could have imagined five years back. Why “Everything?” “Everything” because it brings together or connects people, data, process and things to turn information (insights) into actions that create pristine capabilities, elegant experiences and unparalleled economic opportunities for businesses and individuals.

The intent of this article is to outline initiatives across industries which have prompted significant visible social changes and where IoT has been the prima facie evidence of such a change. We will also look at the basic technology and solution building blocks that constitute the DNA of this IoT or IoE backbone and its enabling services.

Keywords: IOT, IOE, Social Innovation, ICT

1. INTRODUCTION

The world is seeing technology advancements and the rate of change in technology happening in the last half-decade is much more than what it had seen in the last century. The most amicable way of making peace with this rapid change is acceptance and adherence to business models, changing customer demands and improving service delivery. Telcos are no longer the need of the day and they have transformed or rather trying to transform themselves to (Information communication technology (ICT) enablers (Jürgen Meffert, Niko Mohr, 2017). IoT is a byproduct of the same change. This paper is largely intended to talk about the social implications and some of the most pragmatic use cases of this concept which can be willfully accepted by sections of the society. We will look at health care, agriculture, social sciences and ICT as domains while deciphering the key impacts.

IoT or it's more comprehensive moniker, IoE are familiar phrases that we have seen or heard as our world grows more connected by the day. But for the last 24 months or so, people associated with the ICT industry are looking forward to opportunities and investments in this space.

Is the big hue and cry justified or the fuss is akin to popular Shakespearean play “Much ado about nothing”? Although

there is no right or wrong as a comment or a feedback from all stakeholders who form the ICT industry value chain, the fact of the matter is, as a technology it did exist since the last 2 decades but just came into prominence with the advent of connectivity and connected devices who are otherwise “smart” or presumed to be “smart”. The big change that we have witnessed in the last 18 months is social applicability and acceptability and its reactions towards such technology which penetrates our lives in every possible manner. It is now quite positively and unanimously accepted as a median of change in an otherwise “keen to be disrupted” world which is thriving on technological and social innovations.

2. THE CONCEPT OF IOT

The Internet of Things (IoT) is a conceptual framework, which involves embedding connectivity and intelligence across a wide range of devices over the cloud. As per the “IHS Market”, IoT device is one that has some form of embedded connectivity that allows it to directly connect to the Internet or an IP-addressable device or information system (IHS Markit, 2017). These devices can be either a range of sensors or some form of user interface.

Vast amounts of data collection in near real-time from a wide range of smart devices connected to the internet

are the blueprint of IoT. Through the use of complex analytics and big data techniques, this data is processed and refined to uncover valuable insights. Hence, IoT is a Complex Interconnected Information Systems that are greater than the sum total of the individual components (Alex Grizhnevich, 2018).

2.1 Four Pillars of IoT

The core foundational pillars of the IoT movement are these 4Cs

- *Connect*: Interconnected devices and information.
- *Compile*: Vast amounts of data collection in near real-time from a wide range of smart devices connected to the internet.
- *Compute*: Transformation of collected data through advanced techniques to uncover valuable insights.
- *Craft*: Creation of new possibilities through interconnected devices and information leading to newer business models, and innovative solutions.

3. KEY IOT TRENDS AND TECHNOLOGIES

The following figure summarizes the evolution of technology and ICT demands over the last two decades. Most of the terms and terminologies are quite familiar to organizations which are in need as well as for those who supply these services.

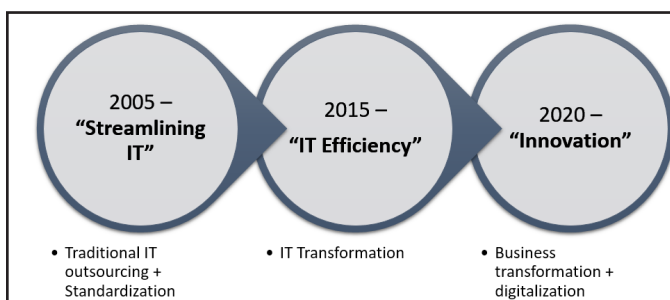


Fig. 1: IoT Trends & Technologies

While looking at any Technology company offering a host of IoT services, we can classify them into four broad set of categories depending on their maturity and what they plan to invest on. We must, therefore, understand ‘IoT value chain’ from both a demand and supply perspectives to clearly objectify the trends. From a demand perspective IoT service providers can be classified into the following

categories: (i-scoop.eu, 2017)

- Has a vision in place but has nothing else to offer.
- Has a vision and Strategy both in place but lacks physical execution of services.
- Has a vision, strategy and business processes but still lacks technology enablement.
- An end-to-end IoT services provider with vision, strategy, business processes and technology.

Most of the technology vendor corporations who are IoT service enablers would be providing certain key IoT offerings to ensure service enablement of these aspiring service providers. They can, therefore, roll out their ambition depending on the need of the IoT service provider’s category mentioned above.

Typically, these technology vendors can broadly deliver the following:

- IoT Cloud Platform for Industries
 - Technology vendors, clients and partners will use new age analytics services to design, build and deliver industry agnostic IoT solutions.
- IoT services roll out and enablement
 - Ease of IoT data integration and development followed by deployment. This also includes integration of various devices, sensors along with their support systems and solutions.
- Expansion of IoT ecosystem
 - The IoT ecosystem has expanded massively over the past few years, from chip and device manufacturers to industry-specific solution providers. This perhaps also includes revisiting the entire IoT business models and thereby strategize in a way of engagement to ensure the larger interest of the IoT service provider.

The key differentiators, which would help IoT service providers, make an effective selection of technology vendors would be the following criterion in the modern era of ICT services enablement.

- An analytics expertise along with a detailed portfolio with regards to the thorough understanding of the latest trends around all possible analytics technologies.
- Adhering to all Industry standards which would thereby include open standards and protocols thus leveraging cross-industry content and best practices

- Advanced analytics with advanced Systems Integration capabilities which will deliver a single view of analytics across the enterprise to help drive real business outcomes.
- Has the capability to offer SaaS (Software as a Service) as an integral differentiator within their portfolio. This will surely ensure lower cost of time to market and lower TCO overall.

Service Delivery Framework

The IoT Service delivery framework comprises of the 5 main components inclusive of the Data Analytics and Service context management, Business Process automation, IoT resource management, IoT communication and IoT security policy procedures (Fiware.org, 2011). If one must represent this in an e2e diagram the holistic view of the IoT SDF will look like the following below.

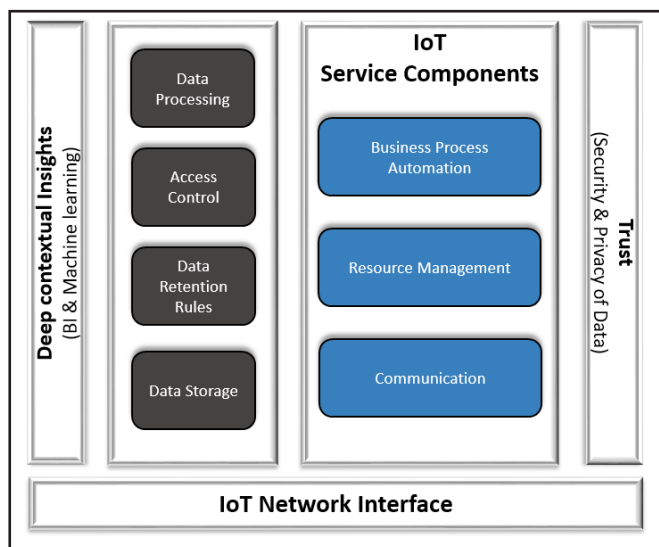


Fig. 2: IoT Delivery Framework

4. IOT IN ACTION: CONNECTED AGRICULTURE

A use case from our society

Sector: Agriculture

Imagine hardware and IT companies collaborated with IoT technologists and built connected tractors, drones, automated irrigation, remote soil monitoring and real-time alerts for the drones to rise to the action whenever needed. This is not a figment of our imagination anymore

– the reality is here. There are early stage companies who are in their pilot testing their prototypes before rolling out these ventures on a large scale across the globe.

The connected agriculture market is projected to grow at a CAGR of 17.9% from 2016 to 2021 i.e., from USD 1.34 Billion in 2016 to USD 3.06 Billion by 2021 (CIST PR Newswire, December 2016).

4.1 Agricultural Innovations

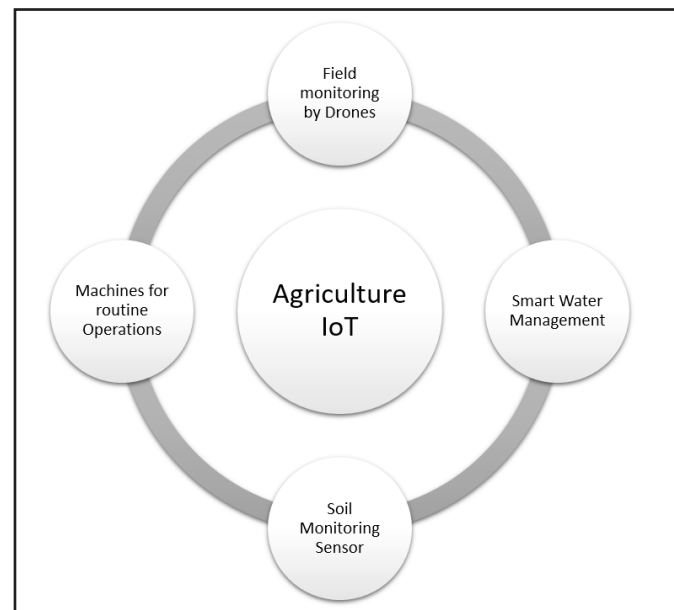


Fig. 3: Agriculture IoT

The Technical University of Madrid has piloted an agricultural robot system named “Rosphere” (David Szondy, July, 2013). Rosphere is armed with powerful sensors that can possibly monitor every single twig in a farm. These interconnected sensors can exchange information with one another over a network. The collective data can be then used to forecast crop yields, growth and be linked to current crop prices.

Another example is Harvest Geek, an open-source wireless greenhouse monitoring system which is used for sensing and reporting on various parameters like temperature, dampness, brightness level, and soil moisture through. These are then linked to the systems to trigger alarms to detect early symptoms of pests or disease (Jaymi Heimbuch, January, 2013).

For example, “Checkit” – a cloud-enabled, remote food monitoring platform from Elektron Technology is making

the headlines by taking food safety to the next level with a moderate cost. Checkit helps multi-site food chains, hotels, supermarkets and other food businesses to ensure food safety and administer process compliance through its state of the art remote food monitoring services (Vesna Doknić, 2014).

4.2 Agricultural IoT Market

The market is in its infancy now – there are some players who are focused toward an area of connected agriculture

while others are trying to figure out how to address a wider segment of need. The IoT market can be divided into two segments: 1) Hardware & network Platforms & 2) Services.

The overall market is growing at a CAGR of 13.8% from 2016 to 2022 & is expected to reach USD 18.45 Billion by 2022 from USD 9.02 Billion in 2016 (BusinessWire, 2016).

Here's a break-down of the market by Application:

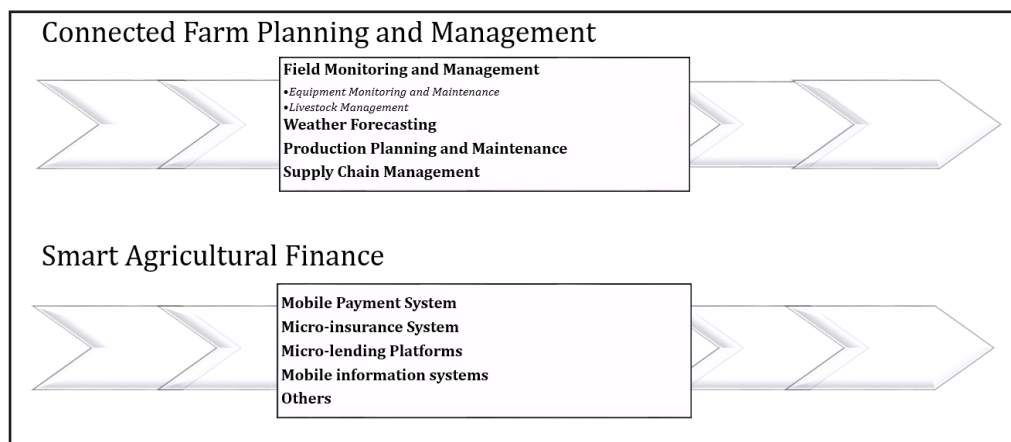


Fig. 4: Agricultural IoT Market Segmentation

If you are wondering if it is easy and quick to implement smart connected agricultural systems – the short answer is “no” but it’s feasible and possible. The benefits are far too many to overlook or dismiss as a fantasy project. Let’s have a look at the key benefits:

- Improved decision-making system for farmers
- Smart production planning
- Amplified productivity
- Better profits
- Increased food production
- Improved water management through smart irrigation
- Data collected can be used by government and policy makers for making economic decisions

5. IOT ROADMAP - 2018 & BEYOND

By adhering to IoT best practices & standards, we can bring order to the madness that IoT brings with it. As the IoT complexities grow, we should focus on three primary issues:

- *Common Architecture:* Today, IoT is an abstract pool of uses and products. It’s vital that we establish patterns for effective application and use.
- *Development of Open Standards:* with the best architectural choices. Today too many Standards exist each serving a different purpose. This results in a series of silos. Open standards are essential to facilitate true interconnectedness between IoT devices & systems.
- *Creation of a “Test Bed”:* where best practices can be designed, implemented and refined. The industry and the government should work in tandem - the first two needs stated above can be best handled by industry, while creation of the test bed platform should be facilitated by the government.

No doubt about it that IoT will influence & significantly change the way we interact with our surroundings. It will create a whole range of new possibilities through interconnected devices and information leading to newer business models and innovative solutions.

6. CONCLUSION

IoT as a concept is here to stay and will encompass various industries and social segments. It will perhaps be the most innovative science in the next decade while it commoditizes from a major transformation technology to a household phenomenon. The umbrella of Digital transformation and truly 'outside-in' transformations of major global corporations will result in seeing IoT or IoE as a service differentiator which will create waves of social and behavior change. In this paper, we discussed the impacts of IoT on one sector Agriculture which is perhaps closest to developing markets, however, the other major impacting sectors will be healthcare, education and utilities. Needless to say, ICT and Telecom would be the drivers and enablers of this change at a mass scale.

Social Innovation is one of the most profound trends of our time and IoT is the tip of the spear to take it to a new level. With IoE driving a second green revolution, there is an increasing hope that the world's farms will be able to generate enough food to feed all keeping environmental & social benefits into considerations. It's up to us to embrace change, become more agile, unearth new revenue sources, and present new customer experiences while elevating existing ones. All one needs to do is adhere to the roadmap for a smarter future.

REFERENCES

- Grizhnevich, A. (2018). IoT and big data: the specifics of productive symbiosis. Retrieved from <https://www.sensoft.com/blog/iot-and-big-data-the-specifics-of-productive-symbiosis>
- Business Wire. (2016). Smart Agriculture Market by Hardware and Network Platform 2016-2022 - GPS/GNSS Devices, Sensor Monitoring Systems, and Smart Detection Systems/Network Elements - Research and Markets. Retrieved from <https://www.businesswire.com/news/home/20160211005509/en/Smart-Agriculture-Market-Hardware-Network-Platform-2016-2022>
- CIST PR Newswire, (December, 2016). Connected Agriculture Market Worth 3.06 Billion USD by 2021. Retrieved from <https://www.prnewswire.com/news-releases/connected-agriculture-market-worth-306-billion-usd-by-2021-606020196.html>
- Szondy, D. (July, 2013). Rosphere spherical robot could be rolling up for work to monitor and tend crops. Retrieved from <https://newatlas.com/rospHERE-spherical-robot/28142/>
- Fiware.org. (2011). Internet of Things (IoT) Services. Enablement Retrieved from [http://forge.fiware.org/plugins/mediawiki/wiki/fiware/index.php/FI-WARE_Internet_of_Things_\(IoT\)_Services_Enablement](http://forge.fiware.org/plugins/mediawiki/wiki/fiware/index.php/FI-WARE_Internet_of_Things_(IoT)_Services_Enablement)
- IHS Markit. (2017). The Internet of things: A movement, not a market Retrieved from https://cdn.ihs.com/www/pdf/IoT_ebook.pdf
- IHS Markit. (2017). Intelligent Buildings and the Impact of the Internet of Things, (2016). Retrieved from <https://www.naesco.org/data/industryreports/CABA%20Intelligent%20Buildings%20%20Impact%20of%20IoT%20-%20Executive%20Summary.pdf>
- i-scoop.eu.(2017).IoTplatforms–IoTplatformdefinitions, capabilities, selection advice and market. Retrieved from: <https://www.i-scoop.eu/internet-of-things-guide/iot-platform-market-2017-2025/>
- Heimbuch, J. (January, 2013). HarvestGeek Automates Your Entire Garden. Retrieved from: <https://www.treehugger.com/gadgets/harvestgeek-automates-your-entire-garden.html>
- Meffert, J. (January, 2017). Overwhelming OTT: Telcos' growth strategy in a digital world. Retrieved from <https://www.mckinsey.com/industries/telecommunications/our-insights/overwhelming-ott-telcos-growth-strategy-in-a-digital-world>
- Doknić, V. (2014). Internet of Things Greenhouse Monitoring and Automation System. Retrieved from http://193.40.244.77/idu0310/wp-content/uploads/2015/09/140605_Internet-of-Things_Vesna-Doknic.pdf